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Editors' Introduction

This Issue of the Journal includes a selection of articles around one common subject: the development of integration-related infrastructure. The main focus is placed on South America's recent experience in this field but the papers also address other topics -which in spite of going beyond the sub-region's reality- are decisively relevant for analyzing the selected subject-matter.

Besides the academic interest of the Journal to encourage and disseminate research in this area, the Issue also has motivations that interweave with the region's situation and the activities of the Inter-American Development Bank (IDB) to contribute to a better international insertion of Latin American and Caribbean countries. It is thus advisable to firstly make a brief reference to these aspects and then to the contents of the papers.

The expansion of the economic cycle experienced at different degrees of intensity by Latin American and Caribbean countries has unveiled, among other things, the need to increase and modernize infrastructure. To a great extent, the countries' competitiveness and their capacity to insert themselves into international value chains is based on an efficient infrastructure. This becomes an essential ingredient for sustaining growth in economies open to the flow of goods, services and capital. Integration-related infrastructure is made up of a diverse range of different projects which favour and improve physical interconnection between countries, whether they share national borders or not. This type of projects require different forms of cooperation involving two or more countries, a process that would turn into "regional public goods" for the benefit of participants once they are successfully completed. The articles summarized in this Issue can be read by using either an analytical or applied approach, as explorations of the many dimensions related to cooperation for infrastructure aimed at physical integration.

Encouraged by the interest to facilitate mechanisms to supply regional public goods, IDB has been providing technical and financial support to investment programmes in infrastructure in the different countries of the region. Particularly since the beginning of this decade, the Bank has paid special attention to physical integration initiatives promoted by Latin American countries. There are two efforts which are particularly important given their size. Firstly, the Puebla-Panama Plan to develop a series of integration works in Central America, favouring the interconnection -in transport, energy and communications- of the isthmus countries with the south of Mexico. Secondly, IIRSA, the Initiative for the Integration of Regional Infrastructure in South America.

The existence of several research papers on IIRSA's experience -several of them arising from academic circles- nurtured the idea of bringing together in a single volume all the works which would otherwise not have the same visibility. However, with the purpose of placing these contributions within a broader framework, an attempt has been made to include these studies side-by-side with discussions that address infrastructure to favour integration, from a broader perspective. Furthermore, this Issue also contains three papers on the Asian experience comparing it with the Latin American experience. The Journal thus tries to provide additional analysis and understanding on the processes which allow cooperation to favour integration.[1]

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[1] A relevant precedent in this regard also produced by the Inter-American Development Bank as part of its analysis is Estevadeordal A., B. Frantz and T. R. Nguyen (eds.), *Regional Public Goods: From Theory to Practice*. Washington: Inter-American Development Bank, 2005.

The conceptual aspects involved in providing infrastructure to favour integration are addressed accordingly under the different topics, in several of this Issue's studies. The first paper in this volume, written by *Paulina Beato*, chooses an analytical perspective and focuses exclusively on conceptual aspects regarding transnational projects, defined as those in which the benefits (measured as gains through the reduction of trade costs, the creation of new trade and greater factor mobility) are spread out in such a manner that there are strong ingredients in the way of multi-directional externalities and public goods. This feature as well as the indivisible, "sunken" nature of the committed investments and the presence of several sovereign countries gives rise to a special mix of problems for allocating resources where there are risks of under-supply and also regulatory ones which call for a coordinated solution from supranational cooperation.

The paper's core structure is based on an example that illustrates the problems related to a transnational infrastructure project in which there are asymmetrical benefits linked to transport cost reduction in trade and the creation of new trade opportunities. Henceforth, the main part reviews the contribution of transnational public goods models, as well as social choice models and those for the design of mechanisms and governance from which results are drawn on the determining facts of the sub-optimal nature of transnational projects (poor information, cost and benefit distribution problems and political and economic restrictions), the mitigating role of under-investment in regional initiatives (solving the problem that demand for information is inexistent at the individual country level and providing a cost distribution mechanism) and the limitations of an international agency to reach optimum dimensions in investment projects. The conclusions and recommendations of this research work aim to make cooperation effective through regional agencies but paying attention to the results arising from the literature on asymmetric information and mechanism design.

Even from a merely analytical-conceptual approach -although inspired in practices and experiences in Europe and Latin America- it is remarkable how the importance of the topics raised by Beato is reflected in the remaining papers of this Issue, such as, for instance, the problem of sub-optimal investment in integration projects (in the *Mauricio Mesquita Moreira* study), the strategic format of the involved parties' decisions (in the article by *Rodrigo Cárcamo-Díaz* and *John Gabriel Goddard*), the nature of the public goods problem and the benefits offered by a regional cooperation initiative (in *Ricardo Carciofi*'s paper), economic factors and economic politics which motivate individual country strategies (in *Roberto Iglesias*' study) and the many problems which crop up in the project selection process (in the documents by *Georgina Cipoletta Tomassian* and *Gustavo Guerra García Picasso*).

Then *Fernando Navajas* uses a contract theory approach to explore gas integration between Argentina and Chile. As is known, energy integration infrastructure achieved a special momentum in the region during the last decade within a process in which the countries have sought to exploit complementariness and feel assured *vis-à-vis* shocks, through exchanges with neighbours. More recently, various gas or electricity integration projects were shaped in several countries of the region. In the nineties, South America presented conditions for intensive gas integration between Argentina and Chile under an umbrella of cooperation which gave rise to private initiatives that led to building six gas pipelines involving a great amount of resources. Subsequent problems in the Argentine gas market greatly disrupted natural gas exports with the resulting frustration in such trade, high reconversion costs and the appearance of several litigations between private sector players.

Navajas' paper describes this case based on the intersection between the perspectives of infrastructure integration and the contract theory. He also argues that besides the risks of a sub-optimal allocation of transnational infrastructure and the habitual regulatory risks, imbalances in domestic markets -related to shocks or sovereign policy decisions- can render incomplete the exchange contracts that use the infrastructure and turn them into the core of the problem hindering integration. In turn, this has implications on the contractual design between the parties (private or public) of an energy infrastructure integration project as well as on the coordination between countries, including planning aimed at energy safety.

IIRSA: General Approach to the Initiative

The three papers in this section provide a general overview of IIRSA but from different standpoints. *Carciofi*'s article discusses IIRSA as an inter-governmental cooperation mechanism. The author starts by highlighting the fact that since its start-up, the region's governments have maintained their interest and participation in the Initiative. The article enquires about the motivations which would explain the functionality of this scheme for the supply of integration infrastructure and explores several hypotheses with the aid of an analytical framework that includes several of the elements of economic geography, project selection, funding mechanisms and market access. In the quest for answers to the question posed, the paper provides an overview of the objectives pursued, reviews the outcomes during the eight years of IIRSA's work and, finally, tries to identify pending challenges. *Cárcamo-Díaz and Goddard*, on the one hand, and *Mesquita Moreira*, on the other, focus their contributions on the IIRSA transport component and resort to the economic theory as well as to empirical evidence to justify the Initiative and assess its impact. The first two authors draw upon the game theory to demonstrate that "multinational transport infrastructure" projects -such as those envisaged by IIRSA- are exposed to several coordination failures arising from "strategic uncertainty". That is to say, given the uncertainty of the governments about the commitment of their counterparts in the multinational infrastructure projects, there are incentives which operate in the opposite direction to the progress of investments tending to maximize well-being, particularly when costs and benefits are asymmetrically distributed among countries.

The game theory is used by *Cárcamo-Díaz and Goddard* to analyze the objectives and IIRSA's recent contribution leading to the conclusion that the Initiative is not only consistent with the theoretical framework but has also made a significant contribution to investment coordination in the region. The authors, however, point out a series of imperfections, particularly in the way in which the projects are funded -jointly, since multinational financing by multilateral institutions has not been sufficiently developed- and in the manner information is gathered and in how the countries design and evaluate infrastructure projects.

On the other hand, *Mesquita Moreira* analyzes IIRSA from the standpoint of trade costs through an economic geography approach. He views the Initiative as a component of a broader integration process and as a key factor in the creation of a fully integrated regional market whose gains are not diluted by the high transport costs arising from deficient or even inexistent infrastructure. The author holds that the defects in South American transport infrastructure, historically biased against intra-regional trade, have worsened as a result of the years of under-investment, to such an extent that transport costs have become one of the most important obstacles -if not the most relevant one- for trade in the region. This

argument is backed by freight and tariff estimates which affect Brazilian trade with South America, where it is demonstrated that the freight costs are generally higher than tariffs. Just like *Cárcamo-Díaz and Goddard*, the author also finds a justification for IIRSA in the need for a greater commitment from the governments, given the fact that infrastructure services are considered public goods, the externalities they generate and the coordination they demand.

IIRSA National Case Studies

The Journal also includes three studies on national IIRSA-related experiences: Brazil, Chile and Peru. Although the papers were written as separate inquiries, the authors try to answer the same question: which have been the motivations that, in each case, have fostered the countries' participation in IIRSA. From the standpoint of the analysis framework, there is a certain similarity: in a more or less explicit manner, the articles look into the political economy of the process, trying to identify the role of the government and of non-governmental players -the private sector and other groups of interest. And a difference is drawn between the elements present in the initial phase, the launch of IIRSA, from those that are still present within the process.

It is not surprising that the authors find that the prevailing factors in each situation are different. It is worth pointing out that the three research papers state that, from the standpoint of national strategies, their participation in IIRSA favours their interests. A stylized presentation is hereafter made of the authors' main arguments.

Roberto Iglesias, when analyzing Brazil, detects two dimensions which are present at the same time. On the one hand, IIRSA's conceptual basis -in which physical integration is an objective in itself which allows certain control to be gained over the geography through cooperation, without compromising the trade agenda topics- is related to a traditional vision of Brazilian diplomacy. These schemes, in turn nurtured by the work of government planners and technicians, who in the years before IIRSA's launch had been working with territorial planning tools (*Avança Brasil* Plan), supported the official decision of President Cardoso's administration in 2000 to take IIRSA to the public regional arena.

On the other hand, Iglesias concurrently points out the convergence of private interests which coincided in time and allegedly reinforced the public agenda. The author documents that the stagnation of public investment at the domestic level, particularly in the construction sector, seems to have been a determining factor for big works and engineering companies, with a high level of installed capacity, to carry out offensive strategies towards regional markets. These private strategies were allegedly supported, in turn, by government decisions regarding funding through BNDES, the agency which supported the regional efforts of the construction and engineering services companies.

The paper also finds that the current context in Brazil is different to what prevailed at the end of the last decade. Particularly, the Programme of Growth Acceleration, which started in 2006, prioritized domestic infrastructure works and projects, especially in the field of energy. This is a pluri-annual public investment programme which includes private partnerships. This emphasis tends to drain resources from infrastructure integration, save for certain projects which are thoroughly consolidated from the technical and financial standpoints.

When *Cipoletta Tomassian* looks into the Chilean case, she wonders why a country that has followed a unilateral liberalization strategy, seeking market access advantages through a very aggressive policy of trade agreements with many different partners, would be

interested in adhering to a regional cooperation framework in the field of infrastructure. The answers all point in the same direction: Chile's participation in IIRSA gives the country visible advantages. It is worthwhile summarizing these elements. Firstly, the author identifies no opposition between the country's trade strategy and its regional insertion. When analyzing trade flows, the paper notes an important piece of information: almost 30% of Chilean imports come from MERCOSUR countries. Furthermore, in 2000, 16% of imports entered the country by land. From this standpoint, transport cost reduction through infrastructure has quite a significant effect on the country's economy. Secondly, this analysis also shows that the selection of integration projects made by Chile in IIRSA comprises high priority works which had to be carried out in one way or another. Additionally, IIRSA offers some attractive advantages - either for obtaining funding, doing technical work with neighbouring countries and even from the viewpoint of Chile's participation and presence in a regional initiative- which would benefit the projects. Finally, and given the appropriate selection of projects, IIRSA is an activity within the governmental sphere, without great visibility on the public agenda and also of interest for the sectors directly linked to investments. There is thus no contradiction between the country's international insertion strategy and its participation in a regional integration initiative.

This situation contrasts with that in Peru analyzed in *García Picasso*'s article. The author points out that "IIRSA has been present in the highest-level government decisions in Peru since 2004", and that under these decisions the "greatest reallocation of resources and priorities has taken place in the Peruvian transport sector" in the last few years. The article specifically explains that the change in strategy led to privileging the East-West cross-cutting hubs over and above longitudinal ones which had traditionally attracted attention. This shift in the approach helped to materialize very important road works: the Northern and Southern Amazonas works are still underway. *García Picasso*'s explanation contains elements similar to those analyzed by *Iglesias* for Brazil. Firstly, domestic policy considerations which foster the implementation of works far away from the traditional hubs. Secondly, the intensification of bilateral relations with Brazil which also predicted an increase in bilateral trade. Thirdly, the pressure exerted by the private sector -in both countries- with regard to public works and, finally, the government's interest to mobilize investments in infrastructure through innovative formulas thus minimizing the commitment of fiscal resources.

In brief, the three case studies offer reasons which lead to understanding IIRSA's functionality for the prevailing strategies and actors in different situations and the real or perceived benefits linked to their participation in the process. On the other hand, they also suggest that the benefits do not seem enough so as to trigger a process of deep integration, with a more demanding commitment from the parties.

The Asian Experience

One of the objectives of the third annual meeting of LAEBA (Latin America/ Caribbean and Asia/Pacific Economics and Business Association), held in Seoul, in November 2006, was to address the discussion on regional cooperation and integration in the field of infrastructure with papers from both regions.[2] Three of the studies on the Asian experience

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[2] The meeting's objectives and agenda can be found at *http://www.iadb.org/intal/detalle_evento.asp?cid=233&origen=&id=317&idioma=ENG*

presented at this meeting are included in this Issue of the Journal with the same motivation as that of the meeting: to promote exchange of experiences between Asia and Latin America and the Caribbean on policies and research in infrastructure. Indeed, these papers not only provide a good approach to the Asian experience but also contribute to placing Latin American topics within a broader perspective.

The first two studies prepared by *Prabir De; Christopher Edmonds* and *Manabu Fujimura*, resort to a literature based on gravitational models of trade costs to estimate the impact of transport costs on intra-Asian trade. *Prabir De* uses several direct and indirect measurements for transport costs in ten Asian countries, including global infrastructure quality indicators for the countries, and reaches the conclusion that a 10% tariff and transport cost reduction would increase bilateral trade by 2% and 6% respectively. This result suggests that not only in Latin America are transport costs the main obstacle to trade, particularly regarding intra-regional trade. Improvements in infrastructure, both here and in Asia, could promote trade even more than the deepening of trade liberalization.

On the other hand, the article by *Edmonds* and *Fujimura* focuses on the Great Mekong sub-region (Cambodia, Laos, Myanmar, Thailand and the Chinese province of Yunnan) and on the impact of improvements in transborder road infrastructure on intra-regional trade. Using road infrastructure measures based on the density of freeway traffic, they find that, if there is a 10% increase in the amount of roads, bilateral trade would increase between 6% and 23%. Once again, the result highlights the importance of transport costs in intra-regional trade, particularly regarding transborder infrastructure.

The third and last paper by *Douglas Brooks* and *Fan Zhai* addresses a different topic that is equally critical for Latin American economies: the different funding options available and their macro-economic and inter-generational distribution implications. The authors use a computable general equilibrium model for comparing recent experiences in China and India in the funding of infrastructure and its implications on economic growth. Their simulation confirms that public infrastructure plays a key role in the sustainability of growth in the long term and suggests that the consumption tax is the funding option that shows the best results in contrast with income tax and indebtedness. In terms of inter-generational equality, however, indebtedness appears as the most advisable option. In other words, it is a quantitative exercise which can help policy-makers and researchers in Latin America to address this historically thorny issue.

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Infrastructure to Favour Integration: Public Goods, Externalities and Contracts

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Issues and Options on Transnational Projects

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Summary

Transnational infrastructure projects are critical, if countries wish to increase cooperation in a more and more competitive global economy. This is because regional infrastructure facilitates trade, investment and information flows, and the movement of people within and between countries. A distinct feature of transnational projects is that an investment located in a country may create trade or generate other trade related benefits to a third country. This means that several countries are involved in the success or failure of transnational projects that, in turn, raise the two issues. First, transnational infrastructure projects show public good features and externalities. This means that an infrastructure project within a country may benefit a third country that cannot participate in the decision-making process that leads to the implementation of the infrastructure. Second, a transnational project has multiple sovereign principles making country, currency and regulatory risks complicated and politically sensitive: Instead of dealing with one set of regulations, sponsors have to deal with two or more; instead of dealing with a currency, transnational projects are dealing with several. This paper is to discuss the implications of these issues.

I. Introduction

Regional infrastructure projects are a necessary condition for the integration of infrastructure of markets. New or upgraded international highways, international bridges, ports, airports, power transmission lines and pipelines, and telecommunications will be needed for accelerating the economic integration process. Transnational infrastructure projects are critical, if countries wish to increase cooperation in a more and more competitive

global economy. Regional infrastructure facilitates trade, investment and information flows, and the movement of people within and between countries.

Although several definitions of transnational projects may be used, all of them try to capture the project capacity to increase the mobility of factors and products across countries. A restricted definition would consider transnational projects as those projects whose trade benefits are larger than costs; trade benefits being measured as the cost reduction in the existing trade plus the market value of the trade creation. Other definitions would include gains in factor mobility among the relevant benefits of the transnational projects. However, whichever the definition is, a distinct feature of transnational projects is that an investment located in a country may create trade or generate other trade related benefits to a third country. This means that several countries are involved in the success or failure of transnational projects that, in turn, raise the following issues. First, transnational infrastructure projects show public good features and externalities. This means that an infrastructure project within a country may benefit a third country that cannot participate in the decision-making process that leads to the implementation of the infrastructure. Second, a transnational project has multiple sovereign principles making country, currency and regulatory risks complicated and politically sensitive: Instead of dealing with one set of regulations, sponsors have to deal with two or more; instead of dealing with a currency, transnational projects are dealing with several.

The purpose of this paper is to discuss issues related to transnational infrastructure projects and the role that regional initiatives may play on promoting them. The paper is organized as follows: Section II discusses in an informal framework the difference between country individual decisions and collective decision. Section III applies the theory of public good to transnational projects. Section IV analyzes organizational issues of transnational investment. Section V contains the conclusions.

II. Country Decisions Versus Collective Decisions

Country Decisions

Bond [2001] shows that country decisions about the selection of transnational infrastructure projects do not bring investments in transnational projects to an optimal level. This results from poor information across countries about a project's benefits, a lack of schemes for distributing cost and benefits among countries, and political and economic constraints for a country to undertake or support the costs of other country infrastructure. Problems involved are similar to those appearing when designing resource allocation mechanisms for contexts in which externalities and public goods are present. The impossibility of finding a fully satisfactory solution for assigning resources in those cases may be translated here, as it will be shown in Section III.

Lack of identification of true benefits arises because each country has limited data for estimating the impacts on trade costs and trade creation. The reduction of costs that a project would provoke on existing trade may be calculated using standard parameters on cost reduction, as information on existing trade is available. However, the evaluation of trade creation in a third country is almost impossible without the strong collaboration of the corresponding country. Moreover, each individual country does not have the incentive to look for other countries' benefits since each country would have to pay the whole costs of investments within its borders even if benefits expand beyond such borders. When the costs and benefits of transnational projects are not symmetrically distributed across countries,

but countries have agreements for distributing costs in a fair manner, then countries may not find rewarding looking for other country's benefits. Thus, lack of information is the first obstacle for identifying efficient transnational projects. Poor identification of efficient transnational projects causes low investment.

Transnational Infrastructure - An Example

To illustrate the issues arising in transnational projects that will be discussed in this paper, a project consisting in enhancing an existing road crossing across two countries A and B will be considered. Let's denominate this project R1. Lets suppose that enhancing the road has similar investment costs in the two countries. The road's main use is exporting agriculture goods from country A to country B. Prices of exporting goods paid by country B importers are independent of transport costs, but country B fully supports transport costs. Let's assume that a reduction in transport costs will not increase trade in country B, but will increase trade in country A. However, cost reductions for country B from undertaking the two portions are US$3 billions. Trade creation will not take place when only a portion is undertaken, while if two portions were undertaken, trade creation would be US$250 million. Larger benefits from undertaking the whole project result because single portions do not allow a rational management of customs. This project is an efficient transnational project in the sense that benefits in terms of trade costs reduction and creation of trade are larger than project costs. However, countries will not undertake this project through individual decisions. Moreover, countries may be unable to identify the project as an efficient transnational project. Table 1 summarizes the above figures.

Table 1

Benefits and Costs of the Whole Project

	Country A Million US$	Country B Million US$	Countries A plus B Million US$
Investment Costs	1,000	1,000	2,000
Trade Costs Reduction	0	3,000	3,000
Trade Creation	250	0	250
Overall Benefits	250	3,000	3,250
Net Benefits	-750	2,000	1,250

Country A would not be interested in the project with the usual distribution of costs between countries, where each country pays the investment of its own country, because with such distribution, costs in country A would be larger than benefits. Agreements for side payments or different distribution of costs are needed for country A to accept the project.

Even with benefits and costs properly identified, low transnational investment results from a country's willingness to invest in projects with costs within the country's border, smaller than the country's benefits, resulting in the country's reluctance to pay projects located outside its borders. The most common practice is that transnational projects are promoted by those countries in which the infrastructure is located. When these countries do not obtain sufficient benefits to compensate costs, they will not promote the project. Other countries obtaining large benefits would only have leverage by accepting to pay investments outside their own borders, but they usually reject such a practice. The reluctance to pay infrastructure investments abroad is quite specific of transnational infrastructure. While most countries' Governments are willing to invest abroad in a variety of assets (in which appropriation rules are well defined), they reject investing abroad in infrastructure assets because appropriation rules for these assets are neither clear nor stable. In some cases, benefits for the third country are so large that the country would be willing to provide compensations to the country accepting the infrastructure. However, lack of politically and socially accepted schemes for doing so, prevent the development of the infrastructure. Experience shows that these mechanisms are more easily implemented at later phases of the integration processes when institutional arrangements for leading the integration process are well established. For example, as Turro [1999] discusses, the European Union established the first mechanism for supporting transnational infrastructure costs in 1994.

Regional Initiatives

Increasing transnational investment calls for some sort of regional initiative that may break the elements that make transnational investment being under optimal level. A regional initiative for promoting and developing transnational investment may be organized under different schemes and its capacity will depend, among other features, upon their decision power and budgetary restrictions. Nevertheless, some assumptions on the regional initiative should be made in order to discuss appropriate practices and guidelines for promoting regional infrastructure in Latin America. Before making assumptions, let us discuss two issues of regional initiatives that set a large difference between the capacity of these initiatives for promoting and implementing transnational projects and the corresponding capacity of national Governments for attending pure national infrastructure. The two features are the lack of capacity and the lack of budget for undergoing transnational projects.

Regarding the capacity for imposing projects, a national Government is empowered with the capacity to undertake, directly or through a wide range of contracts, most pure national infrastructure projects. Regional initiatives are not empowered with a similar capacity to that of national Governments and unanimous approval of involved countries is usually required even in cases with well-advanced integration processes. Being the Latin American region at a very early stage of the integration process, regional initiatives are empowered with promotion (and coordination) capacity, but not implementing capacity.

Regarding the second issue (lack of budget), regional initiatives have a budget for identifying transnational projects, for evaluating costs and benefits. Some regional initiatives such as the Initiative for the Integration of Regional Infrastructure in South America (IIRSA) may grant funds to support the identification of transnational projects and may even subsidy the project design, but they usually do not undertake the cost of the transnational infrastructure. The European Union normally offers support to transnational projects.

This article assumes that the regional initiatives share the above features, which means that a transnational project would only be implemented when all countries in which

the project is located accepted it and that the regional initiative lacks of outside budget to pay the infrastructure or to make side payments.

Removing the Obstacles for Transnational Investment

Regional initiatives aiming to increase transnational infrastructure projects would be successful to the extent that they are able to remove the obstacles making transnational investment under- optimal: poor information, reluctance to support costs of infrastructure assets located out of borders, and asymmetric distribution of costs and benefits. Two remarks should be kept in mind before discussing the capacity of the regional initiative to remove the obstacles. First, those capacities compound among them and better information provide incentives for supporting costs in third countries that, in turn, call for socially acceptable mechanisms for distributing costs. Second, credibility and stability of the regional initiative are necessary conditions to be able to effectively increase transnational infrastructure. This second remark points out when setting goals for regional initiatives in terms of transnational projects to be implemented, limited and secured goals would be better than ambitious and risky ones.

Regarding poor information, regional initiatives for promoting transnational projects would have some advantages for gathering and preparing the necessary information and for assessing benefits and costs of transnational projects. A regional initiative receiving projects with poor identification of a third country benefits, may request from it additional information or may dedicate some of its own resources to refine a certain project's benefits. For example, the cost reduction derived from the custom rationalization would be easily identified for a regional initiative, even if individual countries were not able to identify it. However, this advantage would be more significant if countries had incentives to investigate and declare the true benefits of projects. Gathering information on the benefits of transnational projects without the support of the involved countries is expensive and time consuming. Moreover, cost distribution based on information gathered without the support of involved countries, would not have the acceptance required for effectively implementing the project.

Reluctance of a country to support the cost of an infrastructure located in a third country or to support projects with large benefits for the third country but poor benefits for its own country, may be better dealt in a regional basis. This is because regional initiatives may set and enforce rules ensuring that the country without benefits in the short-run may benefit in the long run. Such a capacity is larger the more advanced the integration process is. For instance, this capacity is large in the European Union that has the capacity for setting rules for harmonizing infrastructure regulatory frameworks to ensure access to all users in a non-discriminatory basis. Although such capacity is low in the Latin American region, the regional initiatives may promote such rules by setting them as conditions for financing the project.

The regional initiative may also deal with the asymmetric distribution of costs and benefits across countries by undertaking a portfolio of transnational projects with costs and benefits compensated for each country. In other words, although a lack of equilibrium between costs and benefits may occur for a given project on a country, the expectations that other projects will correct it will reduce political reluctance. It should be stressed here that the capacity of a regional initiative for dealing with this obstacle, relies on its credibility to implement the portfolio on time. In other words, countries should trust on the capacity of the regional initiatives to ensure that lack of equilibrium between costs and benefits of individual projects will be corrected by the full implementation of an appropriate portfolio.

Although regional initiatives may have the capacity of establishing schemes for distributing costs of transnational projects among countries, rules for such distribution show trade-off between two goals: true identification of benefits and matching benefits and costs across countries. For example, if costs were distributed across countries as a function of the declared benefits, then countries would have an incentive to declare lower benefits than those effectively expected. The result could be an underestimation of benefits and, consequently, a jeopardy in the capacity of the regional initiative for gathering data to identify all efficient transnational projects.

Common Errors in Building-up a Portfolio

The goal of a regional initiative is building-up a portfolio of efficient transnational projects with a high likelihood of being implemented on time. A good selection process facilitates project implementation that, in turn, incentivates countries to improve the identification of costs and benefits. Thus, interaction between good selection and good implementation generates a virtuous circle that would increase transnational projects. If efficient transnational projects and proper implementation is the goal, regional initiatives should be aware of the three types of errors that are easily made when building–up a portfolio of transnational projects: error of type one is selecting an inefficient project (i.e. one whose costs are larger than benefits); a second type of error is not selecting an efficient transnational project; and a third type of error is selecting an efficient project that is not a transnational project, but a pure national project. Causes and implications of the three types of errors are quite different.

Selecting an inefficient transnational project may be a common error in a regional initiative promoted by multilateral financial institutions. Country authorities may see these initiatives as a mechanism to finance projects at low financial costs. Therefore, the incentive of stakeholders is to bring to the regional initiative as many projects as possible. If the regional initiative imposes restrictions on the relationship between benefits and costs in order to ensure efficient projects, the result may be the declaration of large benefits without the support of effective expected benefits. Selecting inefficient projects usually brings serious problems to the implementation phase. Being the most common lack of private sector involvement, poor commitment of countries, and short of capacity of the regional initiative to analyze the portfolio. The result is that only a few, if any, of projects within the portfolio are implemented and the regional initiative losses its credibility. The risk of building-up a large portfolio may be mitigated by advising the stakeholder that not all benefits will be accounted for without proper appropriation of the benefits by a country. In other words, declared benefits will be used for two purposes: project efficiency and cost distribution. If countries know that project costs will be assigned to countries as a portion of the countries benefits, then the incentive to declare benefits, which are larger than the effective ones, disappear. But the incentive to hide benefits appears.

The second type of error is not including in the portfolio efficient transnational projects. This type of error is caused by the elements provoking sub-optimal level of transnational investment. Regional initiatives may reduce these errors by making countries declare the true benefits of transnational projects, to support investment costs out of each country borders, and to accept mechanisms for distributing costs across countries.

Finally, countries knowing that costs will be distributed as a function of benefits and being reluctant to support costs of infrastructure outside their borders will tend to request projects in which their benefits are similar to the costs of the portion of the infrastructure located

within country borders. This choice will bring pure national projects. However, managing a pure national project through an initiative for promoting transnational projects is not desirable. By so doing, national projects would absorb resources and structures designed for transnational projects, and the capacity of the regional initiative for promoting national structures would be restricted. No simple solutions can be found to mitigate this problem. Nevertheless, studies of trade costs and trade creation due to a project may mitigate the problem. Although those studies are expensive and difficult, if such studies are prepared only for projects that are efficient according with the country's declaration and have a country commitment to support their costs, then the number of required studies becomes affordable.

III. Public Goods Theory and Transnational Projects

Transnational Projects as Public Goods Theory

Infrastructures often entail fixed costs, which are so large that no single country can afford to build the infrastructure on its own. Those fixed costs must be shared upon several countries. Infrastructures can, thus, be viewed as public goods for which financing mechanisms must be agreed upon by the partners of the projects. This perspective raises, of course, the *free rider problem*, where Coasian bargaining among countries is not feasible and, particularly, in contexts with informational asymmetries.

A general lesson from the literature on public good mechanisms developed in the eighties and nineties is that, under asymmetric information, the optimal mechanism calls, in general, for deviations away from the first-best allocations. This is because under asymmetric information, a country may pretend having a lower willingness to pay for the public good than what it really has in order to minimize its own contribution; thus, letting other countries of the partnership bear the bulk of the investment. The mechanisms, with the proposal of removing those bad incentives, should sometimes reject projects even though they should have been undertaken under complete information.

These insights have been derived by looking at the provision of a public good for individual agents, *not* for countries. Countries can only be reduced to individual agents under the very restrictive assumption that all agents are homogeneous. However, countries have heterogeneous agents, which make decisions based on their own preferences and wealth. On the other side, Governments aggregate the different preferences through a political process. Governments also bargain among them over the decision of building or not a certain infrastructure.

Therefore, the bargaining and the information in transnational infrastructure projects take place at two layers: individuals and Governments. One layer is composed by individuals: Countries have an heterogeneous population with different preferences on projects. These people must bargain among them to get their preferred results and because individual preferences are privately known, individuals may or may not reveal their true preferences. It will depend on their strategies for bargaining. The other layer is composed by Governments: Governments make decisions based on the country's mechanism for aggregating preferences, which may be different across countries. These Governments must bargain among them to get each country's preferred results. As country rules for aggregating preferences are privately known by each country's Government, a Government may or may not reveal its preferences. It should be highlighted that even though population and distribution of costs and benefits would be symmetric across countries, Government decisions on transnational infrastructure projects may be different

due to different country mechanisms for aggregating preferences and different strategies in the bargaining process. These two layers should be taken into account for analyzing the role of collective mechanisms in increasing transnational infrastructure investment.

Some Results

Laffont and Martimort [2005] developed a model in which the two layers of information and two layers of bargaining are included in a traditional public good model and obtained the following results. First, in a decentralized two-layer bargaining between countries on infrastructure size and country contributions, lack of revelation of true preferences arises and the resulting transnational infrastructure investment is below the optimal level. Second, a collective mechanism for decision-making across countries would increase the volume of transnational infrastructure investment. Third, a single Government is not appropriate for designing and applying the mechanism for transnational infrastructure projects even though it is appropriate for doing so for local public goods. A country Government would have political pressures to privilege welfare within its own country, and other countries would expect biased proposals. Fourth, institutions managing collective decision-making for transnational projects must have enough credibility to enforce the mechanism and avoid bilateral negotiations. Probability of bilateral negotiations is large in transnational collective mechanisms because a single Government can credibly commit to build the infrastructure if a predetermined proportion of population benefits from it, while an International Agency cannot commit to build the infrastructure even if a predetermined proportion of the population benefits from it. Fifth, collective mechanisms for decisions on transnational projects show trade-off between the optimal investment level and the incentive of agents to declare the true benefits.

International Agency Options

As a single Government is not appropriate for managing the collective decision mechanism, let's see now what an international agency can add. For so doing, Laffont and Martimort [2005] assumed that an uninformed international agency is in charge of implementing the collective decision mechanism for transnational infrastructure.

The mechanism decides on the following questions: which projects should be built; how to share the fixed-costs of the infrastructure project among countries; and how much consumers should be charged for using the infrastructure. The Laffont and Martimort model is simple and relies on the following assumptions. First, the international agency is benevolent. That is, it is a benevolent welfare *maximizer*. Second, the international agency does not bring external funds. In other words, it does not have its own budget. Although in integrated environments such assumption is not appropriate, we are interested in exploring collective mechanisms in non-integrated environments. And, this assumption is appropriate for such an environment. Third, the international agency gives equal weight to each country**.** Fourth, there are two countries with different mechanisms for aggregating people's preferences and two types of people: rich and poor.

The collective decision mechanism works in two layers as follows (see Figure 1). First, consumers of both countries, A and B, communicate their willingness to pay for a given infrastructure to their own Government. We should keep in mind that consumers may not report their true willingness to pay and that the Government does not know the true consumer's preferences. Second, each Government receives such information and makes a decision regarding the country contribution to the transnational infrastructure. Such decision

is made through the country's mechanism for aggregating preferences and communicates the decision to the international agency. Third, the international agency accepts or rejects the project, defines the contributions for each country and defines a rule for charging consumers. The decision is made trying to maximize welfare of the two countries, but with imperfect information (only with the information revealed by countries).

The features of the best allocations that may be achieved through these mechanisms depend on the capacity of countries to reject agency decisions.

If countries do not have the option to reject agency decisions, the decision of the international agency as to whether to build the infrastructure would be efficient. Moreover, the decision has two good properties and one bad one. The good ones are that rich agents consume the first best amount; and each country's pricing policy depends only on local parameters, meaning that there is a dichotomy between the pricing decision and the decision to build the project. The bad property is that poor agents are not able to get first best amounts; they only get second best allocations. In general, contributions of poor people to the projects would be larger than their first best options. In order to be able to make compatible the infrastructure that rich people wishes and the true declaration of preferences of rich people, contributions of poor people should be larger than their first best option. These results will hold in both cases, when the international agency does know the country's preferences and when it does not know them, which in turn makes the asymmetric information problem irrelevant. Notice that the apparent lack of relevance of information is due to the assumption that countries must accept the mechanism. This means that countries should accept projects in which benefits for the country are smaller than the costs. Such assumption is realistic in tied integrated environments with other compensation schemes in place, but it is not in non-integrated countries.

If accepting the international agency's intervention is not mandatory, but a sovereign act, accepting a mechanism of this sort would require Parliament approval. Therefore, a country will join a collective decision mechanism only if such mechanism ensures that benefits after undertaking the transnational infrastructure projects are strictly larger than before. This is the restriction that will bring inefficiency to the mechanism.

When removing the assumption of mandatory participation, the features of best allocations attainable through international agencies are not good for two reasons. First, the decision to build or not the infrastructure may be inefficient. Second, first and second best allocations for poor and rich agents may not be attainable through decentralized incentive compatible mechanisms. Therefore, allocations away from second best must be accepted. These results confirm that non-integrated environments are a source of inefficiency for transnational infrastructure projects. Inefficiency appears from two causes: in order to ensure incentive-compatible mechanisms, some efficient projects must be given-up and for a country's acceptance of a new project, the project must strictly increase the country's welfare. Another bad feature is that the international agency must propose an unequal distribution of costs and benefits across countries to induce revelation of preferences. Moreover, the rich country would receive more than the relatively poor one.

IV. Organization Issues

As discussed before, non-integrated countries may be reluctant to share costs and benefits of transnational projects for several reasons: countries are not used to paying for infrastructure investment located in another country, sovereignty allows the hostess

country to restrain the use of transnational infrastructure to foreign countries. A country may not afford to pay its portion of the project when benefits are small in the short-run but large in the long run. However, governance rules of transnational projects are major issues for a country to accept a transnational project.

Regarding timing for governance rules, it should be remarked that all working rules that the partnership will need, cannot be established at the time of setting-up the partnership since unexpected events may occur. If rules cannot be set-up in advance, voting rules become essential for governance. Two issues are particularly relevant for transnational projects: Rules for accepting new partners and the choice of majority versus unanimity for decision-making.

Rules for accepting a new partner became pivotal for partnership governance because, as Barbera [2003] points out, new partners bring both new behavior and voting power. And it is the voting power of a new entrant over the decision of other potential new entrants that may change the overall evaluation of a new entrant. For that reason, some partnerships may give founders some special rights. For example, founding partners vote on the acceptance of new entrants, but new entrants do not vote on additional entrants. Non-founders only vote on projects.

Moving on to the appropriate voting rules on transnational projects, it is clear that the main advantage of the majority rule is that it promotes efficient results. However, this rule may not promote fairness, that is, it may not promote the welfare of the less fortunate partner. On the other side, unanimity rules may stop changes and avoid progress. An option to balance changes and partners' comfort in partnerships is having two voting rules, one for ordinary decisions and another for extraordinary decisions. These two rules, which are present in most country's constitutions, bring stability to the partnership, even if partners are very different.

Although intuition says that the unanimity rule prevents changes and avoids progress, intuition should be revised on partnerships for transnational infrastructure projects with long lives. Indeed, on a dynamic perspective, the unanimity rule has three very good properties. One, partnerships are more easily structured under unanimity rules than under majority rules because countries do not lose the control at the time of the initial agreements. Two, new proposals advance more easily under unanimity rules because partners are not afraid to analyze proposals that they initially do not like as they know that they can exercise their veto power in due time. Three, the simple majority rule can be manipulated through coalitions and trading votes, and therefore would generate multiple and time-consuming bilateral negotiations.

V. Conclusions and Lessons Learned

Three main types of results of both conceptual and practical nature were obtained throughout this paper. First, the levels of transnational investment undertaken by countries on an individual basis are not optimal, but below the optimal ones. This is due to the interaction of three elements: poor information across countries about a project's benefits, lack of schemes for distributing costs and benefits among countries, and political and economic constraints to undertake the costs of a third country infrastructure.

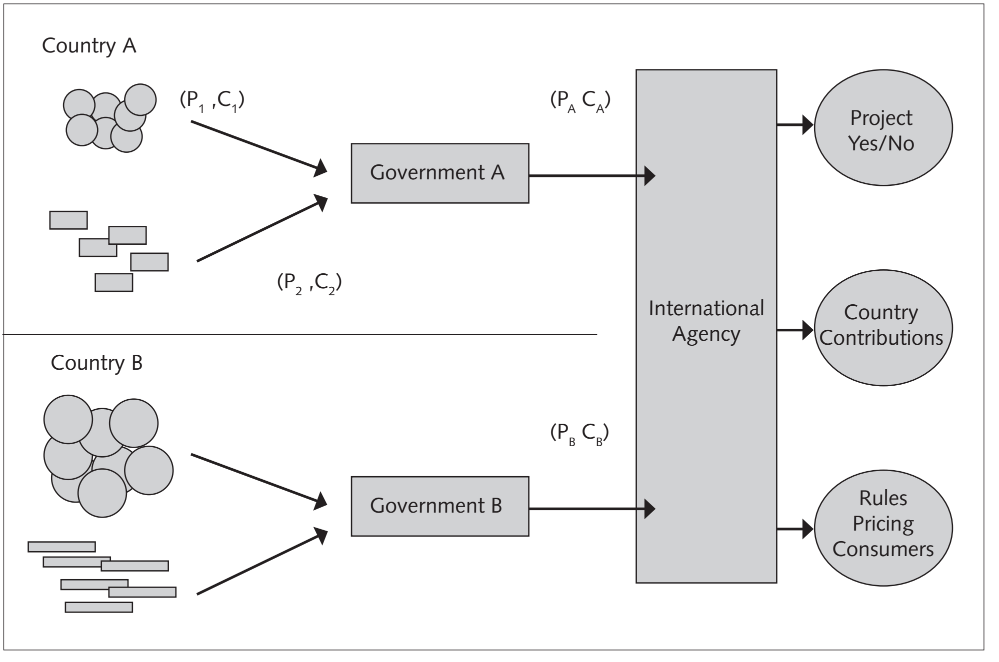
Second, regional initiatives may increase transnational investment. For doing so, they should be able to address the following issues: gathering appropriate information, reducing reluctance to pay investment abroad and finding a mechanism for sharing costs.

Third, the participation of an international agency in the process of negotiating the portfolio would increase the size of the portfolio, but it is not likely to reach the optimal portfolio if countries should maintain incentive to transmit correct information.

The Latin-American countries need to make qualitative efforts for increasing transnational infrastructure. The Action Plan for IIRSA and the Puebla-Panama Plan are regional initiatives aiming at promoting transnational projects. The last two results mentioned above confirm the positive role of International Agencies, but warn them not to be too ambitious. In other words, International Agencies may increase the volume of transnational projects. However, they should not try to achieve an optimal portfolio because this is not compatible with the country's incentives to transmit true information. Therefore, insisting on such portfolio may bring inefficiencies and discomfort among the partners.

Figure 1

COLLECTIVE DECISION MECHANISM



Source: Author's elaboration.

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Contents

Infrastructure Integration and Incomplete Contracts: Natural Gas in the Southern Cone

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Summary

This paper looks at the intersection between energy infrastructure integration and contractual perspectives to study the rise and fall of the recent integration of natural gas infrastructure between Argentina and Chile. It argues that in many cases imbalances in domestic markets related to shocks or to policy decisions make incomplete contracting of the exchange (to be supported by the infrastructure) the center stage of problem. Examining the evidence on recent underperformance related to the Argentine energy sector, it looks at the likely reasons for the generalized restrictions of supply to Chile to discern between competing explanations of broken exchanges that are essential to understand the likely source of contract incompleteness and to qualify contending views in recent private sector litigations, looking also at the scant but interesting evidence of contractual conflict and adaptation between private sector participants. Lessons from the case call for better contract design to govern relationships among private participants and, at the policy level, for some form of supra-national coordination of decisions that affect exchanges, including energy planning, that are particularly relevant in view of recent major developments on natural gas infrastructure integration between Argentina and Bolivia.

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I. Introduction

Regional infrastructure can be seen as a platform to support exchange of inputs or final goods and services in an expanded economic area. The regional public goods perspective to regional infrastructure provision has characterized many challenges that normally have to

do with coordination failures related to the construction and governance of large projects that usually have multidimensional externalities (see, for example, Rufin [2004]). However, active private sector participation in many integration projects show that contractual arrangements and provisions, under the umbrella of good legal and regulatory frameworks, can cope with those difficulties. Absence of or insufficient supply of infrastructure projects has not been a problem in the recent experience, among others, of Southern Cone natural gas integration. At the same time, the exchange supported by infrastructure comes in long-term contracting format, particularly in energy sectors such as natural gas where proven reserves need to guarantee that sunk investment in pipelines will be recovered through appropriate use of capacity and that sunk elements of reserves development need also to be recovered. Besides, domestic market conditions and the prevalence of domestic supply reliability objectives can, in principle, make exchanges contingent on domestic imbalances, that in turn can be due to shocks or to policy failures, such as inconsistent pricing or energy planning decisions. Foreseeing, perfect or imperfectly, such problems amount to precautionary decisions by exchange participants, that can be included in contractual formats. On the other hand, unforeseen contingencies or the inability of agents to incorporate them in written contracts, make contracts intrinsically incomplete. Therefore, there is an interdependency between private contracting of energy exchanges, energy planning (in the form of a balanced domestic market) and infrastructure provision, that critically makes infrastructure integration workable or not.

The significant infrastructure integration of natural gas that emerged in the 1990s in the Southern Cone in Latin America fits well into this problem. The evidence of the leading role played by the private sector has been used to argue that in energy sectors, so called infrastructure-related-regional-public-goods can be easily supplied in a decentralized fashion with rather low public intervention, mainly in the form of "minimally" compatible rules across countries. Indeed, around the mid 1990s about ten large to medium scale projects were put in place to transport natural gas in significant amounts, relative to domestic markets. Long-term contracts of natural gas supply were part of this framework with embedded provisions for a reasonable exchange environment. Among these, gas producers in Argentina and electricity generators or distribution companies in Chile signed contracts under the umbrella of a trade protocol by both countries.

However, in 2004, an imbalance in Argentina led to a restraint of exports, within a generalized shortage of gas deliveries, and to a claim and concern by Chilean authorities. At the private sector level, some litigation processes were triggered, particularly by those Chilean buyers (particularly electricity generators) that took the brunt of the cuts, against upstream gas producers on the Argentine side. The demand rested on the basis that the "Force Majeure" provision contemplated in the contract (as argued by Argentine gas suppliers) should not apply in the case, despite the indication that the Argentine market was under severe policy intervention, given that the Argentine regulators did not directly intervene in gas contracts and rather allowed gas exports whenever a provision of equivalent energy (in fuel oil) were delivered to end users (mainly electricity generators). In any case, deliveries were seriously reduced and the foreseen scenario gave rise to pessimism on the strategy of integrated infrastructure to deal with long-term reliable provision of energy.

This paper looks at the intersection between energy infrastructure integration and contractual perspectives. It argues that, in many cases, imbalances in domestic markets related to shocks or to policy decisions make incomplete contracting of the exchange (to be supported by the infrastructure), the center stage of the problem. This in turn implies the need for contract design to govern relationships among private participants and, at the

policy level, some form of supra-national coordination of decisions that affect exchanges, including energy planning.

The structure of the paper is as follows. Section II reviews the conceptual framework provided by applied contract theory to natural gas trade and inquires into sources of incompleteness in international exchanges. The discussion points to some dimensions that justify the quest for empirical evidence used in the paper. Section III describes central features of natural gas infrastructure integration in the Southern Cone, evidence on recent underperformance related to the Argentine energy imbalance and the policy decisions that followed since then. Section IV looks at the likely reasons for the generalized restrictions of supply to Chile as a form to discern between competing explanations of broken exchanges that are essential to understand the likely source of contract incompleteness and to qualify contending views in recent litigations. Section V moves to the scant but interesting evidence of contractual conflict and adaptation between private sector participants. Section VI discuss lessons for contractual design and regional cooperation that are particularly relevant in view of recent major developments on natural gas infrastructure integration between Argentina and Bolivia. Finally Section VII draws the main conclusions.

II. Contract Theory Perspectives in Natural Gas Trade

Natural gas contracts usually come in long-term format depending on many dimensions at play. Early literature in applied contract theory stressed, among various dimensions affecting contract design, the sunkness of decisions chiefly related to pipeline infrastructure investments and the development of gas fields. The characterization provided came within the framework of transaction cost economics and complete contracting. A complete contract is a long-term contractual relationship where related parties in a transaction (buyer-seller) make provisions to cope with opportunistic ex-post behavior from each other in face of idiosyncratic investments from each side.

Long-term formatting predetermines the level (or sequence) of quantities and prices involved in a time trajectory and includes several contractual provisions to avoid opportunistic behavior against sunken investments. Chiefly among them is the minimum bill or take-or-pay or delivery-or-pay provisions, identified in early literature applied to natural gas contracts (see Masten [1988]). "Pay" in those provisions does not necessarily involve cash payments but rather the obligation to take or deliver what it was written in the contract and in the case of gas deliveries may simply imply the requirement to find at the seller expense the quantities of natural gas required in the contract.

Studies that focused on natural gas were also interested not only in what determines observed contractual provisions, but also on how they change with the economic (regulation and competition) environment (e.g. Masten and Crocker [1985]; Crocker and Masten [1988]). Dimensions such as contract length were shown to (negatively) depend on the degree of competition in natural gas trade, with evidence coming from American markets given the relevance of the issues and the availability of data for large number transactions.

More recently research spread across the Atlantic as European markets developed and allowed for data size to inquire on contractual response to liberalization. Recent econometric evidence on natural gas imports finds contract duration related to the competition regime, asset (project) specificity and volumes (Neumann and Hirshhausen [2006]). Further explanations of the choice of contractual length along these lines have been explained by structural elements such as the "perceived" elasticity of demand in the long run, where suppliers take advantage to lock-in exchanges (Neuhoff and Hirschhausen [2005]).

The interesting feature of these results is that they are taken from international or cross-border transactions in an integrated (by infrastructure) market and thus are more rich and relevant for our setting. However, beyond the econometric evidence on general contract characteristics there are no details on actual contractual performance, conflict or adaptation and the absence of case studies is due to the difficulties of getting access to explicit contractual formats made available for research.

Given this shortcoming it is understandable that issues of incomplete contracting and, in more general terms, contractual governance of unforeseen contingencies, are not addressed by the received literature. To begin with, it is not at all clear why contracts should be intrinsically incomplete in the setting studied by previous papers, and what verifiable features make them incomplete. Perhaps a key feature in cross-border exchanges is the commitment of national governments not to intervene in dimensions agreed-on previously at a coordinated supra-national level. These are precisely features that may have low relevance in the European integration experience. Nevertheless, exchanges in Europe do not come within the realm of the European Union and recent episodes of gas deliveries between Russia and neighbors cast doubts on the reliability of natural gas and led some governments to address questions of security of supply.

A contract is incomplete if contingencies that may affect the exchange later on cannot be incorporated at the moment of writing, either because they are unforeseen or difficult to describe, observe or quantify.[1] Unforeseen contingencies may be due to fundamental shocks in supply or demand structures or in policy variables that either affect them or hit at the exchange described in the contract. Answers to incompleteness in practice range from court "completion" in litigation procedures (which is, rather, third party "arbitration" and is subject to the same difficulties to discern phenomena that the original contractual parties faced) to "governance" frameworks agreed and incorporated into the contractual format. Contract theory in economics explores governance mechanisms while applied contract law studies focuses on court behavior.

A simple framework to describe the potential sources of incompleteness in cross-border contracts of natural gas is provided with the help of the notation given by the following identity, that expresses feasible exports for firm i (X_i^E) as a difference between production (X_i^S) and domestic demand (X_i^D).

$$X_i^E \leq X_i^S(p, I^S(p^e), \theta^S) - X_i^D(p, I^D(p^e), \theta^D) \tag{1}$$

Production X^S depends on prices (p), current and past investment (denoted by I^S) which in turn depends on expected prices (p^e) and a state-contingent variable (θ^S) that represents supply (including geological) conditions. Domestic Demand depends on prices (p), current and past investment in natural gas-using equipment (I^D, a function also of p^e) and a state-contingent variable (θ^D) representing demand conditions (including growth and energy-use patterns).

A contract is a sequence of volumes and prices (X_i^{CE}, p^{CE}) that is individually feasible when written. That is to say that proven reserves of natural gas guarantee agreed volumes and also condition (1) across the time spam of the contract. Opportunistic behavior of a hold-up nature is controlled by specifying fixed quantities and prices (so these cannot be renegotiated or subject to ex-post bargaining). Moreover, if p, θ^S or θ^D, create an imbalance, such that (1) cannot be met, then suppliers or "sellers" in the contract have

normally to "buy" enough quantities to sustain the agreed delivery at the given price (path) or compensate "buyers" in another form, depending on what was originally agreed.

Aggregate consistency requires that adding up both sides of (1) also holds, even when it may not individually hold, for some particular contracts. A stronger requirement for consistency is that individual contracts should satisfy (1) and, given other contracts, should also satisfy the adding-up condition. If aggregation of (1) across firms or contracts do not hold, then there will not be enough natural gas to satisfy exports and domestic markets at the same time, and individual contracts that cannot met (1) will not be able to cover the quantities required in the contract, by borrowing or buying natural gas from other producers. Aggregate consistency is normally supervised by the government, in the form of authorizations (conditional on observed balances and what is perceived in terms of risks), as a regulatory function to avoid the externalities created by individual decisions. In certain scenarios of abundant natural gas resources, the government -judging that there is no risk of aggregate imbalances- may follow an "automatic" export authorization policy (AEAP), leaving to the private sector to evaluate the individual consistency of the project and granting permits once the private evaluation has passed.

In this context, contract incompleteness comes from unforeseen contingencies given by realizations of the state-contingent variables θ^S and θ^D and by the price policy (p, p^e), that cannot be anticipated at the time of writing the contract. Either (uncommitted) price policy decisions or shocks in supply and demand, or both, may violate aggregate consistency and render contracts incomplete insofar as there will be a generalized gas shortage, and contractual provision to back-up deliveries with borrowed gas will not be feasible.

In this paper we distinguish between two competing hypothesis that have been commented elsewhere (Navajas [2006]) to address the natural gas shortage in Argentina and that are related to the sources of incompleteness addressed before. The first hypothesis is that by the late 1990s and the early 2000s a shock in supply and demand conditions (θ^S, θ^D) not properly anticipated by producers or by government (i.e., in the context of an AEAP) led to individual and aggregate inconsistencies of export decisions, compounded by a slow response in investment decisions. The second hypothesis is that the price policy (p, p^e) followed by the government created an aggregate imbalance, particularly on the demand side but probably also on supply investments, that render exports contracts unfeasible. We explore the evidence related to these hypotheses in Section IV, after reviewing the rise and fall of recent natural gas integration in the Southern Cone.

III. Natural Gas Integration in the Southern Cone: From Success to Crisis

Important discoveries of natural gas in the 1970s along with a new paradigm of private sector participation and regulatory regime in the late 1980s and early 1990s raised business climate and prompted several exports projects to Chile, Brazil and Uruguay. At a supranational level, several protocols were signed under the ALADI framework and authorizations to build pipelines were granted. Table 1 summarizes the status of natural gas infrastructure integration in the Southern Cone.

All projects except one that were designed to transport gas from Argentina to its neighbors, are relatively recent and became operative in the second half of the 1990s. Pipelines were built in this period with a capacity to deliver up to 42 MM m^3 day, which represents a sizeable share (about a third) of the production capacity in Argentina. Albeit

incomplete from data restrictions, Table 1 suggests important initial investment efforts of about US$2 billion.

The legal and regulatory framework for these exchanges is summarized in Table 2, describing a period of ten years from the Gas Law in Argentina to the starting of the domestic contractual crisis in early 2002. Crucial to this framework were the bilateral protocols signed with Chile, the authorization mechanism for exports, the MERCOSUR Memorandum of Understanding on gas exchanges, the move towards an AAEP in 2001 and the measures taken immediately after the crisis in Argentina in 2002 pointing to objectives of priority of domestic markets.

In this environment, exports of natural gas to Chile increased substantially from 1997 as the projects became mature. Figure 1 shows a sharp increase from nil in 1997 to a peak of more than 20 MM m^3 day, equivalent to about 17% of domestic demand, in 2004 and a drop since then. As contracted capacity was expanding and additional shipments were expected, the observed fall points to a deliverability problem explained below.

Export prices are reported in Figure 2, and represent average values from trade statistics in Argentina. One important feature of these prices is that they reflected the (quasi-strong) nature of integration between Argentina and Chile, since they were co-integrated with domestic prices.[2] The reason behind this result is that export contract design made the sequence of export prices (normally indexed to reference fuels) constrained by the evolution of domestic prices. This feature shows that a one-price for both domestic and exports was at the heart of the integration design with Chile, very much unlike what it has been recently witnessed in the case of Bolivian exports of natural gas to Brazil and Argentina. Still, and despite this evidence of quasi-strong integration there were some regulatory problems concerning open access issues and pricing of transport as reported in Beato and Benavides [2004].

The post devaluation (2002) environment was relatively normal insofar as contracted deliveries, beyond certain yellow lights turned on in 2002 and referred to at the end of Table 2. The crisis erupted in April 2004, when after a log and hot summer with -strangely enough- shortages of natural gas, Argentina entered into a gas-constrained regime in domestic markets.[3] In what was going to be the first moves in an unprecedented sequence of resolutions, the Secretary of Energy (SE) in Argentina first suspended the automatic exports authorizations (that is, reverted the "AAEP" adopted in 2001) and then moved openly to an invocation of the rule of priority to serve domestic markets.[4] After an initial and temporary suspension of exports to "redirect" gas to domestic markets, the government then moved into perfecting the mechanisms through several resolutions by SE that stated that what it was sought was to require additional injections to serve domestic markets.[5] Thus instructions were given to producers -amid accusations of negligence for not keeping investment efforts- for additional injections determined by SE on an individual basis. In this new framework, and given the burden imposed on Chilean demand -rapidly voiced at the highest level-, it was stressed that exports were not prohibited *per-se* "if" the required additional injections to domestic markets could be met directly with physical gas or with an equivalent fuel.

The magnitude of the constraints that emerged from the mandatory supply to domestic markets resulted in "additions" that were equivalent in 2005 to about 37% (on average for all basins) of total exports measured in January 2004 (that is, in a month previous to the crisis that reflects normal shipments). Table 3 shows these numbers for the three basins, where it can be seen that the "*Neuqina*" basin (the main source of exports to Chile) received the largest request relative to exports.

The previous table suggests that producers in all basins suffered the same effect and that the picture is of a general shortage rather than a basin-located or individual producer one. In fact, this view is enlarged by the evidence shown in Figure 3, comparing the ratio of the actual exports to contracted export capacity in one of the main pipelines (*Gas Andes*, see Table 1 and Figure 1) with that observed for all pipelines. The *Gas Andes* pipeline, exporting from the *Neuqina* basin, is important for its size and location and, as it will be shown below, for being the center of one important contractual conflict that arose after the 2004 crisis.

IV. Competing Views of Broken Exchanges

The previous section shows evidence pointing to a generalized shortage more akin to aggregate than individual inconsistency of export contracts. Thus it seems that aggregate explanations are in order and following the conceptual framework used in Section II. These explanations must be related to aggregate (non-price related) supply shocks, inconsistent domestic pricing policy or autonomous (non-price related) demand shocks. We submit two competing, albeit not mutually exclusive, explanations. The first one is related to evidence connected to a supply shock, while the second one has to do with domestic imbalances caused by distorted pricing. The role of autonomous demand shocks is seen within this second hypothesis (i.e. whether demand growth is due to price or non-price factors). Of course, both hypotheses involved unobservable and, therefore, are only partially addressed by the available evidence. This is true for the researcher but also for the courts, besides the fact that both explanations may be concurrently present in the evidence and it may become difficult to chose the dominant one. In fact, this is a pervasive problem from the perspective of incomplete contracting, since otherwise third party arbitration could easily complete contracts ex-post.

The first hypothesis is related to a shock that may have operated in the form of structural "fatigue" in supply, perhaps due to geological reasons and/or related also to required investment efforts that were not properly anticipated by producers and the government alike.[6] This shock would render contracts incomplete if it was unforeseen early on or, alternatively, may lead to arguments of negligence of some producers concerning investment provision given that it could have been foreseen. An obvious problem with this hypothesis is that it depends on unobservable, or difficult to verify, assertions about supply conditions. Additionally, another conceptual difficulty is that in order to fit into observed results, one needs a generalized or coordinated failure or negligent behavior by all producers exporting to Chile, which is rather difficult to sustain.

This hypothesis has, nevertheless, some foundation in conclusions and comments obtained from an early energy study on Argentina, performed by a World Bank mission in 1989 (see World Bank [1990]). One conclusion from that study is a sort of warning about the dynamics of supply efforts to sustain the evolution of domestic demand and to avoid reaching a critical Reserve/Production ratio (italics are mine).

"The urgent need for an accelerated exploration and development program is clearly shown by the trend in the (Reserves/Production) R/P ratio. In 1987, the (...) R/P ratio in Argentina was 20 years, comfortably above the critical level of 15 years (...) Even if a substantial exploration program is undertaken immediately, and all of the probable and possible reserves are actually discovered, *the critical R/P ratio (for Demand Management) will be reached by the year 2002"* (*Op. cit.*, p. 101).

A second remark of the study was directly related to the export policy on natural gas and the risks for the reliability of supply for domestic users (italics are mine).

"In the case of all three projects exports now being considered (...) the buyer who must make a significant investment in pipelines (e.g. Chile) will insist on a long-term supply contract and probably require that adequate reserves be explicitly dedicated to their project. None of the proposed export projects would impose a limit on near-term gas availability (...) but they would reduce availability over the long-term (...) *Discussions should be continued with potential buyers of Argentine gas; however, the national long-term supply base should be assured before long-term export commitments are made*" (*Op. cit.*, p. 111).

Concerning the first quotation, the actual evolution of production and proven reserves in Argentina coincides with pessimist expectations. As shown in Figure 4, the reserves/production ratio reached 15 years in 2002,[7] with reserves falling since 2001, suggesting that exploration results could not match the speed of production. Even though this does not mean an exact forecast by the study (given that many changes in Argentina happened in the 12 year period) it fits exactly as a qualitative comment that suggest that supply risks existed and had been mentioned before by authoritative sources. In Navajas [2006] this argument is complemented by historical data (1970-2005) taken from the energy balances published by the Secretary of Energy [2006] which shows a very intensive pattern of natural gas use.

Concerning investment efforts to sustain the R/P ratio above the critical level, given the dynamic demand pattern, there is also some evidence showing a sluggish exploration effort after 1999. This is shown in Figure 5 where the number of wellheads explored fell sharply compared to the previous decade. Nevertheless, the evidence shows that new wellheads for development or production did not suffer such a drop, suggesting that production efforts were still high and that the problem was rather related to exploration results. Reasons for the drop in 1999 cannot be attributed to a deteriorated contractual environment, as it may be argued for 2002 onwards. Low oil prices and a recession in Argentina might explain a wait-and-see policy that was later on compounded or reinforced by a contractual intervention and a freeze on prices.

The second hypothesis relates the observed imbalances with a policy-induced distortion in domestic markets after a freeze in domestic prices that, along with a rapid recovery, created a large increase in demand while depressed incentives to producers. The main evidence for this view is provided by the divorce between natural gas prices and benchmark substitute fuels, particularly in transport. This excess demand for direct use of natural gas was reinforced by a similar freeze in end-user prices of electricity, a large user of natural gas.[8] Figure 6 shows the sequence of prices of natural gas for domestic users, the price of imports of natural gas from Bolivia[9] and the price of fuel oil (as a benchmark substitute in thermal generation of electricity). In general liquid fuels such as gasoline (relevant for substitutions towards natural gas in transport)[10] followed a pattern similar to the fuel-oil price described in Figure 6.

That prices are divorced from opportunity costs does not mean that the actual shortages follow simply from this direct observation. Rather we need some measurement that first decomposes the imbalances in supply and demand factors and then proceeds to explore the role of prices. This exercise was performed in Cont and Navajas [2004] and an update to 2006 is summarized in Figure 2.[11] The right hand side bars of the panel

show factors contributing to the shortage, while those in the left hand side are factors compensating the shortage. In 2004, when the shortage erupted, (to an equivalent of 2.4 MM m^3 per day, on average for the January-April period) the explaining factors were the fall in hydro-generation (due to a long dry cycle), the increase in the demand for electricity and natural gas, and to a lesser extent the growth in natural gas exports. On the other hand natural gas supply reacted positively (even though not rapidly enough to meet demand). The situation changed in 2005 and 2006, were demand factors became more important in the explanation of the shortage. For instance, the sharp increase in the demand for GNC between 2003 and 2006 was equivalent to 90% of the observed shortage.

While the evidence shows that demand growth played a leading role in the imbalances, it has been said that this may be due to GDP growth or to an output-mix effect that, for instance in industrial demand, shifted output to energy (gas and electricity) intensive sectors after de devaluation in 2002. However, some scrutiny of these arguments with available data suggest that their role is not fundamental. Income (growth) effects were netted out in Cont and Navajas [2004] using available income elasticities from econometric evidence and they do not represent a large effect given that the economy was in fact recovering previous output levels. Concerning the output-mix effect, Navajas [2006] performed simulations of observed shifts in aggregate and in industrial production since 2002 and used available input-output coefficients to approximate changes in energy intensity. The result was that these sorts of changes were small and happened between 1998 and 2002, so they cannot be attributed to the observed policy changes.

To sum up, addressing likely causes of observed shortages we find that rather casual evidence in favor of a supply shock, possibly not properly anticipated by producers and the government (leading to a less dynamic supply response to demand challenges) coexist with evidence of induced price distortions and demand factors. While the data suggest that demand factors are primarily responsible for the observed shortages, one cannot deny that a sluggish supply and low investment exploration efforts were underlying factors operating before the 2002 crisis. Observed shortages of natural gas are immediately explained by demand factors and point to a policy intervention effect. But the extrapolation of the observed reduction in the Reserves/Production ratio along with warnings expressed several years before suggests that sooner or later the intervention was going to be effected. This contending evidence is what makes third party arbitration procedures precisely so difficult to implement.

V. Contractual Conflict at the Gas Andes Pipeline

Immediately after the restrictions on natural gas deliveries began to bite on the Chilean side, communications and negotiations started at the highest official level, with obvious claims from the Chilean side on the basis of protocols signed in 1995 and other further agreements. The response from and position of the Argentine government was made clear in several critical dimensions arguing that (i) there was an umbrella (protocols) but not an official commitment to exports; (ii) exports permits were wrongly decided by previous administration; (iii) legislation (and protocols) were clear concerning priority of domestic markets; (iv) decisions to supply exports were private decisions, possibly mistaken; (v) Observed natural gas shortages in general were explained by insufficient investment in upstream; (vi) exports are not prohibited if suppliers can deliver substitute fuels to domestic end-users. At the same time the Argentine government stated an unwritten commitment to maintain supplies whenever possible and to avoid cutting residential demand for urban

areas such as Santiago. A new conflict emerged in mid 2006 when Argentina introduced an export tax within an operation to balance an increase in the price of its imports from Bolivia, with a substantial effect in final prices.

The interruptions also triggered contractual conflict at a private level between buyers of natural gas in Chile that had participated in the pipeline projects and producers in Argentina. One important case is related with deliveries through the *Gas Andes* pipeline (see Figure 1) in a conflict that started early on in 2004. The importance of looking at this case is that it is relevant because is a major transaction (about 2.5 MM m^3 day, representing 12% of total exports to Chile at the time of the interruptions) on the larger pipeline to Chile.[12]

The contract involved in this conflict had originally been signed in 1996 by "Buyers" (two generators and a Distco) and "Sellers" (about five gas producers operating areas at the *Neuqina* basin). The qualitative features of the contract are all expected arrangements from the perspective of contract theory surveyed in section 2. The contract (i) was long-term (17 years) in line with the nature of the exchange and the sunk investments involved; (ii) had fixed quantities (with enlargement provisions) from a gas field committed exclusively to this export activities; (iii) had prices indexed by fuels but constrained to domestic pricing at the basin; (iv) was a take-or-pay contract, with flexible clauses for Buyers that may reflect demand uncertainty and contemplated outside opportunities (for the "untaken" gas) to Sellers; (v) was a delivery-or-pay contract with no flexibility, reflecting perhaps very low uncertainty of supply; (vi) had a "Force Majeure" provision contemplating for instance a case of direct government intervention; (vii) had an arbitrage mechanism of disputes.

These features provided a seemingly reasonable design of contractual base given the nature of the exchange, investment in both sides and the stage of development in (gas to gas) market competition. Rigid elements of this contract, compared to what has been depicted by the evidence in the US and Europe (Neumann and Hirschhausen [2006]), can be understood given structural elements. However, the contract had apparently a weak management of unforeseen contingencies, such as problems with overall gas availability. One critical element in contract design was that the inability to deliver gas was supposed to be covered with natural gas from other producers, rather than by an alternative fuel (such as was the condition imposed by the Argentine government to allow exports). This is to say that the contract did not contemplate a massive bottleneck in gas deliverability from Argentina to Chile and, therefore, the ex-post resolution of impeded exchanges were treated as a commercial risk from Buyers or Sellers defaulting individually.

In face of the events and the lack of response by sellers to the request by buyers of the contractually agreed deliveries, these initiated an arbitration demand on damages for the undelivered natural gas, within the terms of the contract. The process of litigation, under the umbrella of the International Chamber of Commerce (ICC), is in process with resolution pending for 2007 and we have obviously had no access to the material related with this legal procedure.

But some comments on the strategies followed by the parties are in order, given what has been presented in this paper. Sellers argued a "Force Majeure" situation given the constraints imposed on them in Argentina. However, this position apparently resulted difficult to sustain in court. From the evidence commented before it results clear why this might have been so. First of all, exports were not explicitly prohibited and could, in principle, be allowed if an alternative substitute (fuel-oil) was delivered to the domestic market, even though this might have been a strategy by the Argentine government to shift the burden to producers, knowing beforehand that the proposed mechanisms for export authorization

would be non-implementable for all cases.[13] Nevertheless some evidence exists that the mechanism was used in specific and isolated cases or events.[14]

Second, and perhaps more problematic to Sellers, to invoke "Force Majeure" and avoid this being seen as an excuse for negligence, Sellers need to show that they had no way to anticipate the imbalances that occurred in Argentina after 2002. However, against this position is the evidence commented in section 3 related to signals of "supply fatigue", lack of exploration efforts before 2002 and the warnings written in the World Bank report of 1990, concerning the balance between gas availability *vis-à-vis* dynamic demand.

On the other hand, Buyers argued for plain or outright contractual negligence rather than "Force Majeure" or unforeseen contingencies. From this angle the argument was simply the lack of investment or provisions that should have been foreseen by sellers to keep supply given the evolution of domestic demand in Argentina. In the end, this argument by buyers resembles, or rather exactly matches, the official Argentine explanation of the imbalances and shortages.[15] However, this line of argumentation has also several problems *vis-à-vis* the evidence presented in this paper. First of all, the generalized, rather than individual, partial interruptions of deliveries (see Table 3 and Figure 3) go against the view that this was an individual negligence case. In terms of the framework presented in section 2, it was not only individual but also aggregate consistency that was violated in the case, with evidence that shocks in supply, demand or price policy (θ^S, θ^D, p, p^e) have been interacting. Given that "aggregate negligence" is a rather difficult argument, this may nevertheless motivate research behind aggregate inconsistency or perhaps coordinated tacit behavior among producers that could have led to a generalized shortage.[16] But this is an issue that goes beyond the narrow and focused bilateral case that will be addressed by the arbitration court.

A second problem for the Buyers demand is the evidence of government intervention in post 2002 and the imbalances created in the domestic market, particularly the role of demand *vis-à-vis* supply in explaining domestic market disequilibrium, that casts doubts on the simple and lineal argument of the Argentine government that it was due to lack of supply and investment efforts. Evidence for an exacerbated pattern of natural gas use at disequilibrium prices suggest an excess demand scenario, with supply lagging behind after years of low investment efforts that were even more paralyzed by the price policy (p, p^e) faced by all Sellers alike.

The impression from this analysis is that it will be a hard job for the arbitration court to "complete" the contract and that, despite claims on the contrary by Buyers, the incomplete nature of the contract lies in the fact that it was not prepared to face events of the nature and magnitude of those experimented years after.

VI. Issues and Lessons for Contract Design and Regional Cooperation

There are two areas of analysis and policymaking where the topics discussed in this paper contribute directly or indirectly. One is the field of contract design for international exchanges of energy that are supported by infrastructure investments. The second one belongs to issues of regional cooperation and coordination of policies among participating countries.

Given the evidence that existing contracts did not include provisions that were targeted to the aggregate inconsistency of export decisions, there seems to exist room for improving design. Efforts in this direction should be concentrated at the study of contractual provisions related to the presence of aggregate energy imbalances on both sides, but particularly on suppliers. This is so because the later can take investment efforts, autonomous

or in response to policy decisions that may jeopardize the sustainability of contracts. *Ex-ante* clauses to govern contingencies are difficult to write down, but provisions can help at providing some back up for these circumstances. The back-up provisions apparently present in existing contracts assume that the Seller can find alternative sources of supply and, therefore, does not properly address a generalized shortage. Explicit inclusion of substitute fuels deliveries (that is, the back up fuels that will be finally used by Buyers) could work better than assuming that natural gas will be available elsewhere.

Rather than reflecting past experiences, these issues are relevant for very recent transactions between Argentina and Bolivia. In fact, the ENARSA-YPFB contract signed in 2006 between both firms is a big project to supply up to 27 MM m^3 day from the Southern Bolivian basin that involves, according to preliminary estimates, a major infrastructure investment in pipelines of about US$1.2 billion and additional investments in Bolivia to develop the gas fields of about 2.0 billion. The contract has been made public in both countries and its design shares some of the features common to long-term minimum bill contracts.

However, the contract is weak on the dimensions stressed in this paper and, in particular, the management of contingencies related to a generalized shortage of gas in Bolivia sometime in the future. Given the level of certified or proven reserves, optimism about deliverability is similar to the one stated at the moment of writing contracts between Argentina and Chile. The commitment of the Bolivian side is only contemplated in the take-or-pay provision, but a clause in the contract implies that, in face of interruptions, priority of supply will be granted to the domestic market, and then followed by previous export contracts to Brazil. Even though the domestic market is small compared to export volumes, it has a large potential of development if policies promoting domestic industrialization are adopted. Thus the contract is subject to the same problems that were present in the Argentina-Chile integration surveyed in this paper. The fact that both governments signed the contract does not add much security of supply given that it is a commercial contract between two public firms and there is no agreement or commitment at a government level and above the contract (beyond an agreement of intentions to cooperate in the project). Finally, the contract has also a feature that does not belong to good practices of regional infrastructure integration and its reading casts doubts on the willingness of Argentina to normalize export permits to Chile.[17]

At the regional cooperation level the message of this paper is that there are reasons to enlarge the focus on regulation-cum-competition design for infrastructure projects (see for example Beato and Benavidez [2004]). More attention to conditions to sustain exchanges on the infrastructure is required. Some of these conditions go back to good policy design to mitigate regulatory risks of sovereign decisions by governments, particularly if the view is that policy-induced mistakes are responsible for impeded exchanges. The question of commitment mechanisms by participant governments (to domestic pricing policies for example) is a difficult one but it may deserve a coordinated effort.

But some other conditions go beyond good regulatory design for infrastructure and to the realm of energy planning, particularly if the view is that mistakes in long-term energy policy, for example, in the form of absence of monitoring over conditions for aggregate consistency on private decisions, are responsible for broken exchanges. A weak form of coordination between governments is to create a permanent exchange of information and monitoring. In the case studied in this paper, the governments of Argentina and Chile agreed on that mechanism in 2002 (see Table 2), when the evidence suggests that the crisis was already well into the radar. Since this poor form of coordination may be seen as

unimportant, the required corrections, should be set well in advance before it's too late. The contract between ENARSA from Argentina and YPFB from Bolivia contemplates a monitoring mechanism of this kind.

More consistent forms of energy policies coordination are difficult to suggest and implement, given the traditional reluctance of governments to commit what is viewed as strategic policy decisions including national security of supply. Nevertheless, this case shows that critical assessment and risk evaluations of energy planning may render high benefits for energy infrastructure integration. Coordination here would imply simply a request that energy plans in an agreed format are made available and subject to stress tests. In the case described in this paper, Argentina abandoned energy planning (not to mention stress testing) in the belief that privatization with a good regulatory framework and efficient private participants would suffice for sustainable energy development. It did not, and the message written inside the World Bank mission report in 1990 was superseded by unfounded unlimited optimism.

VII. Concluding Remarks

This paper draws on applied contract theory and uses evidence on policies, markets and private transactions to discuss the experience of natural gas infrastructure integration in the Southern Cone. The argument is that contracts on international exchanges supported by infrastructure may become incomplete due to contingencies not anticipated at the moment of writing. Sources of contingencies may lie in supply and demand shocks or be related to policy-induced price distortions. Some or all of these sources may create imbalances in domestic markets of exporting countries, leading to aggregate inconsistencies.

The Argentina-Chile integration experience fits well into this mold. At an aggregate level the evidence presented in this paper shows how policy decisions framed the integration of markets and later on reversed the integration path when shortages of a generalized nature began to emerge. We argued that an inquiry into the sources of the shortages is relevant for separating anticipated from unexpected shocks, supply from demand impulses, and policy-induced from market-participants-induced distortions. This separation is also essential to discern the degree of responsibility of sellers and buyers in private transactions, like the one referred to using the *Gas Andes* pipeline. The evidence falls short of being conclusive on the dominant or ultimate factor behind the broken exchanges, even though the quantitative evidence on market disequilibrium post 2002 seems more robust than casual evidence on lack of investments or supply fatigue. But this may reflect the state of available data and of used methods and is open to further inquiry. What seems clear and conclusive is that the event being studied is of an aggregate nature rather than an isolated break of an individual exchange relationship. Rather, the crucial distinction is whether this was due to policy-induced or agents-induced mistakes. In this respect, individual decisions by natural gas producers to move to massive contractual export arrangements and the possibility of tacit coordination given its effects on domestic market equilibrium is another avenue of research that deserves attention.

Finally, this paper has clear lessons for both private agents and policy-makers alike. While regulatory risk mitigation solutions in both contracting and policy making have been stressed before, this paper adds specific points on back-up contract provisions designed to cope with aggregate imbalances, on ex-ante weak forms of supranational coordination related to information about market conditions, and on energy planning dialogues that test consistency and stress situations in markets where exports originate. Methods and institutional mechanisms to perform this coordination seem to be another useful area of applied policy research.

Notes

[1] See Tirole [1994] and Salanie [1997] for technical surveys of theoretical issues and modeling strategies.

[2] This was so until the Argentine mega-devaluation in January 2002, were domestic prices were frozen in pesos and exports continued being denominated in dollar terms. Two vertical lines in Figure 2 indicate January 2002 when the devaluation took place and March 2004, when the domestic crisis led to export constraints. The upward adjustment of export prices shown in the figure since 2004 may depend on contracts changes (addendum) given the Argentine situation but it should also depend on indexation conditions given the link with fuels, and indirectly with the price of oil in international markets. Still, the raise in prices is less than what has been observed in other fuel-indexed export contracts in South America, such as the Gas Sales Agreement between Bolivia and Brazil, and its level in mid 2006 is comparatively much lower, reflecting that prices (and its sequence) were favorably negotiated by Chilean buyers, which looked for prices similar to those observed in the domestic market. This situation changed dramatically in June 2006 as Argentina imposed a substantial export tax that was shifted to the Chilean buyers.

[3] See Cont and Navajas [2004] for an early analysis of the episode.

[4] Resolution SE 265/2004 of March 24, 2004 took this initial step, including the suspension of Resolution 133/2001 of automatic authorizations and in fact of export permits at all. Export permits were later on "restated" in Resolution SE 833/2005. All resolutions quoted are available from *http://www.infoleg.gov.ar*.

[5] The "genealogic tree" of resolutions here starts in Resolution SE 659/2004 to the more recent Resolution 1329/2006.

[6] In the statements contained in Resolution SE 133/2001, the government argued that the level of reserves in Argentina and the recent discoveries in Bolivia created enough margin to proceed with automatic export permits (so called "AAEP" in the terminology of Section II).

[7] The reasons for suggesting a ratio R/P of fifteen years are explained in the study, since the chosen figure depends on the characteristics of the Argentine up-stream sector including geological considerations.

[8] Prices for industrial users both in gas and electricity began to adjust in 2005 and 2006, while they still remain frozen for residential and small commercial user. Prices of GNC were also partially adjusted in 2006.

[9] In the recent long-term contract signed between Argentina and Bolivia the base price (chosen for the first quarter of 2007) is US$5 per MM BTU.

[10] Gasification of the private transport fleet (mainly cars) in Argentina has been substantial since the early 1990s but it suddenly accelerated after 2002 in reaction to relative prices. According to national energy balances natural gas accounted in 2005 for almost 20% of the use of energy in transportation.

[11] We developed a decomposition of the gas shortage from a computable identity that matches the natural gas required by electricity generators with the disposable natural gas. These two parts are expressed in equivalent natural gas units and result, respectively, from the excess demand for electricity (when hidro and nuclear generation is subtracted) and the excess supply of natural gas (when demand components different from electricity are subtracted). International trade in natural gas and electricity is also included in both sides. This decomposition allows to explain the observed shortage of natural gas, in relation to a "normal" year (2003) in terms of several components, to test whether supply or demand (an of what type) are dominant explanations and to proceed to test the role of prices (*versus* growth or output mix changes that affect energy intensity) in the demand side.

[12] This is not the only case but it may be the largest one. Other conflicts emerged in transactions using the Gasoducto del Pacífico (see Table 1) between trading companies (delivering gas to industrial users) in Chile and Repsol-YPF in the *Neuqina* basin, while similar demands were evaluated by electricity generators in the North of Chile, using the *Norandino* Pipeline, against producers in the Nothern basin.

[13] Of course, for suppliers the problem with this proposal was not the availability of alternative fuels but the uncertainty about the price to be recognized by the Secretary of Energy, given the difference in prices between natural gas and fuel oil (see Figure 6). Expected losses and legal implications over pending contracts went against participation. Beyond this lack of incentive, which resulted in negligible acceptance of the mechanism, there is the hypothetical but interesting case that the announced condition for an export permit (i.e. supply an alternative or equivalent amount of fuel-oil) while valid for a single transaction, may not be feasible in the event that all exporters accept the offer, given the inability of the domestic users to, for example, run thermal units with such an amount of fuel. To my knowledge nobody has tested if an unanimous acceptance of the condition to export violates the maximum (reasonable) fuel constraint of the dispatch of thermal units in Argentina or imposes logistic costs (of fuel delivery) that are unreasonable.

[14] Indeed this was used by the Buyers who participated once in the mechanism and complaint that this was a proof that the Sellers had used the "Force Majeure" argument to disentangle themselves from obligations on how to manage the problem, particularly given their position and knowledge of the Argentine market to organize such exchanges.

[15] This may sound strange given the voice expressed by the Chilean authorities about the crisis, and the suggestion that it was necessarily connected with regulatory decisions taken after 2002. But this was what Chilean Buyers, or their lawyers, argued and need not be congruent with official arguments or explanations. For the Chilean authorities it became clear that the contracts were a private concern and that there could not be an official legal claim against Argentina.

[16] For coordinated or tacit behavior of export decisions it is required that decisions taken by individual producers in the Argentine market be "strategic complements" (i.e. raise the marginal benefit of the same actions of others), in the expectation that domestic prices would accommodate to clear domestic markets. Given that exports contracts were designed so as to adjust prices in line with domestic market prices, a rise in export prices is

guaranteed establishing the link for actions (export decisions) to be strategic complements. This problem was to my knowledge never discussed in Argentina. The only intervention by competent authorities in relation to exports to Chile had to do with some proposed mergers or acquisitions of producers participating in the export projects, that led to an evaluation of the cases but not to problems of conduct such as those hypothesized above.

[17] Clause 3.3 of the contract states that the quantities delivered will be allocated to serve domestic markets in Argentina and "*cannot be allocated to increase exports' authorizations to third countries (being public and/or private companies) without the agreement of both parties*". The Bolivian claim to Chile regarding a way out to overcome its insularity is a longstanding one. Beyond this fact, the policy of Argentine exports' authorizations will continue to be tied to required gas to be redirected to domestic markets or on the above mentioned mechanism of making alternative fuels disposable.

Table 1

Natural Gas Pipelines in the Southern Cone						
Pipeline	Year	Capacity MM m³ day	Distance km	Current use (Jan-Aug 2006) MM m³ day	Initial Investment in US$ millions	Initial Shareholders of Project
Chile						
Norandino	1999	5	380	1.7	400	Tractebel and Southern Electric
GasAndes	1997	10	313	5.3	350	AES Gener (13%), Metrogas (13%), CGC (17.5%), Total Gasandes (10%), Total Gas y Electricidad Chile S.A. (46.5%),
Gasoducto del Pacífico	1999	3.5	530	0.6	342	TransCanada, 30%; YPF, 10%; Gasco, 20%; El Paso Energy, 21.8%; and Enap; 18.2%
Atacama	1999	8.5	531	1.5	380	CMS Energy and Endesa (50%-50%)
Metanex YPF	1999	2.0	8	2.0	6.5	na
Metanex SIP	1999	1.2	12	1.1	na	na
Metanex PAE	1997	2	48.5	1.7	na	na
Bolivia						
Tarija-Campo Durán	1972	7.7	5	5.5	na	na
Brazil						
TGM	2000	2.8	450	0.9	250	Techint, CGC, TransCanada International, Petronas Argentina SA, CMS Gas Argentina, Repsol-YPF, Petrobras, Sulgas and AES.
Uruguay						
Cruz del Sur	2002	6	200	0.2	170	ANCAP (20%), British Gas (40%), Pan American Energy (30%), Wintershall Energía S.A. (10%)
Del Litoral	1998	0.7	15	0.1	na	na

Source: Authors' own calculation based on several private and public sources and Internet sites.

Table 2

Framework for Natural Gas Exports: Pre-Crisis

- Gas Law (1992) formally allows exports
- Bilateral Protocol (1995) sets norms that regulate supply and interconnection between Argentina and Chile
- Secretary of Energy (SE) resolution (1998) sets exports permits mechanism, requiring proven reserves and ability/commitment to maintain supply to domestic market
- Authorizations proceed on an individual and discretionary basis
- MERCOSUR's Memorandum of Understanding (1999) on gas exchanges
- Competition Commission studies mergers and indirectly oversees state of exports supply
- SE resolution (2001) makes authorizations automatic after a period without observations
- After 2002 macro crises, domestic contracts frozen in *pesos* and export contracts not intervened (stay in US$). Again, requirements for domestic supply are stressed
- Bilateral Protocol (2002) on information about "market conditions" and on "decisions" related to exchanges

Source: Official sources and Cafiero *et al.* [2004].

Table 3

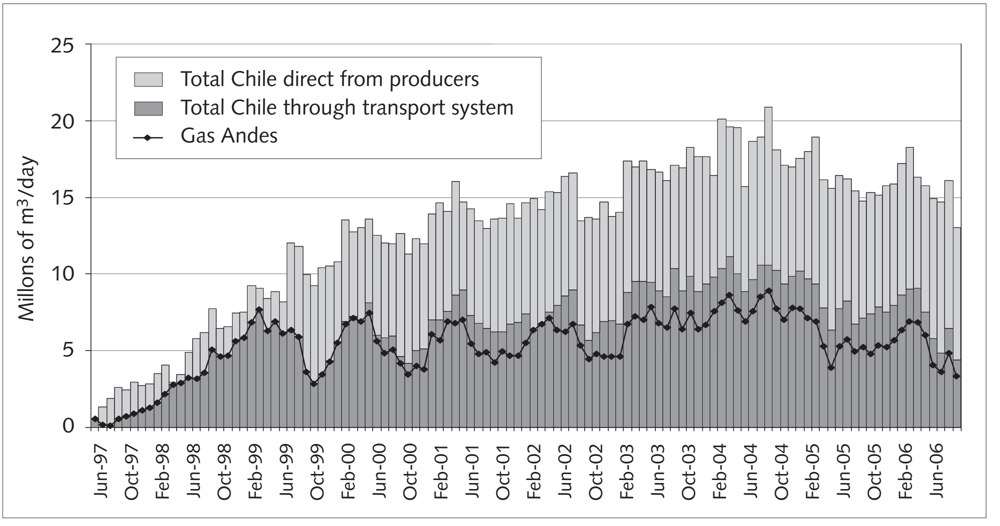
Exports Before the Crisis and "Required Additions" to Supply Domestic Markets in 2005 at the Different Basins

Basin	Daily average exports in January 2004 MMm³d	Share in Exports	Required Additions to Domestic Market daily average 2005 MMm³d	Share in required additions to Domestic Market	Additions in 2005 / Exports in January 2004
Neuqina	9.84	51.4%	5.32	74.6%	54%
Austral	4.57	23.9%	1.21	16.9%	26%
North West	4.73	24.7%	0.61	8.5%	13%
All Basins	19.14		7.14		37%

Note: Memo item: Total Production in all basins = 141.3 in MMm³d for 2005; Neuqina had a 59% share.
Source: Aggregate estimates from the Secretary of Energy.

Figure 1

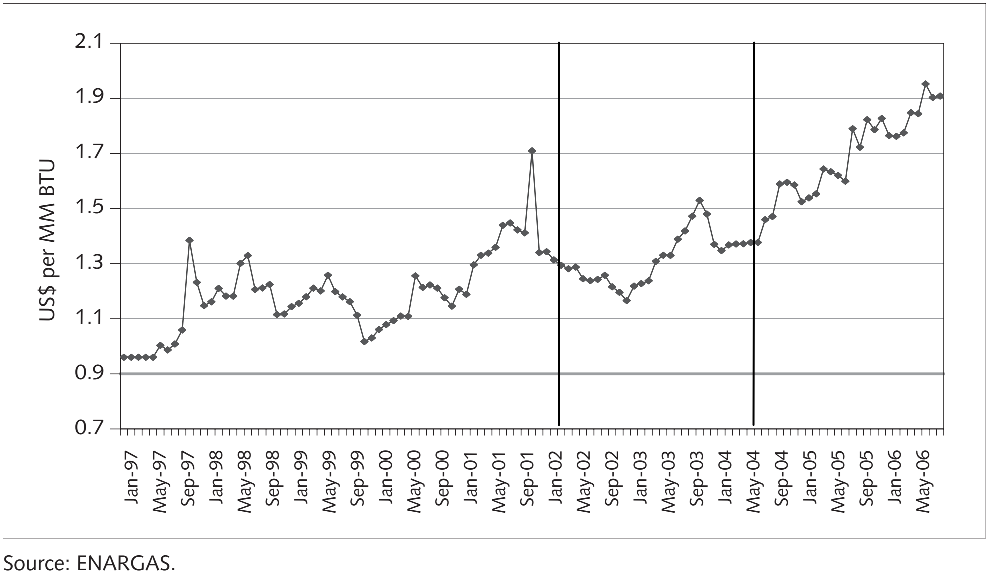
Average Daily Exports of Natural Gas to Chile
In MMm³/day



Source: ENARGAS.

Figure 2

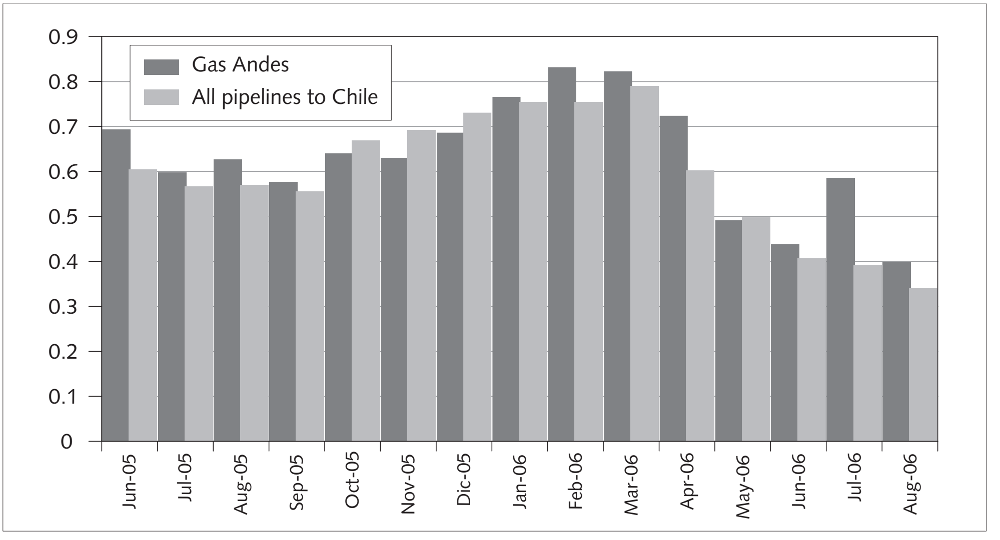
Average Price of Natural Gas Exports to Chile



Source: ENARGAS.

Figure 3

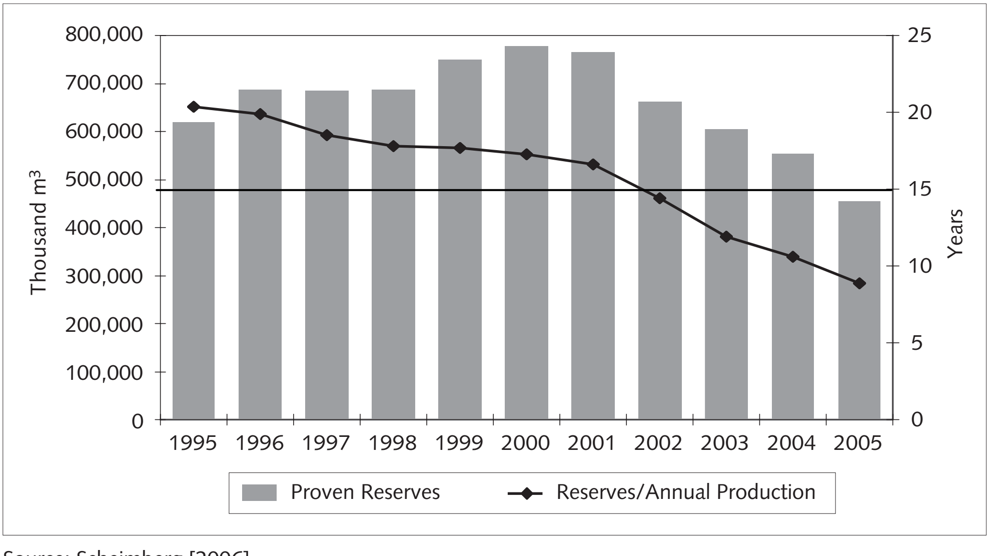
Ratio of Observed Exports to Contracted Capacity
2005-2006



Source: ENARGAS.

Figure 4

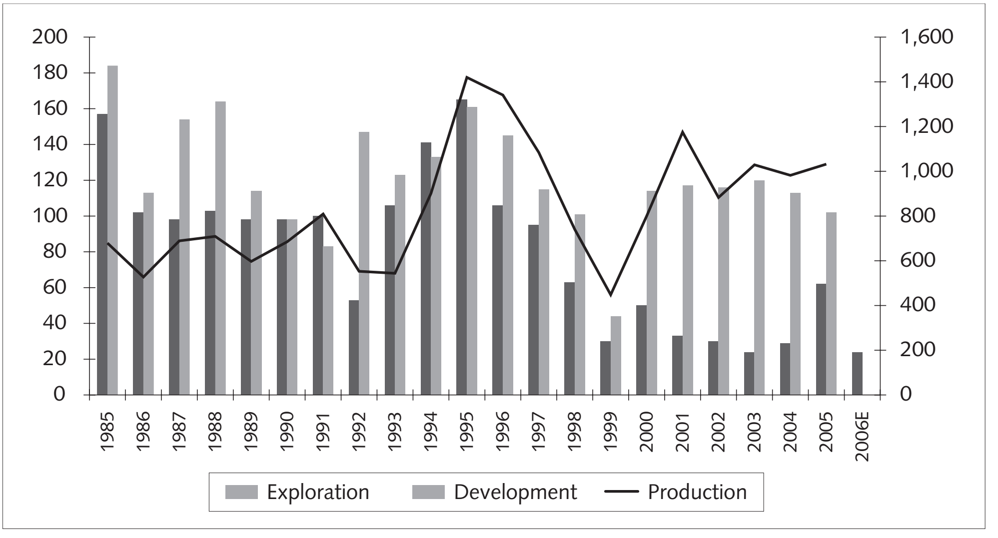
Argentina: Natural Gas Reserves and R/P Ratio
1995-2005



Source: Scheimberg [2006].

Figure 5

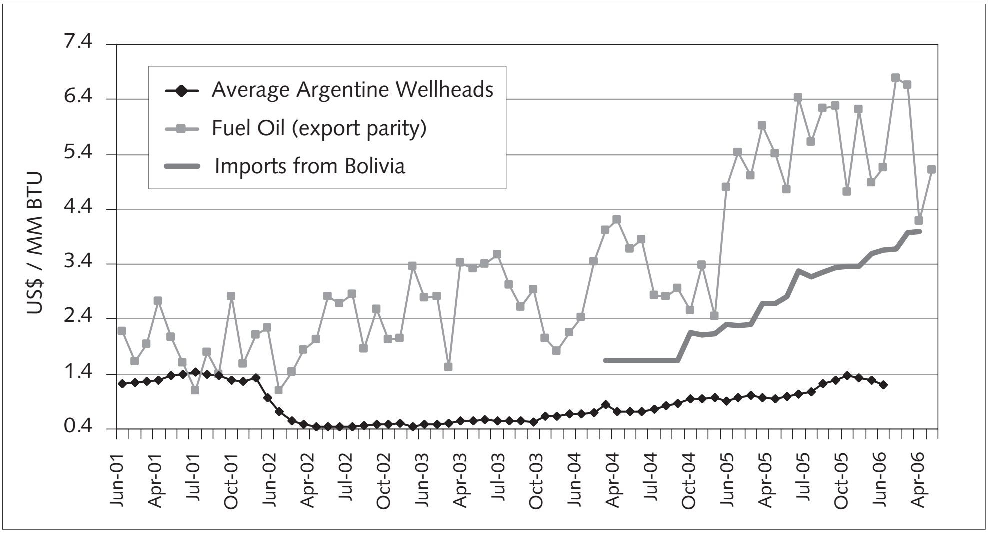
NUMBER OF WELLHEADS: EXPLORATION, DEVELOPMENT (LEFT AXIS) AND PRODUCTION (RIGHT AXIS) - 1985-2006



Source: Scheimberg [2006].

Figure 6

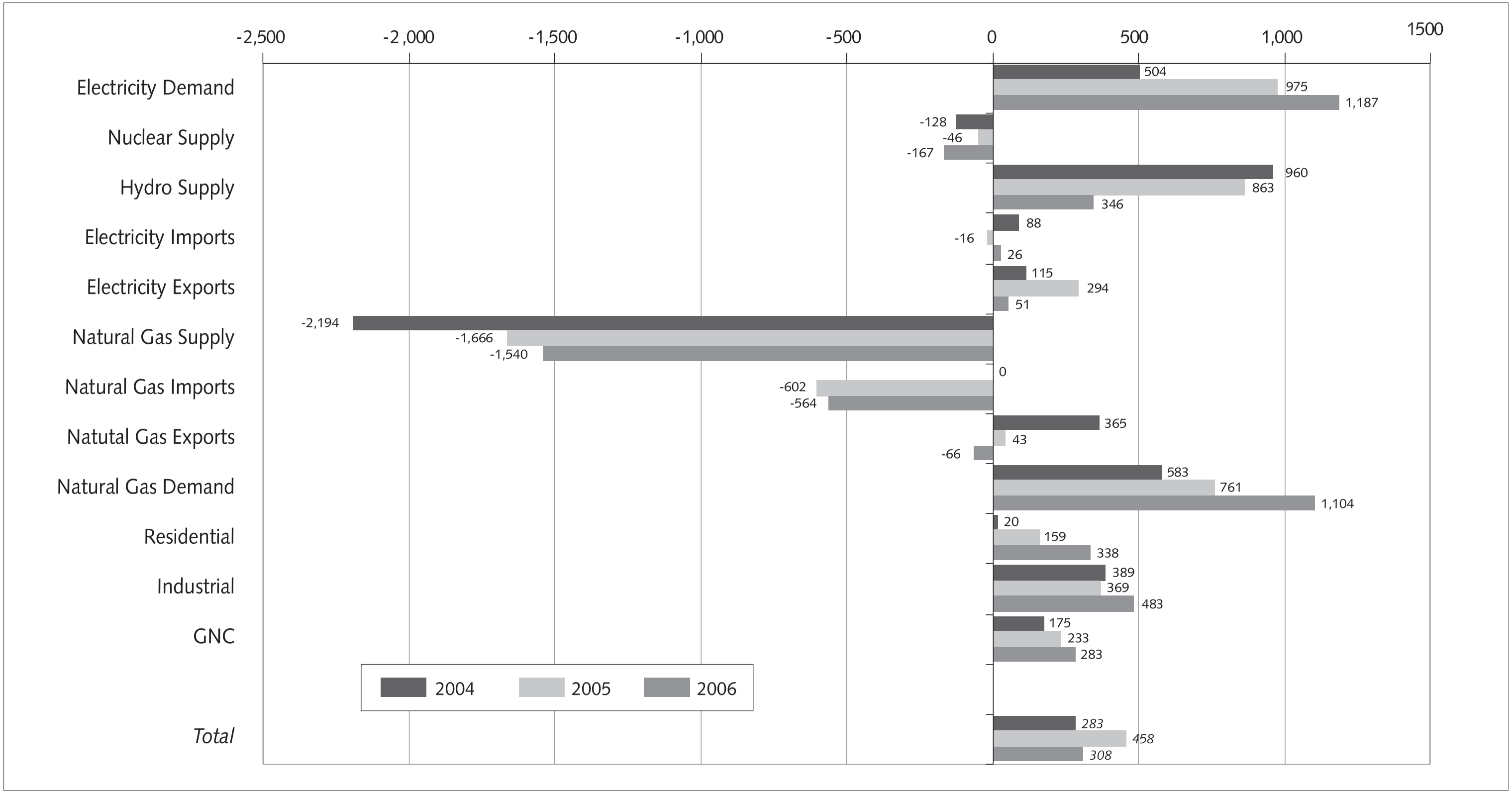
NATURAL GAS (DOMESTIC AND IMPORTED) AND FUEL OIL
US$ per MM BTU



Source: ENARGAS, INDEC and Secretary of Energy.

Figure 7

NATURAL GAS SHORTAGE DECOMPOSITION
January-April 2004, 2005 and 2005 *vs.* 2003 (Units MM m3 day)



Source: Updated from Cont and Navajas [2004].

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IIRSA: General Approach to the Initiative

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Cooperation and Provision of Regional Public Goods: The IIRSA Case

Ricardo Carciofi

Director of IDB-INTAL and Secretary of the Technical Cooperation Committee of the IIRSA.

Summary

This article analyzes the Initiative for the Integration of Regional Infrastructure in South America (IIRSA) as a mechanism for intergovernmental cooperation. In particular, the paper explores the factors that explain why the process has been actively working since its launching in 2000. Also, the article addresses the question of why the infrastructure agenda has been able to make some progress and why its pace has been relatively independent of other dimensions of South American integration.

I am indebted to Mauro Marcondes, Roberto Iglesias, Alejandro Ramos and the co-editors of this issue for their comments. I would also like to acknowledge the contribution made by Romina Gayá, research assistant for the Inter-American Development Bank-Institute for the Integration of Latin America and the Caribbean (IDB-INTAL), who helped in the information collection and data processing for this study. The opinions expressed herein are those of the author and do not necessarily reflect those of the IDB-INTAL or the institutions that form part of Initiative for the Integration of Regional Infrastructure in South America (IIRSA)'s Technical Coordination Committee (CCT - Comité de Coordinación Técnica*). Any errors in this paper are the sole responsibility of the author.*

I. Introduction

The Initiative for the Integration of Regional Infrastructure in South America (IIRSA) is an intergovernmental cooperation mechanism for the development of physical infrastructure with a view to strengthening integration in South America.[1] To this end, the Initiative seeks to promote projects in the sectors of transportation (in its various modalities), energy and telecommunications, as well as regulatory measures conducive to increased efficiency in the provision of all these services. Since its launching in 2000, IIRSA has achieved a series of results while arousing some controversy.[2] Although various studies have dealt with the Initiative, one of its attributes that has been mostly overlooked is its

continuity of work. In effect, this scheme has been kept in place on a sustained basis throughout the past seven years. Furthermore, its participating countries have formulated goals and action plans for the remainder of the present decade.[3] Even if continuity is not synonymous with effectiveness, the former aspect is particularly noteworthy not only because similar efforts have been short-lived but also because IIRSA has remarkably thriven on a minimal institutional structure and in the absence of a robust regional integration scheme.[4] It is well known that the Union of South American Nations (UNASUR - *Unión de Naciones Suramericanas*) as it has come to be known, is a fledging creation and does not yet have a regulatory framework that incorporates these endeavors.[5] In other words, IIRSA has succeeded in focusing its agenda of activities on the development of physical infrastructure and advancing it at its own pace, in spite of the changing conditions that characterize the general context of the integration process in the region.

The situation described above raises some questions that can serve as guidelines for the purpose of this paper, specifically, why has it been feasible to keep such an intergovernmental cooperation and coordination scheme in operation while South America has only just begun to make progress in a comprehensive project of regional integration? Why and to what extent has it been possible to further this physical integration agenda with relative autonomy from the other integration dimensions? The hypothesis explored here is that key to understanding IIRSA's continuity and cooperation process is, on the one hand, the appropriate identification of topics, which has allowed to garner consensus among the participating countries, and, on the other hand, the fact that the work agenda has been materialized in the form of concrete results that have proven useful to the participants in the Initiative as a whole.

We should now outline the methodological approach and the analytical perspective adopted in this paper. The development of integration infrastructure calls for considerations on the subject of geopolitics and international political relations. Although these dimensions obviously pervade IIRSA and their importance is recognized, the scope of this paper is confined to the economic dimension. This does not mean the implicit privilege or primacy of one topic over the other; it is simply a means to narrow down the topics under analysis to a more limited number of issues.

In an attempt to provide an answer to the questions posed above and within the previously delimited scope, this paper is organized as follows. Section II discusses some concepts deemed essential to understand how the cooperation scheme works. Sections III, IV and V delve into the main topics on which the cooperation process practice has been built. While the previously mentioned sections seek to explain the reasons why the Initiative has been able to make some progress and attain part of its objectives, Section VI highlights its limitations and pending challenges. Finally, Section VII presents the conclusions of the study.

II. Conceptual Framework

As mentioned at the beginning of this paper, IIRSA has been designed to spur investments and promote regulatory measures in the areas of transportation, energy and telecommunications for integration purposes. The usual economic perspective and rationale is that the different types of infrastructure entail capital formation and are hence a production factor that has a bearing on growth. This is a relevant consideration that various papers have analyzed in depth as applied to the case of Latin American countries (see Easterley and Servén [2003], Lucioni [2004] and ECLAC [2004a]). Viewed from this macro

and growth angle, the region has lagged behind other emerging economies. It has lower availability of infrastructure and, more specifically, a poorer quality of services derived there in comparison with other regions.[6] This being the case, studies have weighed the factors inhibiting a more expeditious development of infrastructure projects. As in most cases the implementation of this type of projects gives rise to natural monopolies, the most frequently attempted solution in Latin America has been public provisioning.[7] From this it follows that fiscal solvency has put limitations on investments in this type of projects and that recent endeavors have been made to overcome such limitations through the involvement of private capital.[8] Yet, it is evident that the obstacles hindering the implementation of infrastructure projects do not end there. Added to the above-mentioned limitations are, among others, the lack of savings, along with difficulties in harmonizing public and private presence in investments, securing long-term financing, and minimizing the uncertainty surrounding long term decision horizons in economies subject to high volatility in terms of relative prices and their real variables. Therefore, it is clear that one way or another and even in the case of countries taken separately, the development of infrastructure is heavily dependent on the context of governmental policies and decisions that serves as a framework of reference.

If infrastructure is approached from a perspective different from the macro dimension reviewed above, other economic consequences are brought to the fore in addition to the already mentioned impact of investment on growth rates. Irrespective of the technical features of each individual project and the typical modalities of the different sectors where the projects are implemented, infrastructures have a common denominator: they facilitate transportation and reduce its costs, whether it be for the physical movement of persons, goods, services, energy products or information.[9/10] This feature of infrastructure as an investment capable of modifying the equation of transportation costs has decisive implications for the location of economic activities, the facilities offered for attracting or expelling people, the impacts on the environment and, ultimately, the economic dynamics in the region. Hence the significance of all actions that influence the development of investment in infrastructure, and public policies, as explained below, in addition to ascribing importance to the other economic aspects involved in infrastructure projects, should also deal with their spatial impact.

The most recent literature on economic geography has been increasingly focusing its attention on the factors that trigger agglomeration and dispersion processes across the territory (Krugman [1998]). Among agglomeration forces, market size can be cited as an example, whereas some dispersion forces are the natural resources, the location of which is a feature of physical geography. Thus, in deciding their location, enterprises take into account the proximity to markets -in relation to both consumers and inputs- and, depending on the nature of their activity, the distance to (and supply costs of) natural resource-based commodities. Transportation costs and, as discussed above, the associated infrastructure play a key role in location-related decisions. One of the central conclusions that can be drawn from this type of analysis is that in the presence of economies of scale and at moderate levels of transportation costs, the location of an economic activity tends towards agglomeration.[11] A *core-periphery* pattern is therefore reinforced, with the core growing in population, income, employment and economic activity. As transportation costs decrease, the *periphery* can offer alternative locations that offset the benefits of physical proximity to the market, leading to a more balanced use of space.

As a result of these impacts, the development of infrastructure rebalances the centripetal and centrifugal forces behind locational decisions. This translates into an

additional component to public policymaking: the spatial or territorial dimension. The dispersion-agglomeration dynamics can be left to evolve freely or, on the contrary, can be explicitly included as an item on the public agenda. If the latter is the case, projects will probably draw the interest of local actors, sub-national governments, and, depending on the situation, the national government.[12] Naturally, this analysis should not be restricted to a one-dimensional reading. Even if infrastructure investments produce the previously mentioned type of effects on the territory or space involved, the allocation of capital for these investments does not prevent the feasibility assessment from being based on conventional criteria of socio-economic profitability and environmental sustainability. Whether private or public, a project can always find alternative resources. Nonetheless, an assessment of the relative advantage of a given project is very likely to have different readings depending on where its beneficiaries are located and whether there exist mechanisms for the geographic redistribution of the (social, economic and environmental) costs and benefits.

The foregoing discussion has stressed the major impacts that infrastructure has on space. The distance between the location of a project and its area of influence depends on the type of infrastructure concerned. A project may have far-reaching effects (for instance, in the case of gas pipelines or power transmission lines); conversely, its effects may be restricted to the immediate surroundings and its intensity may be lower as distance grows (for example, in the case of some types of road projects). In the case of network systems, the impact is more diffuse and extensive, spreading through the different networks nodes. Consequently, a project can be said to have "spillover effects" of costs and benefits on its area of influence.[13] Given that, as explained before, infrastructure projects generally result in situations of natural monopolies, regardless of whether they are publicly or privately funded, these projects must include regulatory components and constitute, in many cases, a peculiar category of public goods, which can be either national or local depending on their geographic scope of influence.[14/15]

On the other hand, the impact that infrastructure has on space becomes especially relevant if undertaken beyond the scope of a country's own territory. When infrastructure projects are implemented in border areas, their spillover effects can spread to the bordering regions of neighboring states. These states can be passive recipients or *free riders* of the benefits accruing to them from infrastructures that do not belong to them, or, if it is in their interest, they can boost these effects by making supplementary investments in their own territory.[16] A case in point is an integration project, in which investments are coordinated between two or more countries.[17] In an integration project, participants bear the costs of its implementation and, following previously selected criterion, distribute the resulting benefits.[18] Naturally, this does not imply that costs and benefits are strictly proportional to the investment made by each of the "partners" -i.e., there may be a compensation mechanism for the asymmetries inherent to the project.[19] Furthermore, there are a wide variety of modalities for the implementation of a project as well as formulas for the distribution of its costs and benefits. Thus, in the case of road projects, countries usually engage in the works within their respective territories; the coordination of actions is therefore more limited and may include execution schedules, regulatory aspects, border crossing facilities, etc. Alternatively, states can decide on the creation of "a (binational or tri-national) entity" to serve as the vehicle for the project and "to internalize" all the costs and benefits derived from its execution and operation. Regardless of the modality or formula chosen, it is undeniable that the implementation of integration infrastructure requires considerable coordination and cooperation between sovereign states. The menu

is broad and diverse, since it includes not only the distribution of costs and benefits but also the financial framework, the rules for managing the project, the mechanisms for the participation of private capital, if any, the mitigation of environmental impacts, etc. In short, implementing integration projects entails addressing the issues that are usually an integral part of infrastructure projects while adding the perspective of national states that decide, based on the mutual benefit principle, to cooperate and assume the responsibilities inherent to the type of project concerned. From the perspective selected for this paper, these new demands for cooperation point to a new type of public good of a regional nature in the sense that its implementation involves the participation of more than one sovereign state. The participation of the states is materialized not only in the final result, i.e., the physical works of integration infrastructure, but also in the previous cooperation process needed for completing the project. The next section further explores this point.

In addition to the foregoing considerations about the need for cooperation and coordination in physical infrastructure projects, this type of investment has two additional implications that in some way reflect their peculiarity. In the first place, if integration works and projects reduce transportation costs and, hence, modify the economic geography, trade barriers -whether tariff or non-tariff- represent a market access cost stemming from public policy-making. Therefore, it would be contradictory to make efforts to implement integration infrastructure while trade policies as well as processes that facilitate the creation and enlargement of the economic space beyond national borders do not support these efforts. Moreover, in line with what has been suggested in some papers, it can be argued that if market access facilitated by infrastructure is offset by trade barriers, agglomeration and concentration are more likely to occur in the most advanced regions (or country), to the detriment of peripheral regions (Venables [2005]).[20] Evidently, this type of obstacle is not present when investments are located within national borders, where by definition there are no tariff barriers to the movement of people (labor) and goods.

In the second place, in light of what has been discussed about the geographic spillover of net benefits and the effects of scale, the advantages of the integration process can become more extensive when progress across the economic space is jointly coordinated. This suggests how positive it is to promote a synchronized progress of as many countries as possible, in order to maximize the benefits derived from market size. This contention is also empirically supported. There is sufficient evidence and measurements through gravitational models indicating that, when controlled for economy size, the most crucial factor in cross-border trade, investments and technology flows is distance.[21] This is therefore a compelling argument to consider South America as a space suitable for integration -greater physical proximity is a factor that fosters growth through an enlarged market. And this effect is reinforced when infrastructure drives down transportation costs.

From the previously outlined framework of analysis, two aspects can be identified as key issues for the process of coordination and cooperation regarding the development of infrastructure. One is linked to the specific universe of projects and their implementation -i.e., the cost benefit analysis leading to the portfolio of projects, the adoption of a regulatory framework for their development and management, and decisions concerning the allocation of resources for their financing. The other aspect involves the tapping of market size and the economies of scale. The next three sections address these issues by analyzing how they have been resolved in the specific case of IIRSA and how they have come to be the backbone of a cooperation agenda that has encouraged the involvement of the countries participating in the initiative.

III. Cooperation and Regional Infrastructure: Project Identification and Regulatory Harmonization

The purpose of this section is twofold. Firstly, it seeks to illustrate the work carried out by the Initiative both in the identification and selection of integration projects and in the harmonization of regulations relevant to their viability. Secondly, while touching upon these themes, it attempts to identify the factors that have made it possible to advance in this inter-governmental dialogue for cooperation.

Table 1 offers information on IIRSA's project portfolio: the number of projects by country and their respective investment amounts. It should be noted that of the almost US$40 billion represented by the IIRSA's project portfolio total investment, binational projects account for 43.2%. Also, it should be borne in mind that there are other projects that are strictly national, with visible effects on physical integration -in effect, this is one of the criteria taken into account when assessing the eligibility of the project as part of the IIRSA's portfolio. Thus, almost half of the projects developed by the participating countries are integration projects and therefore entail some sort of joint undertaking by the parties involved (Table 1).

From this point of view, coordination and cooperation are undeniably important. Consequently, what are the dimensions inherent to this process? As mentioned earlier, the main feature of integration projects is that they involve decisions by two or more national sovereign states. To a great extent, their decisions are based on the benefits that can be expected from the project. As public and governmental presence is inescapable, it should be pointed out that what is at stake is not only economic but also political gains from the action concerned, whether for the central government or the local stakeholders more closely linked to the project.

In view of all the foregoing, an integration project faces a complex negotiation scenario, in which costs and benefits are seldom equally shared by all the countries and in which the economic and political resources available to each party are also asymmetrical. Moreover, it is necessary to take into account that the project construction period is directly proportional to its economic dimension, technical difficulties, environmental and social impacts, etc. In turn, the longer a project takes, the higher the uncertainty about that the project confronts and therefore reduce the present value of the net benefits. The context and its estimated benefits and gains calculated *ex ante* and are contingent to the projected scenario. As already noted, all these elements are inherent to the development of infrastructure -and all the more so when it comes to integration projects. For example, countries can have strong funded reasons to apply different discount rates in the same project, leading to different conclusions regarding the net benefits of the investment.

Similar -though very specific- considerations may be applied to the execution phase of a project, regardless of whether a project is directly financed by the public Treasury or with investments from Public-Private Partnerships (PPPs). In the cases in which both the execution and financing of an integration project are undertaken by the relevant public sectors, the countries concerned have a concurring interest in getting to know with as much accuracy as possible whether their partners' fiscal programming is compatible with the project completion schedule. Under PPP modalities, the countries involved have to agree on the rules under which private capital will be summoned to participate in the management phase. Whatever the case, the bottom line is the following: intergovernmental coordination is a prerequisite for the execution phase.

The previously discussed peculiarities and difficulties concerning infrastructure projects for integration purposes have not been an insurmountable obstacle to their completion, even in the absence of initiatives such as IIRSA. For several decades and with no overall integration framework, the region has had numerous experiences in binational projects -some with very ambitious objectives, such as the *Yacyretá* or *Itaipú* hydroelectric plants and others with considerably simpler objectives, such as the integration of gas pipelines between Argentina and Chile, a project that did not encounter any problem during its physical development and yet has faced difficulties in terms of gas supply and contract performance.[22] IIRSA's distinctive feature is, by contrast, that it brings together all the countries in South America and joins them in a process that goes beyond the scope of bilateral interconnection works.

What, therefore, is IIRSA's specific contribution that motivates the countries' participation? The Initiative affords the possibility of exchanging information about investment programs and assessments conducted by individual countries on the most tangible benefits and costs. Consequently, it provides a mechanism that helps in the reduction of uncertainties and in the early detection of the type of externalities associated to each project. Although it may seem trite, it is worth pointing out that these multilateral dialogue fora on integration infrastructure were practically unprecedented in South America in the scale and scope as those by IIRSA. Furthermore, the procedure used by IIRSA for managing a short list of priority projects has been standardized in a "management-intensive system":[23] a software that connects on-line the 12 participating countries and is aimed at facilitating the management of the priority projects that make up the *Implementation Agenda based on Consensus* (AIC - *Agenda de Implementación Consensuada*).[24] Naturally enough, IIRSA's forum, its technical meetings and the formal an informal communications among its national coordination teams do not meet all the needs and are therefore far from satisfying the information requirements for the decision-making process typical of complex projects such as those related to integration. However, IIRSA provides governmental leaders with a forum conducive to dialogue, which is further reinforced through specific actions at technical level.[25] Once projects reach more advanced phases or enter the execution phase, relevant bodies and agencies step in to perform more detailed work.

The issue that follows is how valid the cooperation strategy is. In other words, what is the incentive that each country has in order to share information with the rest of the participants if it is does not know for certain whether the other countries will furnish useful information to its own plans? The question is not easy to tackle though several points can be made. Firstly, IIRSA is not a "bilateral game" but rather involves 12 players of very different weight. The participation of these players -each one with very different strategies and resources, which, moreover, change with time- precludes non-cooperative attitudes, or, more precisely, the benefits from participating in the Initiative outweigh the associated costs. Secondly, a factor that contributes to facilitating the coordination mechanism is the presence of the Technical Coordination Committee (CCT - *Comité de Coordinación Técnica*). Albeit belonging to the countries participating in IIRSA, the CCT financing institutions operate with independent mandates and hence are in a position to contribute to consensus building. Finally, a third element that encourages intergovernmental work is that IIRSA's agenda is not merely restricted to the exchange of information on projects but extends to the field of regulations, planning and financial management. This enlarged work menu favors the continuity of the process.[26]

At this point we should pass on to the other key chapter on which IIRSA has focused its attention: the harmonization of sectoral regulations or *Sectoral Integration Processes*, to put it in IIRSA's words. Only in very few areas have regulatory frameworks been consistently applied across the regional sub-blocs currently in place in South America. It is probably the Andean Community (CAN - *Comunidad Andina de Naciones*) that has made the greatest progress in the fields of transportation and other trade-facilitating mechanisms. The Southern Common Market (MERCOSUR - *Mercado Común del Sur*), notwithstanding the considerable trade volume between its members, has made fewer regulatory advances on this front. IIRSA's aspirations to achieve greater regulatory harmonization in the South American space have encountered hurdles. In each of the areas, there are specialized agencies -generally coordinated with national counterparts- that have regulatory supremacy, in addition to the corresponding interest groups that may feel either favored or harmed. IIRSA's work has therefore consisted in detecting proposals and formulating suggestions that must then be channeled through the specific relevant bodies. However, for a proposal to be effectively adopted it must be incorporated into the national legislation concerned, an obstacle that has yet to be overcome.[27] A comparison between the efforts and results in the field of project identification and selection, including in some cases execution tasks, on the one hand, and IIRSA's capacity to create infrastructure regulations across the South American space, on the other hand, reveals clear differences. In the area of regulations, which is more intensive in terms of management and institutional agreements -which include their corresponding national statutory provisions and regulations-, IIRSA's process has not been effective. In this field there are limits to the process of physical integration that require to make further progress in other dimensions -i.e., political, economic and institutional spheres.

IV. Cooperation and Regional Infrastructure: Investment and Financing : Additional Reasons for Cooperation and Involvement in IIRSA

Since its inception IIRSA has been aware of the economic and financial difficulties facing the development of its projects. The difficult macroeconomic context prevailing in the region at the beginning of the decade, which was expected to last into 2003, demanded that countries make realistic economic commitments under the Initiative. These considerations were taken into account in the identification and selection of projects conducted by the countries.[28] As shown in Table 2, the total amount of IIRSA's projects represents 13.6% of total capital formation. The distribution by country is, however, very unequal, an issue that will be discussed later.

On the other hand, since IIRSA implies a long-term effort, the countries have attached high priority to the search for financial mechanisms and instruments suited to the purpose. Thus, the Initiative has pushed three lines of action: the adoption of PPPs for the development of projects, the search for "fiscal margins or room" to accommodate public investment in the budget, and, finally, the design of financial instruments tailored to IIRSA's needs.

Private Participation in the Development of Infrastructure

Countries have been adopting a wide variety of approaches to private sector involvement, depending on the characteristics of their own domestic economic context. Thus, Chile and Peru, for instance, having had some experience in PPPs, applied this

solution to several projects in the portfolio.[29] Brazil, in turn, passed novel legislation on the subject so as to make it possible to support projects that could not be financed by its budget. Argentina, conversely, after having advanced at an accelerated pace in the privatization and concession of public utilities in the nineties, leant once again on public financing, laying down in each case and according to the project involved, the modalities for private sector participation.

Regardless of the peculiarities of each country, the adoption of these kinds of partnerships has proved useful to all the participants. As the countries adopt PPP models for the development of their infrastructure, both public and private sectors gain better insight into this type of contract scheme. This broadened knowledge can in turn be applied to integration projects that, as discussed before, are more complex because of their cross-border impacts. And, indeed, IIRSA's efforts in this direction have tended to stimulate the dissemination of knowledge and exchange of experiences in relation to schemes involving private participation in infrastructure investments. Specifically, contributions have been aimed at exploring how PPP modalities can be applied to multinational projects.[30] In addition, efforts have not been merely restricted to studies. In fact, several projects currently in execution, funded by the Inter-American Development Bank (IDB) and the *Corporación Andina de Fomento* (CAF) have adopted these mechanisms.[31]

"Fiscal Margin" for Public Investment

In any case, the potential for the application of private participation mechanisms in the development of IIRSA's projects is limited. The public budget plays a prominent role. On the one hand, the concession of projects requires guarantees or subsidies that constitute actual or contingent public expenditure. On the other hand, there are multiple situations in which the most effective instrument is public investment. Since IIRSA's inception, several countries participating in the Initiative have raised at various international fora their concern that macroeconomic considerations, in this case the level of the public debt, ultimately affect capital formation in infrastructure and hence growth.[32] The most compelling pronouncement was made in 2004, during the Annual Meeting of the IDB's Board of Governors, at which the Ministers of Finance from eleven countries in Latin America, most of them from South America, signed what is known as the "Letter of Lima" (SELA [2004]). The document voices concern about the quality of infrastructure in the region and the impact of fiscal control on public investment. This statement, publicly issued on consensus by the highest ranking officials responsible for economic and financial management in the South American countries, warns about the risk of creating a vicious circle: accounting methods of fiscal sustainability could lead to perpetrating the weakness resulting from insufficient investments and the ensuing poor economic growth.[33] The text of the Letter places a special emphasis on regional integration projects, showing interest in IIRSA's progress.

These claims were particularly targeted at the International Monetary Fund (IMF), given that the level of fiscal imbalance and the sustainability of public debt are variables closely followed in the case of Fund-supported programs.[34] For this reason, it is necessary to find a fiscal "margin or room" to authorize items of capital expenditure in the budget. This political claim did not go unheard and actually had its echo in the IMF. The IMF's Executive Board thoroughly discussed the issue and commissioned studies to clarify conceptual aspects and make proposals of economic policies (IMF [2005]). The debate has helped cast light on several concepts while suggesting some criteria for application: insistence on the appropriate assessment of public projects, identifying fiscal

margins to make room for investment; taking into account the effect of the investment on the national net worth (asset building) and not only on spending and debt; the need for keeping an adequate record of any contingent obligation assumed by the public sector when adopting risk-mitigation mechanisms for the private sector, among others (ECLAC [2004b]). Appropriate accounting criteria as well as transparency in the disclosure of information have economic advantages for obtaining public financing in the markets, thus leading to a reduction of costs in gaining access to financial resources.

The improvement of the macroeconomic situation in South America in the past three years has contributed to consigning these issues to oblivion, as if they had taken place in a remote past. However, it seems advisable to keep an appropriate record of the underlying economic issues because this problem has not lost its currency. Lessons drawn from the eighties and nineties show, firstly, that in times of fiscal constraints, adjustments in spending fall more than proportionately on investment and, secondly, that private investment in infrastructure prove insufficient to fill the vacancy left by public investment. From 2003 onwards, economic recovery in the region has been accompanied by greater fiscal solvency (ECLAC [2006]). However, few countries manage their public finances in a countercyclical manner.[35] Therefore there is a risk that in case of a slowdown in growth fiscal concerns may resurface again. Consequently, in order not to repeat past episodes, it is necessary to ensure, among other instruments, a careful selection of public projects and, as indicated above, private capital investment in the development of infrastructure.

Innovative Financing Mechanisms

We will now pass on to the third subject announced at the beginning of this section -the development of innovative financial instruments and how they have served as an incentive for the countries to participate. An introductory observation about the context will shed some light on the scope of this question. IIRSA was launched at a time when the region was undergoing financial turbulences -hitting Asian countries in the late nineties- followed by economic crises of unprecedented magnitude that shook great part of South America: Brazil (in 1999), and Argentina and Uruguay (from 2001 onwards). The default on the Argentine debt involved the region even further and contagion effects were feared. Against this backdrop, it was difficult for countries to find access to financial markets in the scale and timeliness needed to spur investment in infrastructure, foster growth and boost domestic demand. Resorting to the adoption of innovative financing instruments was a formula which different international circles started to advocate. The documents discussed at the International Conference on Financing for Development held in Monterrey in 2002 illustrate the type of concerns experienced by governments. In the political arena and at the Latin American level, the Cusco Declaration, issued by the Rio Group in 2004, also provides an insight into the interpretations entertained in Latin America (United Nations [2002], ECLAC [2001] and Rio Group [2003]).

In IIRSA's specific case, the search for "innovation" in financing acquired multiple forms but mainly three directions were pursued. In addition to the two directions already explained above -private sector involvement and fiscal margins for public investment- a third path was followed: the search for a vehicle that allowed the funding of integration projects by forging partnerships between countries while minimizing the impact on public finances.[36] With the design of this instrument, eminently legal in nature, the Initiative sought to surmount a difficulty that cannot be easily overcome when resorting to multilateral banks. These institutions provide financing with sovereign guarantee through

their public windows.[37] However, the existing loan facilities have fiscal impact even in integration projects.[38] Among proposals intended to lift this restriction, there was one that was formulated with some detail -namely, the proposal for the establishment of a South American Infrastructure Authority (ASI - *Autoridad Sudamericana de Infraestructura*).[39] This would be a multilateral entity, whose capital would be made up of the countries' contribution and whose assets would comprise the concessions (projects) granted by the partners. Therefore, this entity would be entrusted with the development of the projects -from obtaining their financing to the subsequent management of the concession. The appeal of this scheme was that, operating as a "regional mega-concessionaire", this entity would be in conditions to develop projects, attracting funds with a minimum impact on the partners' fiscal accounts.[40] The ambitious nature of the project, the uncertainty surrounding access to financing and the inherent complexities of the institutional and legal design made it difficult to build consensus for the launching of the scheme. Other mechanisms also examined in IIRSA have been the creation of guarantee funds, styled after the Multilateral Investment Guarantee Agency (MIGA) of the World Bank, with capital from the countries. Except for institutional governance, it is not clear, though, whether these instruments would represent an innovation to the ones already offered by multilateral banks.

Asymmetries

A careful review of this background and the deliberations pursued in this respect reveal that under the innovation umbrella the Initiative has also attempted to resolve, albeit indirectly, another issue reflected in the data of Table 2: the completion of integration projects included in IIRSA's portfolio entails, as suggested at the beginning of this section, significant differences in investment efforts. As can be seen in Figure 1 (and Table 3), there is a markedly inverse ratio between investment efforts and *per capita* income level. More precisely and drawing on the existing literature on the subject, these differences can be attributed to "structural asymmetries" -in this case due to geographic and economic reasons.[41] On the one hand, it is striking that IIRSA has not paid explicit attention to the dimension of asymmetries involved in the physical integration agenda. As it is well known, in advanced processes of deep integration such as the European Union (EU), the compensation of asymmetries and physical integration have advanced in tandem.[42] On the other hand, the answer to the question of why this issue has not taken root in IIRSA is pretty straightforward when considering what has been pointed out at the beginning of this study: at a certain point, precisely when getting to the very core of integration, issues exceed physical infrastructure. In this regard, MERCOSUR is a case in point. Fifteen years after its inception, its member countries have decided to recognize and address the issue of asymmetries.[43] And they have reached this point after having put in practice an integration project tackling the various angles previously mentioned, including the legal dimension (Treaty of Asuncion). These elements have not yet been crystallized in the entirety of South America; in any case, this would be the convergence point if the agreements of CAN and the MERCOSUR merged, within Latin American Integration Association (ALADI - *Asociación Latinoamericana de Integración*)'s framework (ALADI, MERCOSUR and CAN [2006]).

The reasons expressed in this section take the same direction as those discussed in Section III: they reinforce the idea that member countries have seen some advantages in participating in the Initiative. IIRSA has been explicitly concerned with exploring financing mechanisms for the development of infrastructure. Efforts have focused on three lines of action that, as seen before, have been quite active, have generated an intense debate

among the participating countries and have created expectations of varying ambition and depth depending on the topics and circumstances. When these actions are put into context, it should also be noted that the countries have acted in relation to their proposals for the financing of infrastructure within IIRSA's framework, in sync with positions expressed at other fora. From this perspective, the analysis undertaken above makes it possible to identify reasons, several of them quite powerful, that explain why IIRSA has been able to sustain and encourage the cooperation scheme among its participating countries, and why they, in turn, have found the Initiative to be an effective forum in the furtherance of their objectives. In addition to participating in the debate and formulating proposals in the financial dimensions of the Initiative, the IDB, CAF and the Financial Fund for the Development of the River Plate Basin (FONPLATA - *Fondo Financiero para el Desarrollo de la Cuenca del Plata*), acting as the Initiative's technical coordination body (CCT), have brought about some advantages, not only of financial nature. In effect, the countries perceive that they rely upon these institutions' financial arms as leverage for dialogue, in addition to their specific contributions and facilities with tangible returns.[44]

V. Cooperation and Integration of Regional Infrastructure: The Potential Market

The analysis conducted in the previous two sections has unveiled a rather broad range of arguments that suggest that IIRSA's work has turned out to be, from different angles, an attractive proposal for the countries: the gains associated with participation have outweighed the ensuing costs, and this has contributed to its continuity. Nonetheless, it is proper to wonder whether it is possible to ascertain the economic impacts of physical integration in South America. In order to do so, it's convenient to have an indicator to gauge the size of the market whose access would be facilitated as a result of the development of works breaking down the natural barriers erected by geography.

A concept that comes fairly close to this idea is to measure the potential market size. This is a very simple indicator, propounded by geographers interested in economic issues, which has become fairly widespread.[45] It is a ratio between the size of the economy (of potential target markets) and distance. Table 4 presents the data for countries in South America, which then serves as a benchmark for other regional blocs: the North American Free Trade Agreement (NAFTA) and the EU. Several interesting remarks can be made. In the first place, it is clear that for smaller economies, such as Guyana and Suriname, third markets play a decisive role. At the opposite extreme, in the case of countries such as Argentina and Brazil, it is their own markets that have the highest share -specifically, in the case of Brazil, the home market accounts for 60% of the total potential of the four markets here represented. In the second place, as to the two landlocked countries, Bolivia and Paraguay, by reason of their strategic geographical location, the South American market is the one that ranks first in importance. In the third place, one should take not that a simple average of the share that the twelve countries have in South America (18.75%) is lower than the share they have in extra-regional markets.

As noted above, the simplicity of the indicator used forewarns caution when interpreting its results. The first and most obvious warning is that this measure does not take into consideration any restrictions to market access. If the denominator of the index included levels of tariffs (or non-tariff barriers), the resulting figures would be different.[46] The second caveat is that this is a physical measure in the sense that it is based on the

distance and not on freight costs. The third limitation is that it does not take into account other economic considerations except for the market size; in other words, no supply or demand variables are assumed. And, finally, it should be borne in mind that not all of IIRSA's projects are exclusively intended for intra-regional trade and economic activity.

Rather, the indicator shown in Table 4 provides an additional perspective in relation to the discussion in previous sections. Firstly, it shows that there is a significant difference in the weight of the market potential that the South American space has to offer to each of the countries and hence in the economic interest that it arouses in them. Clearly, for the larger countries in the region, the South American market seems, under this measure, less relevant. However, as it is well known, it is precisely the bigger economies that sell their manufacturing exports in regional market. In turn, smaller countries are more attracted to the potential markets offered by the other partners. In this way, physical integration of the regional space is of supplementary interest for all countries regardless of their size. Secondly, as it has been noted since the beginning of this paper, it is also evident that IIRSA's appeal is enhanced as long as the development of infrastructure is in tandem with the rest of the integration and trade agenda. This is the means that assures reaping the benefits of operating on a regional scale. This observation is in no way new in the Latin American experience: a rich literature -starting with Prebisch, and nourished from then on by the advocates of regional integration- has suggested the appropriateness of tapping economies of scale in the bloc as a means to gain efficiency and competitiveness in the world market. It is obvious that in order to materialize this into results, it is necessary to eliminate the barriers to market entry, facilitate the movement of factors and reduce the asymmetries within the bloc. In sum, the available data on the market potential within South America makes sense of the integration efforts through the improvement of physical infrastructure as long as the other policies and instruments are aligned in the same or a similar direction.

VI. Pending Challenges

This paper has discussed in some detail the reasons why the cooperation and coordination mechanism adopted by IIRSA has drawn interest in member countries. The Initiative's progress and continuity prove that the initial proposal has not gone unnoticed. Indeed, IIRSA has produced in the past few years the results envisioned within its objectives (Annex). An assessment of these achievements falls outside the scope of this paper. The purpose of this final section is to discuss the major challenges confronting the Initiative. This is a way of exploring the scenario that IIRSA will face in the coming years and the validity of the proposal for the development of physical infrastructure, in light of the progress made so far.

It seems clear that the main challenge is related to the issues discussed in previous sections and constitute the central question that has run through this paper: Why has the cooperation scheme embodied by the Initiative managed to remain in place over the past years? It was point out that the continuity of intergovernmental cooperation depends on the capacity to establish an agenda from which it is clear that participation in the Initiative has net benefits *vis-à-vis* non-participation. Thus, for instance, the absence of results, the thematic irrelevance, the incapacity to build consensus among all the members are factors that could lead to the failure of the scheme. Moreover, countries and their governments, which are ultimately the actors that play the primary role of leading the project, will feel drawn to work around these issues in so far as other interest groups -whether at the local or national levels- can perceive that the advance of the projects is being correlated with tangible

positive results. It is therefore reasonable to expect that, as physical integration advances and materializes into results, the process will come up against difficulties and opposition. The measure of success will be determined by the capacity to surmount such obstacles. There are no major differences from any other field of public policy: the intergovernmental character of the process adds certain elements, but does not diminish the need for getting results.

Throughout these years, IIRSA has had the virtue of including in its agenda topics of great appeal preserving the focal point. This was due to the consensus that attended to the diversity of interests and the resulting necessary counterbalances. On occasion, the call was organized according to expectations -as in the case of issues related to financing- and in other cases on the basis of concrete results concerning projects of common interest. These similar ingredients should determine the continuity of the process.

Finally, outside IIRSA's specific scope lies another challenge. As pointed out several times in this article, the physical integration agenda gains true significance in a context of deep integration. In this regard, although it is still too early to foresee the scenario, IIRSA cannot detach itself from the paths followed by the process in South America -in its political, social, economic and trade-related dimensions. After the first steps taken in these past two years since the creation of CSN-UNASUR, there is enough evidence showing the existing difficulties for convergence. The official enthusiasm is offset with the words of caution given by not few analysts (Bouzas, Da Motta Veiga and Ríos [2007]). The infrastructure agenda is specific enough to contribute to the integration process. On the other hand, this agenda also raises issues that can be as thorny as those detected in the economic or trade-related fields.[47]

In the best-case scenario, marked by progress in the integration of South America, IIRSA would very likely be assimilated into and articulated under the general scheme. In such a case, the institutional design of the Initiative, which has so far proven to be very effective, should be readapted. In this situation, one of the features discussed in the previous sections will very possibly become more noticeable: the asymmetry in investment efforts. On the other hand, in a different scenario, characterized by a slower South American integration and still undefined boundaries and depth, IIRSA might have to push a line of action similar to the one known so far. In this context, its current institutional design would be appropriate: its low-cost structure; countries active participation assures the suitability and relevance of the agenda; and finally the presence of financial institutions, facilitates technical inputs and access to the financial resources required for the investments. In any case, the subsequent challenge is whether IIRSA can remain a consistent scheme with the capacity to bring interests together. These attributes will require constant validation. Countries and governments would surely be inclined to provide this support as long as results are attractive enough.

VII. Concluding Remarks

From the analysis it follows that South American countries have been genuinely interested and effectively involved in IIRSA. Since its launching in 2000 this mechanism has helped to materialize results in terms of the integration of physical infrastructure. This being the case, cooperation has thus been a sort of public good facilitating the coordination of decision-making process by the national states. To the degree that tangible benefits are identified, governments demonstrate willingness to participate in the Initiative. The thesis argued in this paper is that the search for consensus on the formulation and focus of the agenda stimulate the process.

The analysis of this paper has not covered the entire ground. There are several directions that could be explored further by future research. In the first place, it seems adequate to review and assess the objectives achieved so far, the benefits that will be reaped from several of the already initiated projects and the deficiencies that could be foreseen in the future. This assessment could be conducted for the Initiative as a whole, targeting its general objectives, or, rather, it could be focused on certain projects in particular. In the second place, it would be interesting to ascertain whether the projects would have a visible impact on the distribution and location of economic activity, to what extent they could modify spatial dynamics and how they are appraised by actors in their area of influence. Lastly, the correlation between the general progress of the integration process in South America and the development of infrastructure constitutes, as already noted here, a matter of ongoing currency that gives rise to several questions. Will the region evolve towards a deeper integration scheme? And, if so, in which directions? How could the lessons drawn from IIRSA be exploited and reinforced? What would happen to infrastructure in the context of a regional scenario that proceed at slow pace towards deeper integration arrangements?

Notes

[1] Background information about IIRSA, mainly with regard to its institutional structure, spatial planning, and project selection, can be found on IIRSA's website (*http://www.iirsa.org*). In addition, there are official documents from the countries and institutions forming part of the CCT; see, for instance, IDB [2006]. Of course, the other IIRSA-related articles in this issue also provide a useful frame of reference for analysis. Details and particulars about these aspects will not be commented upon here; for further information, refer to the cited sources.

[2] Major objections to IIRSA so far have come from environmentalist groups concerned about the general impact of the proposal and, at times, from local actors that oppose some projects in particular. See Killeen [2007]. IIRSA's major achievements are briefly presented in the summary table included in the Annex.

[3] For IIRSA's goals for the 2006-2010 period, see the Minutes of the Executive Steering Committee -the ministerial body that leads the Initiative- for the meeting held in December 2005, in Asunción, Paraguay (*http://www.iirsa.org*).

[4] The Initiative had its origins in the South American Presidential Declaration made in Brasilia, Brazil, in 2000. From then onwards, IIRSA's work and action plans are approved at ministerial meetings held annually. The bulk of the technical work is carried out at intergovernmental meetings attended by representatives from each country (*national coordinators*). For further information on IIRSA's institutional structure, visit *http://www.iirsa.org/acercadeiirsa_ENG.asp?CodIdioma=ENG*.

[5] It should be noted that the Declarations of the South American Community of Nations in 2005 and 2006 have publicly acknowledged IIRSA's accomplishments (*http://www.cumbresudamericana.bo/armado.htm*).

[6] South America ranks in 83rd place (out of a total of 124 positions) in the infrastructure pillar of the Global Competitiveness Index (GCI) compiled by the World Economic Forum (*http://www.wef.org*).

[7] The term natural monopoly is used for economic activities that are supplied more efficiently by one firm: the market can be served at minimal average costs by one productive unit. Historically, the formation of public enterprises in the region can also be attributed to strategic considerations and, in general, to the characteristics of the State-led industrialization process.

[8] Contractual forms are varied -management contracts, build-operate-transfer (BOT) arrangements, and so on- and are generally referred to as Public-Private Partnerships (PPPs).

[9] Strictly speaking, this reduction in transportation costs explains why infrastructure, when seen from an aggregate view, has a positive impact on the rate of economic growth.

[10] IIRSA's definition of projects does not explicitly provide for investment in urban networks (for the distribution of either potable water or electrical power) directly intended for household consumption. From a practical point of view, this is a reasonable decision. However,

this does not preclude that the development of the other modalities of infrastructure should be supplemented with this type of investments. A case in point would be transportation projects requiring investment in urban development for towns located in border areas.

11 Location models also take other factors into consideration: the magnitude and diversity (in terms of skills) of labor markets in the region, the potential for tapping geographically localized external economies (leading to clustering) as opposed to land rent, location diseconomies and congestion, which are factors that favor dispersion. See Krugman and Venables [1995].

12 This is one of the reasons why national and sub-national legislations frequently provide for public consultation mechanisms prior to the governmental approval of an investment project.

13 These "spillover effects" constitute an externality that can impact positively or negatively in the region.

14 The existence of wide-ranging geographic impacts accounts for the fact that infrastructure regulatory jurisdictions also cut across different governmental levels. Typically, investments in transportation networks -road construction, electricity, gas pipelines, etc.- fall within the national (federal) jurisdiction while projects having a narrower scope are incumbent upon local governments (municipalities, provinces, etc.).

15 It has to be noticed that even when under public provision and control, a natural monopoly is not necessarily a public good. Public goods are those provided with constant marginal costs and where is difficult or impossible to exclude the consumer. In the case of many infrastructure projects, exclusion is possible and there are growing marginal costs. In such cases, the services usually are financed through tariffs paid by the consumers. However, in the case of some projects, it is inadvisable or highly costly to design user "exclusion" mechanisms, for which reason financing cannot be obtained through charges (tolls and fares), and it is necessary to turn to taxes.

16 The article co-authored by Cárcamo and Goddard in this issue explores this subject based on an analysis of the game theory.

17 For the purposes of this paper, the term "integration project" refers to a scheme entailing the explicit coordination of actions between two or more countries. Clearly, as explained in the text, a domestic project subject to strong externalities from a neighboring country influences the integration process in the territory or space involved.

18 The paper by Beato included in this issue of the journal makes a more detailed analysis of these features of integration projects.

19 The compensation of asymmetries in integration processes is an issue studied at length in the literature. The text refers to compensations destined to balance the uneven appropriation of the net benefits of an integration project among participant countries. Later, Section IV returns to the asymmetric topic.

20 Strictly speaking, this author refers to incomplete integration processes the elimination of tarriff barriers is just one factor leading to deeper integration.

[21] Several studies have found that the greater the distance between two economies, the fewer their trade interactions (investments and technology). (See Crafts and Venables [2001] pp. 7-8).

[22] The article written by Navajas featured in this issue discusses in detail the difficulties encountered in the gas pipeline integration between Argentina and Chile.

[23] For a detailed explanation on the Strategic Management Information System (SIGE - *Sistema de Información para la Gestión Estratégica*), visit *http://www.iirsa.org*.

[24] For details on AIC, visit *http://www.iirsa.org* and IDB website [2006].

[25] In fact, the SIGE has been designed as an instrument intended for officials with different levels of responsibility to access information. This system is geared towards an increased interaction between the managers of integration projects, thus facilitating communication and management.

[26] IIRSA has adopted four lines of institutional action for the 2006-2010 period, namely: implementation, comprising project preparation and execution tasks; sectoral processes, covering sectoral regulation and the preparation of proposals in this regard; planning, including the identification of projects and their environmental, productive and logistic impacts; and, finally, outreach activities.

[27] Thus, for instance, one of the topics to which IIRSA has allocated great resources has been the study of problems affecting border crossings and the critical factors influencing their efficiency. However, in spite of the technical efforts made by IIRSA, little progress has been made in the streamlining of border crossings and the consistent adoption of statutory regulations is far from being achieved.

[28] For the selection of projects to be included in the portfolio, IIRSA has applied a method that captures the attributes of each group of projects in terms of their impact on regional development and integration, and the feasibility conditions for their implementation (IIRSA [2004]).

[29] The articles by Cipoletta Tomassian and García Picasso included in this issue address, respectively, the Chilean and Peruvian experience in the application of PPPs.

[30] See the work pursued by IIRSA in relation to the Sectoral Process for Financing Instruments (*http://www.iirsa.org*). More specifically, refer to CAF [2002] and the *Grupo de Analistas Financieros Internacionales* (2002].

[31] The Implementation AIC comprises 31 projects, for a total amount of US$6.9 billion; of this group, 14 projects are being executed under some PPP modalities (IDB [2006]).

[32] There are records that the subject was under consideration at IIRSA's initial meetings. See the Minutes of the Executive Steering Committee (CDE - *Comité de Dirección Ejecutiva*) entered in 2001 in Buenos Aires (*http://www.iirsa.org*).

[33] From the technical point of view, the difficulty lies in the fact that the fiscal sustainability analysis monitors the public debt without taking into account as part of the

measurement the new assets acquired as a result from the investment process. The amount of the net debt is therefore lower if these assets are entered in the accounts. Yet, as most of these assets are not liquid, their accounting is questionable if the purpose is to evaluate the financial impact of public liabilities and the capacity for repayment.

[34] Hemming and Ter-Minassian [2005] explain that the issues raised by several Latin American countries led the IMF to study the problem in more detail, both from the conceptual point of view and through case studies. Tanzi [2004], in a paper prepared for the IDB and also in relation to the case of integration projects, presents a series of arguments warning about the difficulties in allocating public budget to investment projects of complex execution and great scale. Both studies reveal that the intensity of the debate on fiscal policy, its macroeconomic impacts, and its consequences on long-term growth was very intense during the early years of the decade and was also linked to the concerns that countries experienced over the development of integration infrastructure. IIRSA was an important topic in the debate.

[35] Chile applies macro-fiscal rules in those cases in which annual spending policies are determined according to the calculation of revenues resulting from the calculation of the potential output (structural balance). For more details, see Marcel *et al.* [2001] and Ter-Minassian [2006]).

[36] The documents from the October 2004 meeting of IIRSA's Executive Technical Group on the Sectoral Process for Financing Instruments are an accurate example of the nature of discussions that were then being held on this subject by governmental representatives in the areas of finance and infrastructure. As can be seen in the work agenda, the meeting was convened "to propose, discuss, and analyze solutions promoting the funding of IIRSA's Strategic Project Portfolio and *to agree on actions to be implemented in the short- and medium-term*" (emphasis added), *http://www.iirsa.org*.

[37] They also have a private window, with no sovereign guarantee, which in the case of IDB, for example, was originally designed in the nineties to grant loans to the private sector. One of the main purposes of this facility was to support the development of infrastructure arising from the concessions and privatizations carried out in the period.

[38] As explained above, the formulas applied in the region have resorted to the formation of "binational entities". The requirement of sovereign guarantees, however, entails that multilateral loans be taken out by the entity's member countries and invested in the agency itself. For public accounting purposes, this is a financial investment, covered by multilateral financing, which has an impact on the treasury and increases the fiscal deficit (if its effect on the national net worth is not taken into account).

[39] The technical proposal, its economic rationale and legal framework were analyzed at a meeting held by the deputy ministers of economy and finance of IIRSA's member countries on October 27, in *Lima*, Peru (see GTE [2004]).

[40] Public spending was thus limited to the capital contribution (*paid in*) and the eventual granting of subsidies or special guarantees to the projects chosen by the country.

[41] For a discussion on asymmetries in integration processes, see Bouzas [2005] and Giordano *et al.* [2004].

[42] The EU has allocated 347 billion of euros to its Cohesion Policy for the 2007-2010 period, of which 282.8 billion of euros are assigned to the objective of convergence of less developed countries and regions.

[43] The selected instrument has been the creation of the MERCOSUR Structural Convergence Fund (FOCEM - Fondo *de Convergencia Estructural*) (INTAL [2005]).

In any case, funds allocated to the FOCEM have proved negligible in comparison with those assigned by the EU. In *per capita* terms, resources for the FOCEM amount to US$0.43 per year while allocations under the EU Cohesion Policy are at around US$114 annually for the 2007-2013 period.

[44] The IDB and CAF have offered a facility for the preparation of IIRSA's projects that amounts to US$20 million and US$50 million, respectively. The facility is non-reimbursable and hence represents a subsidy for the preparation of projects. Additionally, the CCT institutions allocate funds from their own budget to the execution of IIRSA's annual work program. The IDB estimates that since its creation it has invested in this regard US$10 million (IDB [2006]).

[45] See Harris [1954] and, for a recent application to the MERCOSUR case, see Sanguinetti [2006] and Terra and Vaillant [1997].

[46] The article by Mesquita Moreira featured in this issue presents comparative indicators of transportation costs and tariffs in South America.

[47] A case in point of the foregoing is the different paths followed by energy integration in the past years in South America.

Table 1

IIRSA's Projects: Number of Projects, Involved Amounts and Effects on Integration						
Country	Total Projects		Binational Projects		Effects on Integration	
	Number [a/]	Amount [b/] In US$ Billion	Number [c/]	Amount [d/] In US$ Billion	Number [a/]	Amount [b/]
					Percentage	
	(1)	(2)	(3)	(4)	(5)=(3)/(1)	(6)=(4)/(2)
Argentina	63	6.257	22	3.241	34.9	51.8
Bolivia	40	8.025	25	4.218	62.5	52.6
Brazil	66	11.563	26	5.300	39.4	45.8
Chile	29	1.145	9	0.243	31.0	21.2
Colombia	35	0.848	27	0.166	77.1	19.5
Ecuador	35	1.035	26	0.547	74.3	52.8
Guyana	17	0.263	6	0.260	35.3	99.2
Paraguay	29	3.649	14	1.708	48.3	46.8
Peru	65	3.987	28	0.754	43.1	18.9
Suriname	8	0.166	3	0.075	37.5	45.2
Uruguay	14	0.822	5	0.412	35.7	50.1
Venezuela	25	1.426	23	0.199	92.0	13.9
Total	*426* [e/]	*39.185*	*214*	*17.122*	*50.2*	*43.7*
Simple Average	*35.5*	*3.265*	*17.8*	*1.427*	*50.9*	*43.2*

Notes:
[a/] Total number of a country's projects in IIRSA's portfolio (including binational projects).
[b/] Total amount of domestic and binational projects.
[c/] Number of a country's binational projects in IIRSA's portfolio.
[d/] The cost of integration projects results from assigning to each country half of the cost of the bilateral project.
[e/] The total number of projects in IIRSA's portfolio as of the date of this study is 338. The difference with the number indicated above reveals that there are 88 binational projects.

Methodological Explanations:
1. Binational projects are counted separately in each participant country, having a double count in the total.
2. All data on number of projects and amounts corresponds to the existing data on the IIRSA Website as of July 2007. After that date, new data has been incorporated to the portfolio as a result of the Executive Technical Groups advances.

Source: Prepared by the author on the basis of data from IIRSA (*http://www.iirsa.org/proyectos*).

Table 2

Total Investment, Public Investment, and IIRSA's Projects In US$ Billion and Percentages				
Country	Gross Domestic Fixed Investment / GDP a/	Central Government's investment / Gross Domestic Fixed Investment a/	Total IIRSA's Projects	
	Percentage	Percentage	In US$ Billion	Percentage of Investment b/
Argentina	21.5	9.4	6.257	15.9
Bolivia	12.5	81.0	8.025	679.3
Brazil	16.3	31.9	11.563	8.1
Chile	20.6	8.8	1.145	4.7
Colombia	19.8	30.8	0.848	3.5
Ecuador	21.9	22.9	1.035	12.9
Guyana	34.8	65.9	0.263	98.5
Paraguay	19.3	25.5	3.649	252.6
Peru	18.8	9.9	3.987	26.6
Suriname	n.a.	n.a.	0.166	n.a.
Uruguay	13.1	10.3	0.822	37.8
Venezuela	20.2	28.5	1.426	4.9
Total	*18.0*	*25.1*	*39.185*	*13.6*

Notes: n.a.: non-available.
a/ Data for 2005.
b/ The total amount of IIRSA's projects is expressed as a percentage of gross domestic fixed investment in 2005 for illustrative purposes. It should be noted that in most cases project disbursements extend for over one period.
Methodological Explanations: See Table 1.
Source: Prepared by the author on the basis of data from IIRSA, ECLAC and IDB.

Table 3

IIRSA's Projects and GDP *per Capita*
As a Percentage of Investment and in PPP Dollars

Country	Total IIRSA's Projects	GDP *per Capita*
	Percentage of Investments	In PPP Dollars
Argentina	15.9	14,481
Bolivia	679.3	2,767
Brazil	8.1	8,657
Chile	4.7	12,134
Colombia	3.5	7,620
Ecuador	12.9	4,553
Guyana	98.5	4,568
Paraguay	252.6	5,052
Peru	26.6	6,249
Suriname	N/A	5,918
Uruguay	37.8	10,819
Venezuela	4.9	6,606
Total	*13.6*	*7,452* [a/]

Notes: [a/] Simple average.
Source: Prepared by the author on the basis of data from IIRSA, ECLAC and CIA World Factbook.

Table 4

POTENTIAL MARKETS FOR SOUTH AMERICAN COUNTRIES
US$ Millions per km and Percentage

Country	In US$ Millions per km					In Percentage of Potential Market Total			
	Home Market	External			Total Potential Market	Home Market	External		
		Rest of South America	EU	NAFTA			Rest of South America	EU	NAFTA
Argentina	3,573	1,129	1,088	1,603	7,394	48.3	15.3	14.7	21.7
Bolivia	265	1,470	1,172	2,132	5,039	5.3	29.2	23.2	42.3
Brazil	5,812	530	1,349	1,852	9,543	60.9	5.6	14.1	19.4
Chile	2,401	998	1,028	1,711	6,137	39.1	16.3	16.7	27.9
Colombia	3,496	779	1,331	3,312	8,917	39.2	8.7	14.9	37.1
Ecuador	1,202	832	1,237	3,092	6,363	18.9	13.1	19.4	48.6
Guyana	79	1,163	1,549	2,821	5,612	1.4	20.7	27.6	50.3
Paraguay	489	2,172	1,170	1,777	5,607	8.7	38.7	20.9	31.7
Peru	1,596	958	1,142	2,416	6,112	26.1	15.7	18.7	39.5
Suriname	79	1,265	1,575	2,665	5,584	1.4	22.7	28.2	47.7
Uruguay	877	1,392	1,098	1,581	4,948	17.7	28.1	22.2	32.0
Venezuela	1,944	843	1,487	3,438	7,712	25.2	10.9	19.3	44.6

Notes: [a/] Potential home market for country j (PM_j) is calculated as:

$$PM_j = \frac{GDP_j}{d_j}$$

Where:
GDP_j: Gross domestic product in PPP dollars for country j.
d_j: Own distance, calculated as 1/6 of the radius of country j's area.

[b/] Potential market in region i for country j (PM_{ij}) is calculated as:

$$PM_{ij} = \frac{GDP_i}{d_{ij}}$$

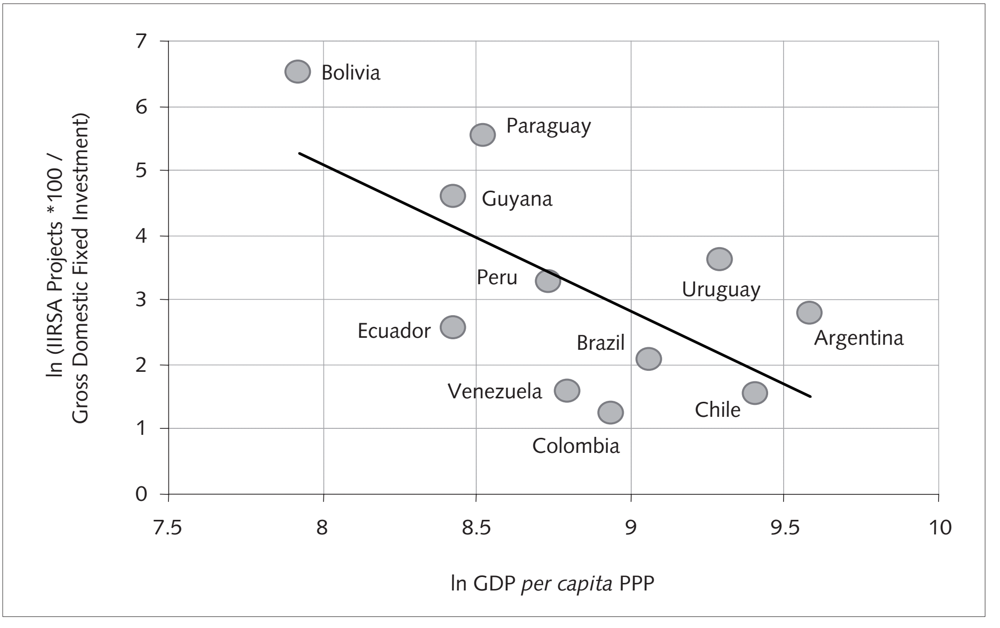
Where:
GDP_i: Gross domestic product in PPP dollars for region i. The GDP for the Rest of South America is the South American GDP minus country j's GDP.
dij : Distance between country j and region i measured as the distance between the capital of country j and a centr al city in region i.
Brasilia was taken as a benchmark in the case of South America; Kansas City for NAFTA and Vienna for the EU.
For the calculation of the potential market for Brazil in South America, the distance being considered is the average distance between Brasilia, and Buenos Aires, *Lima* and Caracas.

[c/] Sum including the potential markets in the Rest of South America, NAFTA and the EU.

Source: Distances Worldwide and our own calculations on the basis of data from CIA World Factbook.

Figure 1

Ratio of GDP *per Capita* to IIRSA's Investment Projects
In Natural Logarithms



Source: Prepared by the author on the basis of data from IIRSA and CIA World Factbook.

Annex: IIRSA's Main Results [1]

1- Project Portfolio

• 338 infrastructure projects grouped into 41 sets of projects with an estimated investment of US$39.185 billion.[2]

• 40 projects with their financing approved or in process of approval by the Technical Coordination Committee member institutions (IDB-CAF-FONPLATA) for a total investment of almost US$7.354 billion (and US$3.375 billion in financing). The data includes the projects of the AIC detailed below.

2- Implementation Agenda Based on Consensus 2005-2010 (AIC)

• 31 projects for a total amount of US$6.921 billion make up this priority agenda that is expected to be completed within the next three years (by 2010)

• AIC features 10 projects in execution for an amount of US$3.643 billion and a concluded project for an amount of US$12 million

• 12 projects being executed under some PPP modality

• Some projects in execution worthy of mention along with their objectives are the following:

- *Paita-Tarapoto-Yurimaguas Road, Ports and Logistic Centers (Amazon Hub):* To improve infrastructure and operation of the intermodal hub, promoting the streamlining of logistics services and ports, which operate throughout the hub, and to consolidate the coast-mountain-jungle corridor of the northern region of Peru and its regional complementariness with the Amazon State of Brazil, to thus promote international trade. (Estimated total investment: US$338 million).

- *Bridge over the Acre River (Peru-Brazil-Bolivia Hub):* To promote the development of physical infrastructure and cross-border integration in South America and, furthermore, to provide Brazil and the macro region in southern Peru access to the Peruvian maritime ports of *Ilo*, *Matarani* and *San Juan* on the Pacific, and *vice versa*. To implement border control centers with integrated control systems on both sides of the bridge over *Acre* River. (Estimated total investment: US$12 million). The construction of the bridge was concluded in January 2006.

- *Paving of the Iñapari-Puerto Maldonado-Inambari, Inambari-Juliaca/ Inambari-Cusco Leg (Peru-Brazil-Bolivia Hub):* To improve and rehabilitate road infrastructure in the macro southern region of Peru, which connects to the States of *Acre* and *Rondônia* in Brazil; and facilitate the flow of passengers and cargo between such regions and the

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[1] The information included in the achievements is available at the IIRSA website *http://www.iirsa.org*.

[2] All references to number of projects and amounts corresponds to the existing data on the IIRSA website as of July 2007. After that date, new data has been incorporated to the portfolio as a result of the Executive Technical Groups advances.
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international markets accessed through the Pacific Basin, thus promoting the regional integration process. (Estimated total investment: US$1.055 billion).

- Building of the Pailón-San José-Puerto Suárez Road (Central Interoceanic Hub): The *Pailón-Puerto Suárez* road is part of the main Bolivian Integration Corridor, which joins the East with the West, and lodges an important percentage of the country's population and economic activity. It supplements regional integration between the ports of Peru and Chile, on the Pacific, and the Brazilian ports on the Atlantic, cutting across Bolivia. (Estimated total investment: US$444.8 million).

- Duplication of the Palhoça-Osorio Leg (Rodovia MERCOSUR) (MERCOSUR-Chile Hub): To improve the traffic flow in the MERCOSUR Corridor and to reduce the number of road accidents. Besides promoting the expansion of the capacity through the duplication of the section, the project will restore the existing track and incorporate different devices in order to increase road safety in a significant manner, emphasizing the measures that are necessary to achieve the organization of local traffic (vehicles and pedestrians), seeking the minimization or even removal of current conflicts with long distance road traffic. (Estimated total investment: US$1.2 billion).

- Duplication of Route 14 between Paso de los Libres and Gualeguaychú (MERCOSUR-Chile Hub): To ensure safer road conditions in the MERCOSUR-Chile Hub transport by highway. (Estimated total investment: US$370 million).

- International Route 60 CH (Valparaíso-Los Andes Leg) (MERCOSUR-Chile Hub): To increase the capacity and upgrade the standard of the International Route 60 CH so as to absorb the growth in traffic demand. It is a structuring highway, which cuts across Chile, starting at the Chilean-Argentinean border, in the *Cristo Redentor* tunnel area, and running to the West, towards *Valparaíso* Port. (Estimated total investment: US$286 million).

3- The Strategic Management Information System (SIGE)

SIGE is an information system running on an IT-based platform administered by the countries. This tool is intended to offer technical support for the management of the 31 projects included in the AIC priority agenda, making it possible to monitor on a real time basis the current status of the projects (such as their critical paths, infrastructure goals, restriction management, management teams, proposed solutions, estimated investment, funding sources, etc.). This system provides for information mechanisms for decision-making processes at the highest-ranking governmental levels.

4- Technical Studies on Regulatory, Planning and Sectoral Aspects

IIRSA has produced technical studies in several thematic areas, which, among others, include:

- "Methodology to Evaluate the Potential for Production Integration": This methodology has been developed by combining three available research methods - Production Chains (quantitative), Networks and Clusters (qualitative)- and it has been applied to two groups of pilot projects.

- "Methodology for the Analysis of Logistic Chains": A methodology applicable to IIRSA's Project Groups has been developed with a view to identifying and determining support actions for the development of logistic chains in the Integration and Development Hubs and their pilot application to a given IIRSA's Project Group.

• "Environmental Strategic Evaluation (EAE)": The goal of this methodology is to provide IIRSA with a conceptual framework and practical guidelines for the application of strategic environmental evaluations of its Groups of Projects, with the following purposes: (i) To improve the comprehension of the territories in order to promote their sustainable development and to optimize the benefits of IIRSA's Project Groups; (ii) To measure the impacts, critical aspects and vulnerable areas and to identify socio-environmental development opportunities of the influence territories of the IIRSA groups of projects; (iii) To establish associated management and investment guidelines that shall give rise to more sustainable development options, as well as to identify design and implementation recommendations for the groups of projects, and (iv) To create a space for making participative activities and a constructive dialogue possible among governments and key participants of the area of influence of the groups of projects.

• "Methodology to Evaluate Cross-border Infrastructure Projects" (in progress): Its goal is to develop a methodology for the distribution of costs and benefits of multinational projects among the participating countries.

• "Georeferenced Information System or GEOSUR": This is a Regional Geoserver that provides online information about IIRSA's spatial planning process, including information about projects and about the economic and socio-environmental dynamics. This is also a geointegrator mechanism as it has an online portal that integrates data coming from a network of official and scientific institutions, widening and updating the available spatial information in order to support national and regional planning efforts.

• "Information and Communications Technologies at the Service of South American Competitiveness and Integration": This study undertakes a diagnosis divided into three main areas: promotion of competition to increase networks, connectivity agendas, and promotion of contents and universal access.

• "Facilitation of Transportation at South American Border Crossings": This study helped determine the typology of border crossings and the necessary activities to improve their operation and enhance service provision.

• "Assessment of Main Ports in South America": This study assesses each country's main ports and examines port logistics and their impact on international trade flows. In addition, it identifies activities to eliminate existing obstacles to the transport of goods by sea.

• "Multimodal Transportation in South America: Towards Regional Regulatory Harmonization": It is aimed at promoting the analysis of the legal issues involved in multimodal transportation in the region, laying the grounds for the establishment of a harmonized legal framework for the international multimodal transportation of goods. Additionally, it analyzes the incidence that this development would have at the regional competitiveness level.

• "Studies related to the Sectoral Process for Financing Instruments": The various studies have sought to contribute to different aspects related to investments in infrastructure and the numerous mechanisms for their implementation. These studies cover the areas of methodology for the identification and prioritization of projects, the determination of financial structures for cross-border infrastructure projects within IIRSA, the need for supporting mechanisms that promote the development of cross-border transactions by local capital market and the study of alternatives to and experiences in PPP projects in South America.

5- Project Financing Facilities

• *Fund for the Financing of Technical Cooperation for Initiatives for Regional Infrastructure Integration (FIRII):* In February 2006, the IDB's Board of Executive Directors approved a reform to the *Fund for the Financing of Technical Cooperation for Initiatives for Regional Infrastructure Integration*. With this measure, the Integration Fund, established in 2005, became a US$20 million non-reimbursable fund to finance technical cooperation operations for the formulation of infrastructure projects for integration purposes, particularly those comprised within the Initiative.

• *Fund for the Promotion of Sustainable Infrastructure Projects (*Fondo para la Promoción de Proyectos de Infraestructura Sostenible - PROINFRA*)*: CAF established PROINFRA, endowed with US$50 million with a view to upgrading infrastructure projects, giving priority to those aimed at strengthening regional integration or introducing innovative financing schemes. PROINFRA forms part of the actions advanced by the multilateral body in support of the Initiative.

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Contents

Investing in Multinational Transport Infrastructure: Coordination Perspectives for Latin America

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Summary

Multinational transport infrastructure (MTI) projects are fraught with coordination problems. This paper contributes by identifying key challenges faced by MTI coordination, analyzing them using economic theory and applying the lessons thereby obtained to make an in-depth diagnosis of major ongoing coordination efforts for MTI in Latin America. Specifically, this paper carries out the following. First, after motivating the need for public funding of MTI projects, we present a game theoretic framework to analyze coordination of investment in MTI projects in static and dynamic settings. Second, we review the Initiative for the Integration of Regional Infrastructure in South America (IIRSA), describing how it works and how it has contributed to coordination of MTI projects. Third, we present policy implications derived from our analysis, in particular proposing how MTI coordination can be facilitated in Latin America, especially within the framework of IIRSA.

This paper is based on Cárcamo-Díaz, R. and Goddard, J.G. [2007], "Coordination of Public Expenditure in Transport Infrastructure: Analysis and Policy Perspectives for Latin America", United Nations ECLAC Macroeconomía del Desarrollo, Series No. 56, January 2007.

I. Introduction

Regional integration efforts in Latin America have a long history. Although these efforts have in practice concentrated on trade facilitation, regional integration also has the potential to spur growth by harnessing economic gains from policy coordination among countries.

Previous research on policy coordination in Latin America, focusing on monetary policy, fiscal policy and exchange rate issues (e.g., Ghymers [2005]), has succeeded in identifying the need for and advances so far on the institutional side of macroeconomic coordination initiatives. However, concrete identification of areas where coordination is taking place and where deeper analysis is necessary has been largely missing in the

literature. One such area is Multinational Transport Infrastructure (MTI), which in Latin America is largely financed by the state. Public finance has a key role to play in funding MTI, as network externalities and other economic and environmental "spillovers" are difficult to measure - let alone capture - by private firms, and therefore private firms that might invest in a single country might not have adequate incentives to participate financially in MTI projects. Therefore, coordination of investment in MTI projects effectively amounts to coordinating (a part of) public expenditure at the regional level.

Infrastructure, defined as the set of engineering structures, equipment and facilities with a long-term useful life employed by households and productive sectors of the economy (INTAL [2000]), is essential for economic growth (Easterly and Servén [2003]) and integration. As pointed out by IDB [2002], there is a positive relationship across countries between income levels and the quality of infrastructure. According to Tanzi [2005], the implicit assumption about the direction of causation goes from infrastructure to growth, although this issue is still debated in the literature.[1] Investment in cross-border transport infrastructure in Europe has been credited with the establishment of a true pan-European market, linking peripheral regions to the core of the European Union (EU), opening up the European market to accession countries, and in general, fostering social cohesion and job-creation (PwC [2004]).

The argument in favor of increasing investment in transport infrastructure (both domestic and cross-border) to reduce trade costs is one of the most recurring in the literature (e.g., Fujimura [2004]). In developing countries, lack of adequate infrastructure explains at least 40 percent of transport costs (IDB [2002]). Additionally, Tanzi [2005] lists the following benefits conveyed by investment in transport infrastructure: it raises welfare by saving time and facilitating contacts and movements, it enlarges the size of labor, goods, and services markets by reducing transport and communication costs, and it allows the exploitation of economies of scale, as agents can choose with more freedom where to locate. Deficiencies in infrastructure negatively affect exchanges with neighbors and also with the rest of the world. The role of MTI is very important for "deep integration" within Latin American sub-regions, for attracting Foreign Direct Investment (FDI) aimed at serving the regional market and strengthening integration in global production and supply networks.

Recent developments in international trade patterns strengthen the arguments in favor of increasing investment in MTI. In the Andean Community, for example, intra-regional commercial exchanges increased from US$11.6 to 25.6 billion between 1992 and 2003, implying a rise from 7% to 9.8% of gross domestic product (GDP), and an increase in participation in overall trade from 21% to 27%. Still, this figure remains below the 60.3% intra-regional trade ratio in the EU-15 and 44.5% share in the North American Free Trade Agreement (NAFTA) in 2003 (Iwao [2005]). A second trend is that South America has benefited from the increased appetite of China for the commodities exported by the region (ECLAC [2005]), and China has simultaneously become a major supplier of manufactured goods for the region. Trade with China shows the highest percentage increases, with a ten-fold multiplication in commercial exchanges.[2] From being virtually negligible in 1992, China accounted for 4% of the region's international trade by 2003.

Having pointed out key reasons for channeling investment into MTI, the question that emerges is how investment at the regional level can be implemented. Due to the existence of spillovers, strategic complementarities, uncertainty and the dynamic nature of investment, we will show in this paper that it is necessary to actively coordinate public investment in MTI. This, in order to avoid potential coordination failure from ocurring at

succesive stages of individual investment projects as well as for formulating priority projects in long-term regional investment programs.

In the last few years, the Initiative for the Integration of Regional Infrastructure in South America (IIRSA) has introduced elements to institutionalize cooperation in MTI projects in the region. We will review and analyze the coordination aspects of that initiative,[3] with two aims. First, we will interpret how its contribution to policy coordination in South America fits economic theories of coordination. That analysis will serve as a stepping stone to attain our second aim, which is to identify policy implications that can foster the successful implementation of MTI projects in Latin America.

The paper is organized as follows. Section II briefly describes the role of public funds for financing multinational transport infrastructure projects. Section III sets out a theoretical economic framework for our analysis of coordination of MTI projects. Section IV describes the IIRSA experience and analyzes it using the framework presented in Section III. Section V highlights the policy implications that emerge from our work. Section VI concludes.

II. Public Financing of Transport Infrastructure: What is Special about Multinational Projects?

In the economic literature (e.g., IMF [2004]), the need for government involvement in financing infrastructure is often justified by the existence of diverse market failures. In MTI projects the market failures arise from multiple sources, including network characteristics, economies of scale and scope, financing requirements for sunk and lumpy investment in the presence of credit shortages (e.g., due to the absence of deep and liquid domestic capital markets), and revenue uncertainty (especially related to estimates of cross-country future risks impinging on traffic volume) that is very difficult to hedge against, among others. Government intervention can take several forms, including (but not limited to) direct financing of MTI projects. Tanzi [2005] explains the alternative ways of financing transport infrastructure projects.

Financing transport infrastructure projects with public funds, especially those projects with large cross-border implications, is difficult for at least three reasons.

A first reason is simply the existence of budget constraints: given the multiplicity of demands on the state purse, governments all over the world are finding it increasingly difficult to make the necessary financial commitments to finance large-scale infrastructure projects.

Second, infrastructure projects are often not considered a Government priority, because the benefits of transport projects are spread over time, the beneficiaries are many and difficult to identify and the costs normally involve a substantial up-front charge. In the case of MTI, if project evaluation at the national level ignores international spillover effects, there might be a downward bias in multinational project evaluation of benefits *vis-à-vis* costs,[4] leading to the latter receiving a lower priority than national ones. In particular, if pressing politically sensitive demands arise, public investment (including infrastructure) might suffer. This is typically the case when wage demands by the public sector are intense, when there are problems with the health, education, or pension system, or any other politically sensitive area that might endanger the incumbent government's political prospects.[5] Also, current expenditure might be more difficult to cut at short notice than investment due to legal reasons and contractual rigidities, as well as the characteristics of the price-setting and wage-bargaining process. The IMF [2004; 2005b] and Easterly and Servén [2003] show that in the past infrastructure has

been cut in Latin America in periods of distress, sometimes even bearing the brunt of adjustments. Investment and other non-priority expenditures have been cut whenever the economic cycle, exogenous shocks, or political pressures have resulted in an increase in budget deficits.

Finally, countries in Latin America have often found it difficult to finance investment in infrastructure using public funding due to high levels of public debt and the (related) high cost of issuing new debt in financial markets where elevated risk premia are required (IDB [2002]), particularly in view that transport infrastructure projects can take a long time to start paying off.

Such public funding concerns have led to calls for private sector participation in the building, operation and maintenance of transport infrastructure (European Commission [2001], PWC [2004]). During the decade of 1990, the private sector started to play an increasing role, building, operating, and financing infrastructure in Latin America, although its involvement in transport was less significant than in the cases of energy and telecommunications (INTAL [2000]). Despite increasing private sector involvement in transport infrastructure at the national level, its participation in multinational projects has so far proved limited. In particular, private sector involvement is more likely in high traffic, large projects where private, directly collectable returns are likely to be forthcoming. The private sector is unlikely to finance secondary connection roads, regional airports, and other infrastructure whose levels of traffic, cost, or risk would demand higher rates of private return to justify investing. Additionally, some anecdotal evidence indicates that national planning institutions charged with designing and evaluating transport infrastructure projects in Latin America face serious drawbacks.[6] If this problem were severe enough so as to, for example, put forward projects without an adequate cost-benefit analysis that incorporates accurate estimates of economic impacts, financing costs, and sustainability, then private financing could be reasonably expected to demand higher returns to compensate for the additional risk. What this means is that projects that, correctly designed and evaluated, would be viable and eligible for private sector participation, might be rendered unviable due to sub-standard design and evaluation.

The problems of access to private funding affect both national and MTI projects. However, MTI projects have at least two special characteristics that make them even more difficult to finance by the private sector, and have so far resulted in most projects being funded by public funds both in Europe and Latin America, with external support mostly from regional or international financing institutions. In the first place, the availability of private funding for MTI projects is often limited, as perceived risk is higher than in national projects (CAF [2004]).[7] In the second place, projects including several countries mean complying with different legislation, jurisdiction, and rules in general, including approaches to price-setting that can significantly delay and complicate the project design and assessment phase. Therefore, for private firms to invest in MTI projects, it is necessary to reach what is usually a difficult balance of risk and return.

For all of the above reasons, and without denying the need for mobilizing private sector resources as much as possible, we agree with Tanzi [2005] that governments will continue to bear the brunt of the financing effort of MTI in Latin America in the near future, even if the type of public funding commitment changes.[8]

III. *Multinational Transport Infrastructure: Projects as Coordination Games* [9]

The Basic Framework: MTI Projects as a Stag Hunt Game

Consider a hypothetical bi-national transport infrastructure project that is being evaluated by the authorities of two countries. Both countries are aware that if investment on the transportation network does not occur on the other side of the border, the full benefits of the project will not materialize, therefore privately optimal action for each country is not to invest. A simple way of modelling a situation like this is to introduce a one-shot Stag Hunt-type of coordination game as shown in Figure 1.

In this game, which assumes symmetric payoffs for simplicity, two governments must simultaneously decide whether they will invest in a road that connects the countries. Each country has two possible actions: to invest in their planned segment of the road (action *Invest*) or not to invest (action *Don't Invest*). The cost of building the road segment in their own country is C. Also, building their section of the road produces a payoff of size W for *each* country, independently of what the other country does. This represents the benefits that the newly connected border regions of a country will enjoy, even if the section of the road in the other country is not built. The benefit (payoff) to country A (B) if only country B (A) builds its section of the road is X, which accrues independently of whether country A (B) builds its own section of the road. X is the value of the positive spillover[10] that country B (A) building its road section generates for country A (B).

Each country gets an additional benefit if and only if they both build their corresponding section of the road, and this has a value of P, which represents the value of the network effects. The network effects most frequently discussed in the literature are those arising on the demand side. Those effects occur because the value of the services of a network for any given user increases with the total number of users or segments of the network. If we abstract from capacity constraints, connecting two previously separated networks with a single link (e.g., a bridge connecting two national road networks in neighboring countries) is equivalent to having each node (or destination) of a network connected to each other node.[11] Network characteristics are an essential element in analysing the value of transport infrastructure, and neglecting the measurement of network effects could dramatically affect the perceived value of an MTI project. In practice, however, modelling of network effects is often less thorough than desired (Laird *et al*. [2005]) due to funding, administrative, informational and other constraints. The size of P is related to factors such as the size of the networks enabled by the new connection, the induced increases in traffic, and others.

For coordination to be non-trivial in the game in Figure 1, we need to make two assumptions. First, the purely domestic benefit W is assumed to be smaller than the cost of building the road for each country ($W - C < 0$). Second, we assume that the network effects are positive and larger than the cost of the domestic segment of the road, net of purely domestic benefits ($P + W - C > 0$).[12] The key point is that if both countries invest, both will be better off. But if *ex ante* they don't believe that the other country will invest, each country may decide not to invest, because of the concern of incurring the cost of their section of the road without obtaining the full benefits emanating from the Pareto-superior outcome (*Invest, Invest*). In game-theoretic terms, each country has "strategic uncertainty" about the other country's move.

This is a static game with two pure strategy Nash equilibria[13] that can be Pareto-ranked: (*Invest, Invest*) and (*Don't Invest, Don't Invest*), both shown in grey in Figure 1. The equilibrium in which both invest generates larger payoffs in each of the countries. The question is which equilibrium prevails in games with multiple equilibria, like the coordination game analyzed here (see Cárcamo-Díaz [2005]). One way of answering this question is to look at laboratory experiments carried out to empirically test human behaviour in similar games. As shown by Straub [1995], in certain experimental situations the (*Don't Invest, Don't Invest*) equilibrium has been shown to be preferred, something that has been attributed to the idea that the mentioned equilibrium can be "risk dominant", if it is less risky than (*Invest, Invest*) and therefore, it is chosen by both players.[14] In the present context, if the equilibrium (*Don't Invest, Don't Invest*) is *risk dominant*, it would mean that, in the absence of other factors, the two governments would "play it safe" and not execute an MTI project with this payoff structure.

MTI projects, modelled as coordination games leading to coordination failure, are likely to present asymmetries in the costs and benefits to the different countries involved. For example, as the volume of traffic that circulates is typically related to the size of the economy, an interconnection between a large and a small country often benefits countries in an asymmetric way. A small economy would in general be expected to receive more benefits from interconnection than the larger one in terms of access to new markets (Gómez-Ibañez and Strong [2003]). However, that might change if the small country is a transit country towards other markets for the larger country. For example, imagine a game such as the one in Figure 2, where country A receives network effects from the project that are larger than those of country B by some arbitrary magnitude κ (kappa). In this game, there is a large benefit for one of the countries (i.e. A) of finishing the project, but the other one (B) stands to gain less if the project is actually finished, while risking the same amount of money towards its implementation.[15]

Similarly, it is possible that investment costs are asymmetric, illustrated in Figure 3, where country A has costs C and country B has an additional cost ε (epsilon) over the cost C paid by country A. In a similar way as in the previous example, differences in costs of investment make it more risky and less profitable for B to invest.[16] It can be concluded that asymmetric gains and costs can add to the "riskiness" of the (*Invest, Invest*) Pareto-superior equilibrium and result in the inferior (*Don't Invest, Don't Invest*) being played, even though both countries would be better off by coordinating.

If payoffs and costs are highly asymmetric, a binational MTI project might have one strong pure-strategy Nash Equilibria instead of the two in the Stag Hunt game above, namely: (*Don't Invest, Don't Invest*). For example, consider the case of an MTI project between a country with a large economy and a well-developed infrastructure and a small one with deficient infrastructure but which is a transit country towards other large markets. The small transit country would have to invest significantly to upgrade its network, but if the expected domestic and network effects of investing were low, it might be better off by not investing. This would amount to combining asymmetric benefits and costs. In such a case we would have the game in Figure 4, where we assume that the condition $P + W > C + \varepsilon$ is not satisfied for country B. In this example, the strategy *Invest* is strongly dominated for country B, it would therefore never invest, and the only Nash Equilibrium is: (*Don't Invest, Don't Invest*). A numerical example of this game, shown in Figure 4, assumes payoffs $X = 2,\ W = 0,\ C = 3,\ P = 3,\ \kappa = 3$ and $\varepsilon = 1$.

In this case, if a supranational institution were capable of transferring a sufficient part of the gains from country A to country B (in our numerical example a transfer of 2 units would be sufficient), both countries would gain from investing in the project. As pointed out by Fujimura [2004], unbalanced costs and benefits, together with the need for front-end, lumpy investments, can hinder the execution of cross-border transport infrastructure projects.

Up to now, we discussed coordination between governments under the assumption that investment actions were feasible from a fiscal perspective. In reality, however, countries face significant financial constraints that, when binding, limit their capacity to invest in transport infrastructure, including MTI. Such constraints can be included in our framework. For example, in the Stag Hunt game above, financial restrictions can enter via reductions in the number of available actions (e.g., if there were financial constraints, the *Not Invest* action would be the only one available and the game would break down) as the action set is discrete. In games with continuous action sets, the financial constraint limits the values that actions can take.

Introducing Uncertainty and Multi-period Interaction

Coordination problems can become more complex in the presence of multi-period, iterative investment stages and when there are risks that one or both governments will run into financial difficulties (or lose political will) to finish the project, even in the *absence* of asymmetric information.

To show why this is the case, consider an MTI project with three investment periods, after which the project is finished. In the first investment period, country A decides whether to make an initial investment on its section of an MTI project, which (assumed for simplicity) requires paying half the total cost of its section. In the second investment period, country B decides whether to invest or not. If it does, it pays the full cost of its section of the project. In the third investment period, country A now has to decide whether to finish its remaining section of the road. Now, imagine there is a positive probability at the end of the first investment period of an event that prevents country A or B (or both) from continuing to invest in the project, and that at the end of the second investment period there is also a probability that country A won't be able to finish the project. The capacity or willingness of the players to finish the project could be affected by a shift in government priorities, the occurrence of a crisis, fiscal revenue reductions, or anything that might interrupt the project during implementation. We model this (for simplicity) exogenous risk of project interruption as a move by *Nature*, that can interrupt the project either after the first or the second investment stage. The conditional probability that the project is interrupted following the first investment stage is α, and the conditional probability that the project is interrupted after the second stage is β. This game in represented in Figure 5.[17]

The solution of this game is as follows. Assuming that both countries invested in the first two investment periods and that *Nature* did not interrupt the game (so country A is indeed given the choice of finishing the project), then country A will invest in the last period *if the network effects are sufficiently large with respect to the cost*.[18] In this case, the payoffs for both countries will be high, consisting of the full network effects P plus the externalities X minus investment costs C.[19] In the second investment period, if B has the opportunity to invest, it turns out that investing is not automatically the dominant strategy for that country, because by investing B runs the risk of the game finishing afterwards; whereas if it doesn't invest, it still captures some benefits from country A's

investment in stage I. So, *B* will invest only if the risk of the game ending at the end of the second investment period (indicated by β) is low enough. In stage I, *A* will make a similar calculation. *A* knows that *B* will invest in the second investment period if β is sufficiently low, but it is also necessary that the probability α that the game ends before *B* can decide to invest is low enough.[20]

The central message that can be extracted is that the dynamic nature of decision-making and implementation brings about additional difficulties for coordination. And note that this occurs even *without* asymmetric information. In particular, the mere suspicion that the other country will not want to or be able to invest in a later stage can be enough to prevent an MTI project from ever entering into its execution phase. As pointed out by Fujimura [2004], synchronizing project phases in different countries can be difficult due to heterogeneous internal political and economic conditions. In this dynamic environment, even if *ex ante* the probabilities of exogenous interruption α and β are low enough, the project might not be executed.

Coordination becomes much more challenging if other real-world characteristics are introduced into the model.

In the first place, we need to consider that information about potential payoffs that is contingent on other countries' decisions (i.e., the values of *P* and *X*), is very difficult to quantify. For example, country *A* might know less than *B* about the spillovers generated through *B*'s investment in its section of the road (the value of its *X*). The value of the network effects *P* might also be assessed with significant noise and be privately known.[21] Countries employ different methods for assessing costs and benefits of MTI projects, so that, even with access to the same information (i.e., if there is no private information), there may be differences in estimates about payoffs. Game-theorists call this situation one in which payoffs are not "common knowledge" (Geanakoplos [1992]), violating a standard assumption of such analysis. Moreover, it is often unclear what forecasting methods, modelling assumptions, objective functions, or even models were used (Short and Kopp [2005]). This problem is particularly important if *ex ante* estimates of the cost of projects are systematically under-estimated (e.g., due to a negative bias in estimation models) and if spillovers on partner and third countries are ignored, as it has been claimed is often the case (PWC [2004]).

In the second place, each country might be willing to use its private information strategically: if the costs to be borne by each party are conditional on the benefits to be extracted from the project (although that doesn't need to be so), both country authorities may willingly downplay their payoffs or overstate their costs. Such incentives have been reported in Europe (Sichelschmidt [1999]).[22]

Finally, one limitation of game theory is that different methods for modelling imperfect information can lead to diametrically different outcomes, even in situations that are otherwise strategically identical. As explained in Cárcamo-Díaz [2005], countries more often than not play dynamic games of imperfect information, where each participant only has a probability distribution about the possible "types" of the authorities in other countries.[23] An important aspect of uncertainty is that during the construction and operation stages of the project government changes (in elections and cabinet reshuffles and other modifications to the political balance of power) can cause the government's payoff function to change significantly. This eventuality can contribute to making the *ex ante* decision by a country about whether to invest or not substantially more complex.

IV. Coordinating Investment in Multinational Infrastructure in Latin America: IIRSA

Brief Description, Aims and Characteristics

IIRSA "*...is a forum of dialogue among the authorities responsible for transport, energy and telecommunications in the twelve South American countries*".[24] Created as a result of the Summit of South American Presidents held in Brasilia in the year 2000, it has the objective of fostering the development of transport, energy and communications infrastructure with a regional perspective, contributing to the physical integration of the twelve South American countries and fostering equitable and sustainable development. It includes mechanisms of coordination and information exchange among governments and three multilateral regional financial institutions -namely, the *Corporación Andina de Fomento* (CAF), the Inter-American Development Bank (IDB) and the Financial Fund for the Development of the River Plate Basin (FONPLATA).

IIRSA uses the concept of "Integration and Development Hubs" (EIDs - *Ejes de Integración y Desarrollo*) to organise its vision of physical integration (see the webpage *http://www.iirsa.org*). Ten EIDs have been defined in South America.

IIRSA structures its work at three levels. First, its direction level is based around the Executive Steering Committee (CDE - *Comité de Dirección Ejecutiva*), formed by the Infrastructure or Planning Ministers of South American countries. Their role is that of deciding the strategic lines of work and approving action plans. Second, the executive level is structured around Technical Executive Groups (GTEs - *Grupos Técnicos Ejecutivos*), which are integrated by senior officials and experts named by the countries. There is one GTE for each EID, with the purpose of analyzing specific topics among countries and carrying out concrete actions at the multinational level. A third level is integrated by representatives from the aforementioned multilateral regional financial institutions, and is called the Technical Coordination Committee (CCT - *Comité de Coordinación Técnica*). The CCT provides financial and technical support to countries, coordinates joint activities, and acts as the custodian of the "institutional memory" of the Initiative.

In addition, each country has a National Coordinator. According to IIRSA,[25] the National Coordinator is: "*…responsible for coordinating the participation of the different ministries and government institutions involved in IIRSA and, eventually, that of other relevant sectors of society (private sector, sub-national governments, academia, NGOs, etc.*)." National Coordinators are charged with important tasks that include: representing IIRSA within their countries; identifying problems and articulating the participation of the public and private sector in the different GTEs; evaluating the terms of reference of the technical assistance that the CCT carries out, when the assistance involves their countries; registering information on the Strategic Management Information System (see below); following-up on the process of elaboration and execution of a project; periodically meeting to analyze and monitor the advance of the yearly action plans and setting the agenda and documents for the CDE meeting jointly with the CCT.

IIRSA and Coordination

IIRSA fosters coordination of public expenditure in MTI at two stages of the program and project cycle:

• for the definition of the groups of projects to be considered, their ranking according to a series of criteria, and the selection of projects that will be prioritized; and

• for during the execution of the projects.

Coordination in the first stage is furthered by holding meetings among the groups of government officials and experts that integrate the GTEs, and by seeking consensus on the groups of projects that are to be implemented by the countries and their priority. According to IIRSA's website, by June 2005 the Initiative had identified 335 infrastructure projects, including in transport (289 projects), energy (40 projects) and communications (6 projects). The estimated necessary investment for all those projects totalled US$37,470 million as of 2005, of which 17,376 million corresponded to transport projects.

In November 2004, the Executive Steering Committee (CDE - *Comité de Dirección Ejecutiva*) approved a group of 31 integration projects[26] out of the total project portfolio identified, which were considered to be of "high impact" for physical integration in South America. Those 31 projects, 28 of which are transport projects totalling US$5,401 million of required investment as of June 2006, became the "Implementation Agenda Based on Consensus 2005-2010" (AIC - *Agenda de Implementación Consensuada*), which was presented during the South American Presidents' Summit held in December 2004.

IIRSA has employed a methodology to analyze and classify the projects identified within each EID. This is important because identifying those projects with the largest potential impact (in terms of the strategic objectives of IIRSA) allows countries and multilateral financial institutions to concentrate their scarce resources in those projects considered to be of high priority. According to IIRSA's documents,[27] the analytic process can be divided into four stages:

(1) grouping of the projects of each Integration and Development Hub;

(2) establishing the factors of analysis;

(3) preparing and consolidating the information about groups of projects;

(4) evaluating the resulting groups of projects.

A "Business Vision" for each EID and a portfolio of projects supplied by the countries, together with a series of guiding principles for the effort, known as "Strategic Vision for the Physical Integration of the Region", were the basic elements with which work on project ranking and selection started. According to official IIRSA documentation, the criteria for grouping projects is the existence of "spillovers" or "synergy", explained as the possibility that a group of investments can generate more benefits than the summation of individual component projects.[28] Using our framework of Section V, clearly the most important MTI projects would have substantial network effects P and (positive) externalities X. In IIRSA, projects are grouped around a project called "anchor project" (or "existing anchor project" if it already exists). These anchor projects are often bottlenecks or "missing links" in infrastructure networks that are the key to unlocking positive network externalities in an MTI project.[29] The grouping process led to organizing the total portfolio of IIRSA projects into 40 groups of projects, which became IIRSA's Project Portfolio 2004.[30] Project grouping was carried out by a multinational working group.

In order to compare the different groups of projects that have been defined, IIRSA defines a series of analysis factors, around two dimensions: first, the impact of each grouping on sustainable development through physical integration and, second, the likelihood that each grouping can be implemented. See the details in the Appendix.

According to IIRSA documents, projects are ranked using "Multicriteria Analysis" (MCA) instead of a pure Cost-Benefit Analysis (CBA). This means that the analysis factors are

weighted, with weights being jointly determined by the members of GTEs using a software platform that uses a decision making criteria called Analytic Hierarchy Process.[31] The process ends with the obtention of a ranking for the groups of projects within each EID.

There is evidence, however, that this ranking process is carried out using inadequate information on the costs side. We present below a preliminary assessment of the extent of cost underestimation in IIRSA's AIC by comparing cost estimates made at two moments of time for the same projects, from IIRSA sources from different time periods.[32] In the June 2006 AIC cost estimate, 18 out of the 28 transport projects listed had higher costs than those cited in the June 2005 estimate, three had lower cost and 7 presented no changes. Note that out of the 18 that had higher reported costs in 2006 *vis-à-vis* 2005, 11 were in the "in tendering/concession" or "in execution" stages; of the 7 projects without changes in the cost estimates, 6 were still in the "in preparation" stage by June 2006. This reinforces, for the case of South America, the prior belief that cost estimates in project design are substantially and systematically underestimated, and that costs increase when projects are actually tendered and executed. Table 4 shows that the cost estimates for the 28 transport projects as a whole were 62.9% higher in 2006 than in 2005, with 11 projects having costs at least 50% higher in 2006. On average, each transport project had cost estimates that were 75.5% higher in 2006 than in 2005.

To facilitate coordination at the project design and specification stage, the multilateral institutions that constitute the CCT can finance studies for that purpose. For example, in early 2006 the AFC approved a "Fund for the Promotion of Sustainable Infrastructure Projects" (PROINFRA),[33] with 50 million dollars for the period 2005-2010 to finance studies of feasibility, environmental impact, etc., giving priority to regional integration projects and projects that introduce innovative financing schemes; while the IDB has constituted an "Integration Fund",[34] a non-reimbursable fund that has US$20 million available to finance integration infrastructures studies. In the domain of financing, the fact that the IDB and the AFC both participate actively in IIRSA via the CCT can also assist coordination,[35] as the projects are normally financed with an important component of debt, and for MTI projects to be financially viable, all national segments need financing.

Coordination at the project execution stage is fostered by introducing common information-sharing and monitoring mechanisms. In order to facilitate and monitor the effective execution of AIC projects, IIRSA implemented a Web-based information system called Strategic Management Information System (SIGE - *Sistema de Información para la Gestión Estratégica*)[36] that allows the compilation of information about the AIC projects in a central repository. Among the information gathered are critical stages of the projects, current situation, potential solutions to restrictions and problems, estimated investment and financing sources, as well as data about the projects, such as technical documents, pictures of the work in progress, actors, etc. In addition to the SIGE, monitoring includes sharing progress reports every two and six months. Further analysis of the extent of success of the IIRSA initiative in terms of coordination at the execution stage would require in-depth access to information about specific projects, including whether deadlines were met, actual costs incurred, etc. In coordinating execution, the role of the National Coordinators is probably key,[37] as project execution is carried out by each country's authorities according to their own timing and domestic practices: IIRSA does not supranationally enforce project execution.

How Does IIRSA Fit our Analytical Framework?

We will now outline IIRSA's contribution to coordination as viewed through the lens of our analytic framework.

First, if the project selection (decision) level is modelled as a Stag Hunt of game with multiple equilibria, IIRSA can be considered to act as a "focal point" to coordinate the selection of those projects considered to be "of the highest ranking".The idea is that, due to its characteristics (i.e. expected large benefits of executing it) a certain project is "salient" and, therefore, chosen by IIRSA members among many different alternatives.[38] By jointly analyzing and evaluating the characteristics, costs and benefits of different projects, those considered by IIRSA members as of higher value become focal and are thereby chosen. That emerges from our description above of IIRSA's efforts in getting the individual countries to agree on the AIC (through the work of the CDE, the CCT, the National Coordinators and after having held several GTE meetings).

Second, IIRSA meetings also convey "cheap talk" messages (costless information exchange among countries, for details see Farrell and Rabin [1996]) about their willingness (political objectives and priorities) and capacity (political and financial constraints) to coordinate public expenditure in MTI projects. If credible, this contributes to overcome the "risk dominance" of the (*Don't Invest, Don't Invest*) outcome in the Stag Hunt game, leading to the commitment of executing a certain project, by including it in the AIC. By increasing the exchange of information among countries, IIRSA makes more transparent the key factors determining the probabilities α and β affecting whether the dynamic, iterative-moves game will be interrupted.

Third, IIRSA contributes to coordination in the presence of asymmetric information, as countries can send signals to each other about their willingness to commit resources, via their iterative cooperation process and repeated interaction. This signalling process results from the actual implementation of the AIC. Additionally, IIRSA constitutes a vital attempt to jointly (i.e., cooperatively) solve the multiple problems described in project design when it involves several countries and interest groups. By structuring information exchange, bargaining and decision making within the Initiative, it is expected that better coordination on Pareto superior outcomes will result. At the project execution level, increased information availability through the setting up the Strategic Management Information System to monitor the implementation of AIC projects should lead to reductions in uncertainty (although not strategic uncertainty), asymmetric information and deviations from common knowledge, all of which are factors that make coordination more difficult, as mentioned above.

IIRSA also contributes to coordination within our framework in less direct ways. In particular, we argued that the size of the costs and benefits of MTI projects can also be affected by institutional factors such as the ease with which cargo and people can cross borders. In South America, a study funded by IIRSA found that crossing times at the borders can be very slow and therefore reduce the benefits of better infrastructure. For example, at the Aguas Verdes (Peru)-Huaquillas (Ecuador) border crossing, the importing process on the Ecuadorean side alone was estimated to take 24 to 48 hours, and if the cargo required fitosanitary intervention, the delays could add two or more days to the journey (IIRSA [2003] p. 36). To diagnose and analyze how to tackle these issues, IIRSA has carried out a series of studies and analysis about Border Crossings in South America,[39] and has the Sectorial Integration Process about Border Crossings.

Finally, IIRSA cannot (and has not been designed to) solve every conceivable problem of coordination in MTIs. As we have seen, financing of projects remains a matter of national responsibility, despite the support from multilateral financing institutions. Even more crucially, there are two serious MTI problems in South America where it is unlikely that IIRSA can help. The first is the weaknesses of the different national capabilities to produce data, design and evaluate MTI projects. The second is the fact that as IIRSA is not a supranational authority, it cannot redistribute benefits from the "winners" to the "losers" of an MTI project, thereby limiting its capacity to help to implement coordination projects with payoffs like the game in Figure 4.

V. The Road Ahead: Policy Implications for the Region

Information and Measurement Issues: Improving the Appraisal of Costs and Benefits of Multinational Projects at the Regional Level

Recent work (IMF [2005a; 2005b]) points to serious shortcomings in the way that Latin American countries design and measure the expected costs and benefits of transportation projects. IMF [2005b] found that in several countries there is wide heterogeneity in the quality of project design and assessment, and that there is still substantial room for improvement in those cases where evaluation is "adequate". Given the additional difficulties that multinational projects present, there is a pressing need to strengthen the institutions that generate the information and models that will later be used to evaluate and rank different infrastructure projects in the region, especially taking into account cross-national spillover effects. This challenge has been identified in IIRSA[40] as important for strengthening the way projects are designed, prepared and evaluated.[41]

The efforts to improve the quantity and quality of information available about costs and benefits in MTI projects need to be coordinated among countries to progressively move towards harmonized practices that conform to international benchmarks. Common (or at least, compatible) statistical standards need to be developed and applied to ensure comparability of data collected by national agencies. It is also necessary to ensure that costs and benefits are estimated in the same way by each party of a MTI project. That would likely imply agreement on the models used and the assumptions about the state of the world, as well as access to the same information. A major challenge is to have a harmonized methodology that takes into account country-specific structural conditions, and particularly market imperfections such as market power, network effects, and other externalities.

In relation to costs, it is important to consider all the costs of alternative financing sources and to attempt to measure the opportunity costs of funds. This is particularly important in Latin America, where most of the public expenditure in transport infrastructure has historically been financed with debt, especially from multilateral sources. For this reason, coordination between Ministries of Public Works and Planning and Ministries of Finance is crucial. Accurate estimations of future costs are often missing in infrastructure projects,[42] and this lack of foresight has been widely observed to be a source of (sometimes unexpected and large) future fiscal costs.

Investment in new MTI implies that Governments are acquiring a liability in terms of recurring future maintenance expenditures. Crucially, maintenance and upkeep in IIRSA projects (and in any MTI project) remain the exclusive domain of national Governments. Estimates of fiscal outlays *ex ante* should therefore include, not only the

expected cost of guarantees (and other contingent liabilites) provided by the Government to private sector operators, but also maintenance and upkeep costs. Disregarding future maintenance expenditures at the design stage might lead to overestimation of the project's value, potentially leading to incorrect decisions at the evaluation stage. It is even possible that countries will face a situation resembling the dynamic coordination game outlined above: if facing uncertainty about whether a neighboring country will invest sufficiently in maintenance, countries may choose not to invest in the first place. There is evidence that many countries under-invest in maintenance and that such costs are often underestimated. For example, IMF [2005b] argues that Latin American countries including Brazil, Peru and Colombia have considerable maintenance deficiencies in their road network.[43]

Analysis and Decision-making: Improving Joint Evaluation and Ranking of Multinational Projects

Countries also need to coordinate how projects are evaluated. As IIRSA uses a type of MCA to analyze and rank alternative projects, it is important to acknowledge that MCA methodologies must overcome a series of issues (Grant-Muller *et al.* [2001]), including:

- Identifying and defining the impacts that will be considered in the project.
- Clarifying the measurement method and specifying how each impact will be assigned a value.
- Deciding how weights will be obtained for the impacts.

In multinational infrastructure projects, these prerequisites present a tough challenge, as participating countries need to reach an agreement despite their differences in experiences and expectations, institutional frameworks and resource constraints (human, financial, etc.). On this point, it has been acknowledged[44] at IIRSA meetings that the analysis and decision-making process need to be substantially improved along several dimensions, including the project analysis methodology, the process whereby projects are grouped together and what complementary actions need to be carried out to strengthen the positive impact of regional transport infrastructure projects. In particular, it has been acknowledged that the evaluation process needs to be based on detailed numerical estimates of costs and benefits of each group of projects. According to IIRSA's documents, the classification and ranking of the groups of projects for the EIDs was, despite the presence of numeric elements, "qualitative and based on the convergence of the opinions of experts".[45]

One element of the multi-criteria analysis of "priority projects" in IIRSA is a qualitative assessment about the degree of alignment of each project with national (and sub-national) investment priorities. While it is important that MTI projects respond to national developmental interests, putting too large a weight on this dimension when prioritizing projects in IIRSA could lead to selecting projects that yield low regional spillovers. If projects chosen by IIRSA as "regional" projects are more likely to receive financing from multilateral financial institutions (whether for design, planning and evaluation, or actual implementation) than strictly "national" ones, countries could have an incentive to propose as "regional" projects some which are not. This potential problem was identified early on in IIRSA (see Gomez-Ibañez and Strong [2003]), but it is not clear whether the initiative is immune to it or not. In Europe, where funds from a supranational institution are available to support "regional" transport infrastructure projects, this problem has been repeatedly documented.[46] A bias towards projects with national benefits could result even if inclusion in IIRSA does not provide financing in advantageous terms, as governments can extract political capital from executing "regional" projects that would have been carried out for strictly national reasons.

Another point that was identified by IIRSA early on[47] was the need for setting up effective dialogue mechanisms, not only among participating countries, but also with the parties concerned by MTI projects *within* countries. This is important in order to align the incentives of the sub-national entities (governments, local civil groups, NGOs, etc.) who have the capacity to advance (or hinder) the execution of the projects. Although dialogue is an important tool to ascertain the manifold interests of interested actors within countries, the effective alignment of incentives (or misalignment, in the case of failure) will probably be the result of a bargaining process among these parties and the National government. That could require the Government making use of its limited tax and spending capabilities to re-assign payoffs resulting from the MTI project to interested parties within the country. As we mentioned in Section IV, IIRSA has charged "national coordinators" with coordinating the efforts within countries related to the Initiative. At this point in time, however, it is unclear how this process takes place and how successful those efforts have been in South America.

Future MTI coordination efforts could benefit from *ex post* evaluations about the accuracy of the assumptions, projections and models used to assess and evaluate MTI projects. In an environment displaying significant informational problems, improving the accuracy of project assessment and evaluation using *ex post* assessments might contribute to increase the chances that multinational projects constitute an efficient allocation of scarce public resources. Unfortunately, this iterative learning from (successful and unsuccessful) past experiences to update assumptions and models, and possibly to introduce corrective mechanisms, is often missing in multinational projects (for the case of Europe, see Short and Kopp [2005]).

Addressing Binding Financial Constraints in Latin America

As we pointed out in Section II, most countries in Latin America have few degrees of freedom to use tax money to fund infrastructure. To increase this flexibility on the expenditure side, a first alternative is to generate higher public savings,[48] for example via State reform. However, obtaining more fiscal degrees of freedom on the expenditure side to invest in infrastructure remains a serious challenge, given the high opportunity costs of those funds in a region where basic services of sufficient quality are insufficient to meet demand. On the revenue side, the incidence of poverty and inequality narrows the tax base and continuing problems with high tax evasion rates are compounded by widespread earmarking of income in several countries (e.g., Ecuador).

We have already mentioned that it is difficult for political reasons to channel some of the payoffs of a multinational transport project to countries that do not benefit enough, so that they will agree to participate and/or have the financial resources to do so. This constraint might result in a coordination failure that prevents a valuable multinational project from being carried out. In view of the absence of supranational institutions in Latin America capable of solving the issue by transferring welfare from the "winners" to the "losers" of an MTI project,[49] an alternative that has been proposed is to create multinational guarantee funds and special purpose vehicles (Gómez-Ibañez and Strong [2003]), which could have a "solidarity" (i.e., transfer) component.

It is important that project financing adequately considers the implications for debt sustainability of using public debt (explicit or contingent) to finance multinational infrastructure projects (IMF [2004]). An alternative for countries that are large exporters of non-renewable resources such as petroleum (Ecuador, Venezuela), natural gas (Bolivia), or minerals (Chile, Peru) is to use income from royalties and related public revenues to fund

productive transport infrastructure, including multinational infrastructure. By so doing, the government can advance several important objectives: fostering trade and improving regional integration, smoothing inter-temporal consumption; contributing to diversify the economy, because of the positive competitiveness and growth effects of reduced transportation costs generate for all economic sectors, especially value-added tradable goods. One way to ground this proposal would be to establish bi-national or multinational funds that could be used, for example, to provide guarantees for multinational Public-Private Partnerships (PPPs), thereby making multinational projects sufficiently attractive for private finance. Still, such a proposal would need to be researched and analyzed, and this task is well beyond the scope of this paper, as it would be critical to address several implementation challenges, including the governance of such funds, the resources committed, the mechanisms of participation by countries, the scope of projects that can be funded, etc.

One "solution" to overcome binding financing constraints faced by countries that appears repeatedly in IIRSA's meetings[50] relies on relaxing existing ceilings to public expenditure in infrastructure. IMF [2004] presents a series of reasons for and against lifting the investment expenditure cap, concluding that the risks of such a move probably dominate the benefits. Among the reasons against this proposal, the IMF highlights the problem of sub-standard cost-benefit analysis.[51]

In terms of the organization of the IIRSA initiative, it is necessary to address the current lack of connections between project assessment/evaluation/ranking and its financing.[52] This reflects the disconnect that exists within countries regarding investment and financing, with investment assigned to planning and public works Ministries and financing to the Ministry of Finance. Current practice in IIRSA divorces project evaluation, ranking and selection (which take place first) and securing funding for the projects; an important example of this is the procedure followed to identify the 31 priority projects that constitute the "Implementation Agenda Based on Consensus 2005-2010" defined in November 2004.[53] One consequence is that projects that are approved for implementation can be delayed awaiting funding, something that might result in downward *ex post* revisions of project costs and benefits.[54]

As part of the solution, it would be useful to have representatives of Finance Ministries in the technical meetings where projects are chosen, as well as increasing the involvement of Finance Ministers in the decision-making process carried out by the CDE. Given that the costs of the financing options (e.g., internal debt, different multilateral institutions, and guarantees to the private sector) are an essential part of the cost-benefit analysis that needs to be carried out, they should be considered from the beginning in the process. By moving in this direction, IIRSA has the opportunity not only to assist in securing finance for projects and subsequent maintenance, but also to improve coordination within countries in the area of transport policy.

VI. Conclusions

Implementing MTI projects in Latin America constitutes a significant challenge. While both academic and policy discussions often focus on the challenges posed by binding fiscal constraints, in this paper we show that there are also multiple and complex coordination issues that need to be addressed. We identified the key issues necessary for effective MTI coordination, analyzed them using an appropriate economic

framework and put them into perspective in the context of IIRSA, a major ongoing MTI coordination effort in Latin America.

• The first main conclusion from our analysis is that *there is a clear role for the State to coordinate MTI at the international level and domestically*.

Public funding plays a dominant role in the financing of MTI projects, therefore, coordination of MTI effectively involves coordinating the investment efforts of participating governments. Such interaction can result in "coordination failure". This occurs due to "strategic uncertainty," as each Government takes investment (and other) decisions autonomously and cannot be sure ex ante that others will invest as well. Such coordination problems are less likely to arise if all countries receive a large domestic payoff from building their own section of the MTI project, if costs are small relatively to the estimated benefits, or if network effects generated by linking national transport networks are greater, as the overall benefits of investing increase. But, as we pointed out, coordination problems can be worsened by asymmetries in costs and benefits.

Coordination by the State will be required even if the Private Sector participates in the design, evaluation, construction, operation, maintenance and financing of MTI. Indeed, based on prominent European cases, such as the construction and operation of the Channel Tunnel linking Great Britain and France,[55] it has been seen that PPPs normally require governments to be involved with coordinating project design, assessment and evaluation, as well as with coordination of complementary public financial support (such as government guarantees) and policy measures.[56] Additionally, the national Government has a significant role to play in internal coordination, aligning the incentives of the assorted sub-national governments, ministries and other relevant actors.

Project design and evaluation should be one of the central areas for State coordination. Solving coordination issues surrounding design and assessment will require a broad set of actions to raise the quality of available information, to use assessment models that recognize the special features of transport networks (i.e., spillovers, network effect, etc.), to come up with more appropriate methods for selecting MTI projects, based on as much quantitative criteria as possible, and will require as well as promoting more interaction and feedback between design, assessment, and evaluation. As part of this effort, it is important to achieve an adequate balance between model sophistication and informational and processing capabilities. There is no easy solution because of the wide cross-national heterogeneity in terms of capabilities and available resources, but an initial answer may lie in making complementary investments and sharing information and expertise at the regional level, as well as leveraging any available external assistance.

• The second main conclusion is that *coordination efforts will have to address the binding financial constraints that limit investment in MTI projects*, acknowledging the fact that fiscal expenditures have been and are expected to be the main source of financing for MTI at least in the near future.

Securing financing for MTI projects in Latin America is a key hurdle that needs to be overcome. Even if design and evaluation are effectively coordinated, MTI projects might pose serious difficulties for coordination at the implementation stage because neither private participants nor national governments might have the incentives or resources for financing these. The obstacles to securing private financial commitments include the higher perceived and real risks of MTI projects *vs.* national ones, including different jurisdictions, information problems, assessment and regulatory risk, etc. Limited degrees of freedom in

conducting fiscal policy in Latin America also represent a serious limitation to funding MTI projects with public funds. In this context of budgetary restrictions, it is correspondingly more important that an assessment of MTI projects considers the opportunity costs of e.g. education, health or other infrastructure projects.

Continued availability of multilateral debt for building IIRSA projects provides relief to the financing dilemma by injecting external resources and providing financing independently of the economic cycle and the existence of other demands on public funds. However, an important assumption behind this role of multilateral debt is that the problem faced by Governments is one of liquidity rather than one of solvency. If MTI projects are not properly assessed, or if a country's debt is not sustainable, then debt financing of MTI projects might not be welfare increasing. Additionally, new instruments (bi-national and multinational funds, special purpose vehicles) could be useful for making available and stabilizing the stream of public resources allocated to long-term investment in new regional transport networks (and in other types of regional infrastructure), in addition to other possible objectives of such instruments.

• The third main conclusion is that *while IIRSA has contributed to the coordination of regional MTI projects in South America, there are shortcomings that need to be addressed.*

The review of IIRSA in light of our analytic framework suggests this Initiative is making significant coordination contributions. The high-level decisions on project selection that translated into the AIC can be considered as a "focal point" that coordinated selection towards those projects that had the highest rankings according to the methodologies used. Regular IIRSA meetings also convey critical information exchange about the willingness and capacity of Governments to coordinate public expenditure in MTI projects, reducing the risks of delayed or inadequate implementation investments. By structuring information exchange, bargaining, and decision making within the Initiative, it is more likely that coordination on Pareto superior ex-post outcomes will result at the project execution stage.

There are, however, several issues that could pose problems for IIRSA in the future. One is that financing of projects remains a matter of national responsibility, despite the support from multilateral financing institutions. IIRSA is not a supranational authority and it cannot redistribute benefits from the "winners" to the "losers" of an MTI project. Part of the solution could be to include Ministers of Finance in IIRSA's CDE meetings, so that the authorities who authorize expenditure and who negotiate debt issuance with multilateral banks are present during the decision-taking process and participate directly in the prioritizing exercise for regional projects. Introducing such participation early on could facilitate resource allocation later. Additionally, the participation of senior Finance policymakers could help to align future incentives of subnational governments and other national actors implementing MTI projects.

Another issue is that by and large countries have weak national capabilities to produce data and design and evaluate MTI projects. This has also been an enduring issue in the EU's own MTI coordination effort, the Trans-European Networks Transport initiative (TEN-T) and reflects the complexity inherent to MTI. To improve assessment quality, we proposed closer coordination between countries to share information and expertise, leveraged with the external funds available from multilateral financial institutions. Coordination of additional resource commitments in this area is critical to learn whether projects selected so far are the ones with the highest regional returns, and to improve future project selection efforts.

Notes

[1] See IMF [2004] for a list of econometric studies conducted on the subject, their methodologies and results.

[2] ECLAC's yearly publication "Latin America and the Caribbean in the World Economy" examines the international insertion of the Latin American economies. ECLAC [2006] finds a continued increase in Latin American exports to China, which in 2005 reach US$19 billion, of which 15.5% is by Andean Community countries (including Venezuela, which alone accounts for 9.4% of Latin American exports), and are to a large extent responsible for the growing surplus in the trade balance.

[3] However, we will not address the related issues of regulation, standard-setting, and other institutional dimensions of networks that can significantly affect the private and social value of investments in them.

[4] This has allegedly occurred in Europe's TEN-T initiative: "A key issue with any cross-border investment is how to evaluate the resulting benefits to the adjacent country or the wider EU. *In many cases these benefits are not evaluated at all*. This can result in an investment appearing to have a poor cost-benefit ratio, or even being dismissed altogether, solely because the full benefits are not being taken into account" (PwC [2004] p. 11).

[5] Rogoff [1990] presents an interesting model that provides a credible explanation of why cash-constrained governments resort to curtailing capital expenditure in favor of current expenditure as a result of the political cycle.

[6] For example, see the multiple references in IIRSA's meetings (see the webpage *http//:www.iirsa.org*) between government officials and multilateral organization representatives about the limitations in the capacity of the public sector in many South American countries to adequately design and evaluate transport infrastructure projects, due to human resources, financial and institutional limitations.

[7] "Now, while using PPP modalities constitutes an interesting and advantageous alternative for the execution of large transnational investment projects, it is no less true that given that those projects are of that (transnational) type, the difficulties and obstacles for their implementation increase, especially when "fully private financing" formulas are attempted (…) and when they are large-scale investments " (CAF [2004]p. 283). Authors' translation.

[8] For example, if PPPs become more important in high-risk regions like Latin America, it is very likely that public guarantees (contingent public liabilities) will continue to be required, while debt might become less important.

[9] An important assumption made here will be that a government can act as a single rational entity with a precise and well-defined objective: the maximization of its expected payoff, abstracting from the complexities of within-government strategic interaction between coalitions with different objectives. We assume that such bargaining leads to the "preferences and constraints" that determine the payoffs of the national governments in our models. Another, assumption is that we will ignore bargaining between countries about possible modifiable project specifications such as its exact geographical location.

In this section, we will refer to the players as national governments coordinating their investment, ignoring for simplicity the possibility that it might be private firms acting as agents of the former.

[10] Transport infrastructure projects can also translate into negative spillovers for neighboring countries. See Cárcamo-Diaz and Goddard [2007], footnote 24.

[11] The number of connections between nodes in a network is given by $\frac{n(n-1)}{2}$. To illustrate the value of a new connection between two previously separated networks, imagine that the network of a country connects 10 cities and the network of another one, a further 5. The total number of connections existing is 45 in the first country plus 10 in the second one, a total of 55. If both countries are connected, however, the network's size is 105. However, transport networks, are congestible. Therefore, in transport networks not only the number of nodes that can be reached are important, but also the number of segments connecting those nodes and the capacity and utilisation of those segments. Additionally, the strength of demand-side network effects is positively related to institutional variables such as the ease in obtaining cross-border permits for road transport shipment or existing open skies agreements for air transport. Bad regulation can result in connected segments of a whole not being a true network.

[12] If only the first condition is not met, both countries would build their section of the road simply for the national benefits of doing so (playing *Invest* is then a dominant strategy), ignoring spillovers. In such cases, countries would be interested in "international coordination" only as a way of removing financing constraints for the construction of roads that would be welfare-improving even in the absence of spillovers and network effects. If only the second condition is not met, playing *Don't Invest* is the dominant strategy for both players. Both conditions need to hold for the game in Figure 1 to be a coordination game with two pure-strategy Nash Equilibria that can be Pareto-ranked.

[13] Game theory literature normally proposes that play will lead to a Nash Equilibrium, as otherwise at least one of the players would have an incentive to deviate. The question of how equilibrium arises leads to concepts of evolution or learning (e.g., Camerer [2003]).

[14] In the two-player coordination games with two strong Nash Equilibria, risk dominance is found by calculating the Nash Product of each equilibrium. This is "…the product of the opportunity costs of unilaterally deviating from that equilibrium for each player. (…) The pure-strategy Nash equilibrium with the greater Nash product is risk dominant" Straub ([1995] p. 341). For the Pareto-inferior Nash Equilibrium (*Don't Invest, Don't Invest*) in the Stag Hunt game in Figure 1 to be risk dominant, the condition $(C - W)^2 > (P + W - C)^2$ has to hold.

[15] This game poses a challenge for coordination only if the parameter values are such that the Pareto-Inferior Nash Equilibrium (*Don't Invest, Don't Invest*) is risk-dominant. For that to happen, given any $\kappa \geq 0$, the condition $(P + \kappa + W - C)$ x $(P + W - C) > (C - W)^2$ must be satisfied.

[16] Now, there is a coordination issue only if two conditions for the parameters are satisfied. First, given $\varepsilon \geq 0$, for the game in Figure 3 to be a Stag Hunt game it is necessary that the network effects P and the purely domestic gains from the MTI project W are larger

than the cost C plus the additional cost ε (i.e. $P + W > C + \varepsilon$). Second, the Pareto-inferior Nash Equilibrium (*Don't Invest, Don't Invest*) has to be risk-dominant, so the condition $(P + W - C) \times (P + W - C - \varepsilon) < (C - W) \times (C + \varepsilon - W)$ must be satisfied.

17 Another interesting alternative is to model interaction in an MTI Project where the countries can choose to "delay" investment. Such a model would endogenously explain the severe delays experienced by MTI projects in Latin America and elsewhere.

18 In this example, the necessary condition for dominance is $P > \frac{C}{2}$.

19 For simplicity, we assume that the purely domestic benefit of investing is zero for both countries (i.e. $W = 0$), and we assume that while externalities X accrue partially as investments take place (i.e., if half the road is built, half of X accrues to the other country), the network effect P only accrues when the MTI project is finished.

20 In Cárcamo-Díaz and Goddard [2007] we present the minimum values that the exogenous α and β need to have for coordination to occur on the (*Invest, Invest, Invest*) outcome. (*Invest, Invest, Invest*) and (*Don't Invest, Don't Invest, Invest*) are the sub-game perfect Nash equilibria of this game, depending on the values of the probabilities of interruption α and β, with the former being the equilibrium for low values of α and β and the latter being the equilibrium for high values. For X non negative, increases in network effects P and externalities X allow the project to be executed with larger probabilities of interruption α and β, while increases in the project's cost C to each country reduces the maximum probabilities of interruption α and β that can be tolerated without the project collapsing.

21 Determining future revenue P and X requires assessing elements such as: the increases in traffic resulting from implementing the project, its type, whether there is seasonality, the willingness and capacity of that traffic to pay tolls and taxes, the increases in economic activity in both countries resulting from the new transport infrastructure (and which sub-national regions benefit, something particularly important in federal or decentralised administrations), etc. Also, there is usually uncertainty about the spatial extent of spillovers such as environmental impacts, population flows, changes in transit patterns for goods, and so on.

22 Sichelschmidt ([1999] p. 178) writes: "Hence, governments of Member States may have submitted projects for the TEN programme not primarily because of their importance in a really Union-wide context but simply because they wished to attract from the common treasury as many financial resources as possible".

23 The classic reference is Kreps and Wilson [1982].

24 See *http://www.iirsa.org*. In this section, we draw heavily from the information available in that website about the initiative. Quotes have been translated by the authors from the original Spanish in IIRSA's website.

25 See the document Annex 10 of IIRSA's 7th Meeting of the CDE, held in Asuncion, Paraguay on December 1-2 2005, about the Institutionalization of National Coordination in IIRSA at *http://www.iirsa.org*.

26 See *http://www.iirsa.org* for a full list. The transport projects of the AIC are shown in Table 1.

27 Obtained mainly from their website: *http://www.iirsa.org.*

28 "The grouping of investment projects is based on the possibility of exploiting the positive externalities of a set of investments that can generate larger benefits than the summation of the effects of the individual projects composing the set. We call this additional benefit synergy" Authors' translation of the document *Análisis de la Cartera de Proyectos*. See *http://www.iirsa.org*.

29 However, international experience shows that measuring spillovers is a difficult task. According to Van Exel *et al.* [2002], most of the initial priority projects in Europe were assessed using national evaluation procedures that took little or no account of cross-border effects.

30 See the minutes of IIRSA's 6th meeting of the CDE, held in Lima, Peru on November 23-24, 2004.

31 The software used was called Expert Choice.

32 There was a discrepancy between the cost estimates of AIC projects available in IIRSA's "*Información Específica*" document last updated on June 2005 (see *http://www.iirsa.org/BancoMedios/Documentos%20PDF/fs_informacion_especifica.pdf*) and the June 2006 update of the AIC status (*http://www.iirsa.org/BancoConocimiento/A/agenda_de_implementacion_consensuada_2005-2010/agenda_de_implementacion_consensuada_2005-2010.asp?CodIdioma=ESP*). Given the large average size of the changes in cost estimates between both periods, it is reasonable to attribute at least part of the observed changes to cost underestimation at the design stage.

33 Its official name in Spanish is "*Fondo de Promoción de Proyectos de Infraestructura Sostenible*". See the news for April 20, 2006, available at *http://www.caf.com*.

34 Its official name in Spanish is "*Fondo para el financiamiento de operaciones de cooperación técnica para Iniciativas para la Integración de Infraestructura*", see IIRSA webpage: *http://www.iirsa.org*.

35 The role of multilateral banks is complex. If projects analyzed as part of the IIRSA initiative were to have a higher probability of obtaining multilateral financing, because of IIRSA's project analysis that includes spillovers and network effects, that could improve welfare. But the condition would be that other equally welfare-enhancing projects (in infrastructure or other areas) were not crowded out by being artificially "lowered in ranking", as the capacity of indebtedness of Latin American countries is limited. As projects in other areas might also be measured with significant noise, ex ante it is difficult to conclude on the welfare implications of this.

36 Its official name in Spanish is "*Sistema de Información para Gestión Estratégica*". See more details about the SIGE at *http://www.iirsa.org/BancoConocimiento/N/noticia_sige/noticia_sige.asp?CodIdioma=ESP.*

37 The role of the National Coordinators is claimed to be one of "articulating the work of the different actors within and outside governments in a country". See Annex 10 document of IIRSA's 7th meeting of the CDE, held in Asuncion, Paraguay on December 1-2, 2005. Unfortunately, it is not clear what this has implied in practice in different countries.

[38] The classic reference to focalness is Schelling [1960].

[39] See IIRSA's website at *http://www.iirsa.org/SecPFrontera.asp?CodIdioma=ESP* for more on this.

[40] For example, see the presentations "*Una Nueva Etapa de Planificación and Avances y Limitaciones del proceso de Planificación*" during IIRSA's seminar *Taller sobre experiencias de planificación*, Asuncion (Paraguay), November 8, 2005.

[41] See the minutes of the 7th Meeting of the CDE, held in Asuncion, Paraguay on December 1-2, 2005.

[42] Short and Kopp ([2005] p. 366) also claim that there is evidence in Europe indicating capture of the planning process by interest groups, which contributes to cost underestimation (or benefit overestimation).

[43] "Road transport dominates the Brazilian transport system, but only 25 percent of the paved federal road network is in good condition, and the last rehabilitation expenditures for more than 80 percent of the network occurred 10 or more years ago", p. 5; in Colombia "The World Bank has noted in particular the deterioration in recent years of the paved road network, due to shortfalls in maintenance", p. 15; and in Peru "…about a third of the national road network is said to be in poor condition (with only one-quarter being in good state of repair)", p. 43.

[44] See the presentation *Una Nueva Etapa de Planificación*, during IIRSA's seminar *Taller sobre experiencias de planificación*, Asuncion (Paraguay), November 8, 2005.

[45] "In spite of the numerical elements, the evaluation process continues to be qualitative [in nature] and based on the convergence of experts' opinions", p. 6. CCT Report to the CDE, Annex 1, document presented in the 5th Meeting of the CDE, held in Santiago de Chile, December 4-5, 2003.

[46] The Karel van Miert Group that proposed the reforms to TEN-T guidelines and new projects in 2003 remarked that "the coherence of the trans-European network suffers from the actions of the past. The transport infrastructure networks in the various member states were developed above all according to a national logic, giving priority to the development of radial routes serving major cities, thus affecting overall balance" (EC [2003] p. 21).

[47] See, for example the Minutes of the CDE Fourth Meeting, held in Caracas on July 2, 2003.

[48] IMF officials have publicly proposed that financing for higher public expenditure in infrastructure should come mainly from higher public savings. See the presentation *Inversión Pública y Política Fiscal*, during the IIRSA meeting of October 25-26, 2004 in Lima, Peru, available online at *http://www.iirsa.org*, as well as IMF [2004; 2005a; 2005b]. In particular, the IMF has proposed that structural (or cyclically-adjusted) fiscal targets could protect public expenditure in infrastructure from endogenous and exogenous shocks to fiscal revenues (see IMF [2004]).

[49] As the EC funds TEN-T from country contributions to the EC budget rather than from resources extracted from TEN-T "winners", this indicates that the type of transfer (i.e. within-MTI-project transfer) that we are discussing here is not available in Europe either.

[50] For example, see the minutes of the CDE Fifth Meeting, items 4.5.b) and 5.9, held in Santiago de Chile, on December 4-5, 2003.

[51] "...in reality public investment projects are not necessarily of high quality. In the absence of appropriate screening and monitoring mechanisms, governments may incur large borrowing costs to finance investments with low rates of financial or even social return, in some cases undermining the prospects for debt sustainability. Conversely, other uses of public funds -namely to restructure revenue and expenditure- may have a higher rate of return than public investment" (IMF [2004] p. 15).

[52] Interviews with senior country officials and multilateral bank staff indicates that funding and monitoring of country sections in terms of financing are bilateral affairs between multilateral banks and national Ministries of Finance. However, Tanzi ([2005] p. 10) comments about the monitoring role of the latter: "Decisions on public projects are often made by spending ministries that have less concern about the efficiency and the financial implications of these projects. Perhaps, the move away from tax financed to debt financed projects, may have reduced the power of the Finance Ministry. The reason is that the spending ministries often negotiate directly with the lenders and the Finance Ministry has limited political power to prevent spending that is externally financed".

[53] There is evidence of the divorce between the portfolio of projects (including the "Implementation Agenda based on Consensus 2005-2010" and their financing in IIRSA documents. For example, the minutes of the 7th Meeting of the CDE, held in Asuncion, Paraguay on December 1-2, 2005, when discussing IIRSA's Action Plan for 2006, note the "*Incorporación del tema IIRSA al diálogo bilateral de las instituciones financieras del CCT y otras instituciones financieras pertinentes con los países y relevamiento de los requerimientos de financiamiento de los proyectos de la AIC - la Cartera IIRSA*", point 7.1, p. 4.

[54] This was one of the problems identified during the consultation projects carried by IIRSA with civil society. See the document Annex 6 of the Regional Seminar on the Strategic Vision of South American Physical Integration, held in Asuncion, Paraguay on November 30, 2005.

[55] A case in which *ex ante* traffic estimates were overestimated early on, leading to serious problems during implementation (National Audit Office [2005]). The report estimates that taxpayers will need to foot cash flow shortfalls of £260 million (at 1997 prices) in the most likely scenario, in addition to the sizeable government grants already committed.

[56] For participating countries to harvest the full results from MTI, there is need for expediting border crossings and removing artificial barriers to trade introduced by inefficient custom procedures in Latin America. See "*Síntesis y Conclusiones del Programa de Proyectos Piloto: Pasos de Frontera*", presented in IIRSA's 8th Meeting of National Coordinators, held in Buenos Aires, June 29, 2006.

Table 1

	Transport Projects	Hub	Countries	Cost Estimate June 2005 in US$ millions	Cost Estimate June 2006 in US$ millions	% Difference 2006/2005	Status in June 2006
Cost Estimates of AIC Transport Projects in 2005 and 2006							
Projects with higher cost estimates in 2006							
1	Recovery of the Navigability of the Meta River	Andean	CO-VE	12	108	*800.0%*	In tendering-concession
2	Francisco de Orellana Port	Amazon	EC	20	105.3	*426.5%*	In preparation
3	Duplication of Palhoça-Osorio Tranche (MERCOSUR Rodovia)	MERCOSUR-Chile	BR (AR-UY)	283	800	*182.7%*	In execution
4	Pasto-Mocoa Motorway	Amazon	CO	71	183	*157.7%*	In preparation
5	Lima-Tingo María-Pucallpa Highway, Ports and Logistic Centers	Amazon	PE (BR)	296	589	*99.0%*	In tendering-concession
6	Adjustment of Branco River-Montevideo-Colonia-Nueva Palmira Corridor	MERCOSUR-Chile	UY (AR-BR)	90	176.8	*96.4%*	In execution
7	Construction of Pailón-San José-Puerto Suárez Motorway	Central Interoceanic	BO (BR-CH-PE)	245	435.3	*77.7%*	In execution
8	International Route 60 CH (Valparaiso-Los Andes sector)	MERCOSUR-Chile	CH (AR)	165	286	*73.3%*	In execution
9	Boa Vista-Bonfim-Lethem-Georgetown Motorway (1st stage: studies)	Guiana Shield	GY-BR	2	3.3	*65.0%*	In preparation
10	Paving of Iñapari-Maldonado Port-Inambari, Inambari-Juliaca/Inambari-Cusco	Peru-Brasil-Bolivia	PE (BR)	700	1,055	*50.7%*	In execution
11	Desaguadero's Frontier Center (CEBAF)	Andean	BO-PE	5	7.5	*50.0%*	In preparation
12	Duplication of Route 14	MERCOSUR-Chile	AR (BR)	270	370	*37.0%*	In preparation
13	Paita-Tarapoto-Yurimaguas Motorway, Ports and Logistic Centers	Amazon	PE (BR)	248	338	*36.3%*	In execution
14	Infante Rivarola-Cañada Oruro Border Crossing	Central Interoceanic	BO-PY	1	1.2	*20.0%*	In preparation
15	Bridge over the Acre River	Peru-Brasil-Bolivia	BR-PE	10	12	*20.0%*	In execution
16	Improvements in the Nieuw Nickerie Via-Paramaribo-Albina and International Crossing over the Marowijne River	Guyana Shield	SU-GY	90	105	*16.7%*	In preparation

Table 1 (continued)

	Cost Estimates of AIC Transport Projects in 2005 and 2006						
	Transport Projects	Hub	Countries	Cost Estimate June 2005 in US$ millions	Cost Estimate June 2006 in US$ millions	% Difference 2006/2005	Status in June 2006
Projects with higher cost estimates in 2006							
17	Los Andes-Mendoza Railroad Project	MERCOSUR-Chile	AR-CH	224	251	*12.1%*	In tendering-concession
18	Toledo-Pisiga Motorway	Central Interoceanic	BO (CH)	75	76	*1.3%*	In execution
Projects without cost estimate changes between 2005 and 2006							
19	Construction of Jaguarão-Branco River International Bridge	MERCOSUR-Chile	BR-UY	12	12	*0.0%*	In preparation
20	Construction of Salvador Mazza-Yacuiba International Bridge	Capricorn	AR-BO	10	10	*0.0%*	In preparation
21	President Franco-Porto Meira new bridge and Frontier Center (CEBAF)	Capricorn	PY-BR	55	55	*0.0%*	In preparation
22	São Paulo Railroad Ring (North and South)	Central Interoceanic	BR	300	300	*0.0%*	In preparation
23	Construction of the Cañada Oruro-Villamontes-Tarija-Abaroa Station Motorway (1st stage)	Central Interoceanic	BO (PY)	60	60	*0.0%*	In tendering-concession
24	Rehabilitation of El Sillar Tranche	Central Interoceanic	BO (BR-CH-PE)	30	30	*0.0%*	In preparation
25	Cúcuta-San Antonio del Táchira Border Crossing	Andean	CO-VE	2	2	*0.0%*	In preparation
Projects with lower cost estimates in 2006							
26	Rehabilitation of Iquique-Colchane Motorway	Central Interoceanic	CH (BO)	20	19.2	*-4.0%*	In execution
27	Bridge over the Takutu River	Guyana Shield	GY-BR	18	10	*-44.4%*	In execution
28	Venezuela (Guyana City)-Guyana (Georgetown)-Suriname (Paramaribo) Motorway (1st stage)	Guyana Shield	VE-GY-SU	2	0.8	*-60.0%*	In preparation
Total				*3,316.0*	*5,401.0*	*62.9%*	
Average				*118.4*	*192.9*	*75.5%*	

Source: Authors' elaboration using data from IIRSA's website at http.//www.iirsa.org.

Figure 1

THE STAG HUNT GAME

		Country B	
		Don't Invest	Invest
Country A	Don't Invest	0 , 0	X, W – C
	Invest	W – C, X	P+W+X–C, P+W+X–C

Source: Authors' elaboration.

Figure 2

COORDINATION GAME WITH ASYMMETRIC NETWORK EFFECTS

		Country B	
		Don't Invest	Invest
Country A	Don't Invest	0 , 0	X, W – C
	Invest	W – C, X	$(P+\kappa)+X+W-C$, $P+X+W-C$

Source: Authors' elaboration.

Figure 3

COORDINATION GAME WITH ASYMMETRIC COSTS

		Country B	
		Don't Invest	Invest
Country A	Don't Invest	0 , 0	X, W – $(C+\varepsilon)$
	Invest	W – C, X	$P+X+W-C$, $P+X+W-(C+\varepsilon)$

Source: Authors' elaboration.

Figure 4

GAME WITH BOTH ASYMMETRIC NETWORK EFFECTS AND COSTS

Country B

Country A		Don't Invest	Invest
	Don't Invest	0 , 0	X, W – (C + ε)
	Invest	W – C, X	(P+ κ)+X+W–C, P+X+W–(C+ ε)

Only one Nash Equilibrium

Country B

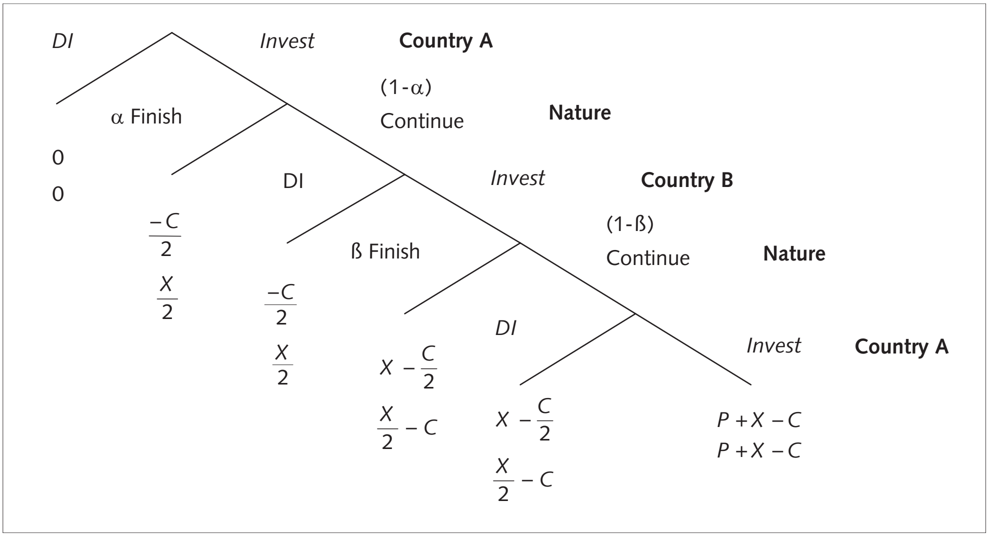
Country A		Don't Invest	Invest
	Don't Invest	0 , 0	2 , -4
	Invest	-3 , 2	5 , 1

Only one Nash Equilibrium

Source: Authors' elaboration.

Figure 5

INTERACTIVE DECISIONS WITH A POSSIBILITY OF BREAK-UP



Source: Authors' elaboration.

Appendix

IIRSA's Analysis Factors

The impact of the group of projects on sustainable development is measured along the following three dimensions:

(1) An economic dimension that considers the group's capacity to: increase the trade flow of goods and services, generate investment opportunities in the relevant geographic area, increase competitiveness in the relevant geographic area by lowering costs (e.g., transport).

(2) A social dimension that considers the group's capacity to: generate income and employment in the area of influence, improve the quality of life of the population (e.g. access to health services, education, mobility, etc.), considering different income segments.

(3) An environmental dimension that considers group's capacity to: improve on the usage of natural resources, maintain or improve the environmental quality in the relevant geographic area.

The likelihood that each group of projects can be implemented is analyzed along the following three dimensions:

(i) Risks faced by the group of projects, including: whether there is an adequate regulatory and institutional framework in the sectors and countries where the projects are located; whether the present and future level of demand, justifies the group of projects, identifying risks about the projections of future demand; how high is the environmental risk associated with the group (e.g., whether environmental impacts can be mitigated, etc); and, how much risk exists owing to the equipment and technology that will be used, the construction process, and other risk factors associated with project execution and operation.

(ii) The financing constraints, including: what is the capacity of the group of projects to attract private investment in infrastructure, given the expected returns; the investment capacity of the public sector, given fiscal conditions and constraints; and, the likelihood of attracting the private sector to Public-Private Partnerships in infrastructure, given the existing regulatory framework.

(iii) The political dimension, including: the degree of political accord and commitment of the countries in terms of the implementation of transnational projects,* the degree of alignment of the group of projects with public policy and existing national investment priorities; and, the possibility of overcoming potential opposition to the projects due to political, social or environmental reasons.

* When there are projects that are part of an accord between countries, political commitment can be considered higher.

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Contents

Trade Costs and the Economic Fundamentals of the Initiative for the Integration of Regional Infrastructure in South America (IIRSA)

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Summary

In October 2000, the twelve countries of South America launched, a multinational, multisectoral and multidisciplinary initiative, whose main objective is to develop the region's infrastructure within a context of environmental sustainability. Supported by the Inter-American Development Bank (IDB), the Corporación Andina de Fomento (CAF), and the Financial Fund for the Development of the River Plate Basin (FONPLATA), the Initiative is based on a hub strategy and its action plan calls for (1) strengthening national investment planning and coordination among countries, (2) standardizing and harmonizing regulatory and institutional aspects and (3) developing a portfolio of projects that encourage private sector participation and innovative financing schemes. This paper revisits IIRSA's economic fundamentals, looking at: the motivation behind regional integration; the importance of transport versus policy related trade costs; and the likely impact of the initiative on regional disparities and growth.

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I. Introduction

In October 2000, the twelve countries of South America launched an unprecedented multinational, multisectoral and multidisciplinary initiative, whose main objective is to develop the region's infrastructure within a context of environmental sustainability. Supported by the Inter-American Development Bank (IDB), the *Corporación Andina de Fomento* (CAF), and the Financial Fund for the Development of the River Plate Basin (FONPLATA),

the Initiative for the Integration of Regional Infrastructure in South America (IIRSA) is based on a hub strategy and its action plan calls for (1) strengthening national investment planning and coordination among countries, (2) standardizing and harmonizing regulatory and institutional aspects and (3) developing a portfolio of projects that encourage private sector participation and innovative financing schemes. Four years after its launching, IIRSA is getting to a critical stage. The twelve countries involved agreed on focusing on 348 consensual projects, which amount to US$38 billion. Among those projects, 31 will be implemented until 2010, amounting to US$6.4 billion.

The challenges of this major investment drive can hardly be underestimated and severely tests the countries' ability to coordinate their efforts, to reconcile their national and regional agendas and, above all, to raise and allocate resources within a scenario of high debt, low savings and tight fiscal constraints. Multilateral institutions involved, particularly the IDB, will be also under pressure to devise new and more flexible financial instruments that can be instrumental in overcoming fiscal and operational hurdles. All these challenges suggest that the time is ripe for revisiting the economic fundamentals of IIRSA. What is the rationale behind the initiative? What are the likely impacts on trade and growth? What are the risks? If anything, IIRSA's success will hinge on the governments and multilateral institutions' ability to offer sound and coherent answers to these questions. This document aims to be instrumental in this effort.

This document is divided into five sections, including this introduction. It begins with a look at the case for regional integration, particularly, for South-South Integration, which is IIRSA's *raison d'être*. It then moves on to discuss the relative importance of infrastructure and policy-related trade costs. Section IV covers the impacts of infrastructure on regional disparities and the links between infrastructure and growth. The final section sums up the main arguments and discusses the rationale behind government intervention in infrastructure.

II. The Rationale for South-South Integration and the Role of IIRSA

The case for IIRSA goes beyond the need for infrastructure and is part of a broader case for South-South integration as a tool to promote higher productivity, equity and growth. As it is well known, Latin America and the Caribbean (LAC), in a quest to resume sustainable growth, have embarked on a comprehensive process of trade liberalization since the 1990s, which involved unilateral, multilateral and regional initiatives (IDB [2002]). The rationale behind the regional initiatives is to (1) move faster than it would be possible in complex multilateral negotiations, (2) avoid the asymmetries of market access involved in unilateral liberalizations and (3) gather size and experience to maximize the benefits and minimize the costs of worldwide integration.

Even though both the North-South and South-South agreements that have been proliferating in the region serve these objectives, the latter, given the implicit lower asymmetries of size and technology, involve lower risks of major import dislocations for the smaller, less developed partners. One can then argue that, apart from geopolitical considerations and the standard gains from trade, the main motivation behind South-South agreements is to achieve greater integration while overcoming some of the disadvantages of small size and technology.

In a world economy where economies of scale are rife, by getting together, these countries could offer their firms an enlarged domestic market, helping them to compete against their considerable larger and more knowledgeable counterparts in the developed

world. A larger domestic market would help not only by increasing local firms' production runs, which would reduce average costs and expedite learning, but also by creating the conditions for the development of a broader network of suppliers. The point here is that the division of labor depends on the size of the market. Given that most intermediate good industries have economies of scale, their development depend on production runs achieving a minimum scale, which in turn, depend on the size of the market. Therefore, large markets are bound to have more local suppliers whose interaction and proximity with final good producers tends to generate higher productivity and lower costs.

This motivation, though, cannot be translated into something meaningful if the flow of goods and services are hampered by high trade costs driven either by lingering tariff and non-tariff barriers or by a precarious infrastructure. The more so because South-South agreements in the region, even as ambitious as the one envisaged by the Union of South American Nations (UNASUR), tend to form markets that are still small *vis-à-vis* countries and trade blocs in the North or even in developing Asia. For instance, the Gross Domestic Product (GDP) of the UNASUR, which would integrate the whole South America, is just 9% of that of the US and roughly 70% of China's GDP (WDI data [2003]). The corollary of this limitation is that agreements of this type cannot afford to live with imperfect free trade zones or a precarious infrastructure. High trade costs can render the scale gains irrelevant.

Evidence available suggests that, despite considerable progress made in the last decade, intraregional trade in South America is still relativity low. It rose from 8% in 1990 to 14% in 1998, only to fall to 12% in 2004, after a number of crises in Brazil, Argentina and Venezuela. To put these figures into perspective (Figure 1), in 2004, intraregional trade in the EU-15 was 42% and in East Asia, 18%, despite the low number of formal trade agreements in the latter region. These figures suggest that South-South agreements in South America are still far from realizing all the potential scale gains from deeper integration and this seems to be rooted in two main gaps. The first one is institutional. Sub-regional blocs such as the Southern Common Market (MERCOSUR) and the Andean Community (CAN) are still imperfect free trade zones (see INTAL Sub-Regional Integration Reports) and imperfect custom unions and only recently (October 2004) a limited trade agreement between the two sub-regions came into force. The second gap is in infrastructure. The region suffers from a substantial deficit of infrastructure, which, in conjunction with other trade costs imposed by tariff and non-tariff barriers, conspires to limit trade flows.

It is exactly in this second gap that initiatives such as IIRSA can play a major role. For both historical and geographical reasons, infrastructure has always been a major impediment to intraregional trade in South America. During the colonial days, natural resource exploitation and legal impediments restricted trade mainly to Europe and this was reflected in the infrastructure then built, which served mainly extraregional trade. The fact that the colonies were separated by the Andes and by the Amazon forest was not helpful either. This picture suffered little change in the first century after independence since most economies in the region remained specialized in natural resources, with little to trade among them. Industrialization by import substitution in the second half of the last century changed the economic structure and therefore, the opportunities to trade, yet the protectionism implicit in the inward looking strategy, despite the rhetoric of regional integration, left little chance for closer trade ties and, therefore, little incentive to invest in intraregional infrastructure.

The crisis of the import substitution strategy in the early 1980s and the ensuing trade liberalization opened new opportunities for regional integration and the boom in intraregional trade that followed exposed very clearly the bottlenecks in infrastructure. Yet,

the fiscal consequences of the crisis, which are still felt these days, imposed tight budget constraints for most regional governments, and left little room for public investment in infrastructure. These fiscal constraints alongside efficiency considerations led the region to privatize utilities, ports and roads in a bid to attract private investment. Privatization did improve efficiency in most countries (see for example, Chong [2004] and World Bank [2004]) and boosted private investment particularly in telecommunications, but, as shown in Figure 2, this was not enough to compensate the drastic and overall fall in public investment.[1] The limited flow of private investment is likely to be rooted in many circumstantial causes such as the region's macroeconomic volatility, regulatory missteps and a deteriorating global market for private financing of infrastructure assets. Yet, given the importance of externalities in infrastructure projects (Prud'homme [2004]), particularly in those that involve several countries, it is hardly surprising that the private sector did not make up for the public investment retrenchment.

Whatever the causes, the fact is that the underinvestment of the last two decades has aggravated the region's infrastructure deficit, further undermining both the quality and availability of the infrastructure services. As show in Calderón and Servén [2003], whereas in 1980 most countries in the region had infrastructure stocks (telephones, roads and electricity) above the "international norm", that is, above what would be predicted by their *per capita* income, the situation was mainly reversed in 2000 (with the exception of telecommunications), with the majority of countries having stocks below the "norm". Transport, a key element of trade costs, is exactly where the situation is more difficult. For instance, in road transport, which accounts for the bulk of intraregional trade for most South American countries (Figure 3), the region lags well behind East Asia and the industrial countries (Figure 4). In maritime freight, things do not look good either. Table 1 shows that transit times through Brazil's ports (that is, the total time needed for cargo to pass through the port, from ship call to port exit gate) are well above those in developing Asia.

This worrying picture is also captured by the quality indicators of the Global Competitiveness Report 2003/2004 (Figure 5), where, rail and ports, which generally represent the two most cost efficient modes of transportation, performing badly in all countries of the region (roads are not part of the survey).

The quality and efficiency problems are compounded by South America's choice of transport modes. As Batista da Silva ([1996] p. 19) put it "in emphasizing roads over rail, river and costal logistics systems, these countries have selected the most expensive as well as the least environmental friendly option for their infrastructure system". In Brazil, for instance, where roads respond for more than 90% of transport costs, avoidable logistic costs by means of a more cost-effective use of multimodal transport, "were adding more than US$1.2 billion per year to the costs of external trade and at least US$1.3 billion per year to the costs of domestic interregional trade in corridors with available rail services" (World Bank [2004] p.18).

In Argentina, the excessive costs of a road-based transport system can be gauged by estimates, which, in 1999, put road, rail and fluvial freight at respectively at US$13, US$10.5 and US$5 per ton (Thomson *et al.* [2003]). Estimates for truck and maritime freights between Brazil's northeast and Uruguay and Argentina (Figure 6) also suggest that by fostering multimodal transport, IIRSA can help the region not only to fill the infrastructure gap, but also make sure that this gap is filled in a more cost-effective faction.

The importance of overcoming South America's infrastructure deficit and eliminating its bias towards extraregional trade and road transportation goes beyond

maximizing the benefits of integration. It can also play an important role in minimizing the risks that are common to South-South integration. In a group of countries with similar technology and resource endowments, integration can lead to the agglomeration of economic activities and, therefore, to an uneven distribution of benefits. Even though agglomeration can boost efficiency and raise income levels for the region as a whole, a sharp increase in regional disparities can lead to a political backlash, which, in turn, can halt or even reverse the process of integration. These politically undesirable effects can be mitigated by the use of fiscal and financial incentives, but above all by making sure that all countries in the region have good access to infrastructure. Section IV discusses this issue in more detail.

III. Infrastructure and Policy-related Trade Costs

South America's move towards multilateral, unilateral and preferential trade liberalization has gone a long way towards bringing down policy-related trade costs such as tariff and non-tariff measures (IDB [2002]). Even though this process has fallen well short of creating a fully-fledged free trade zone in the region, the precarious conditions of the infrastructure suggest that the progress towards reducing transport costs has been far more modest. In fact, one can argue that countries may have more to gain from supporting an initiative such as IIRSA, than from perfecting their preferential trade agreements. That is, governments may be well advised to move away from an integration strategy that has so far been almost exclusively based on formal trade agreements, to a strategy that reflects more accurately the importance of the obstacles that lie, literally, on the ground. But how important are transport costs? To what extent they reflect deficiencies in the infrastructure as opposed to distance? How they measure up against tariff and non-tariff costs?

These are all very important empirical questions and to answer them rigorously would involve time and data requirements that are well beyond the scope of this document. It is possible, though, with the help of the literature and readily available data, to have a rough estimate of the orders of magnitude involved. Hummels [1999], for instance, estimates freight costs for all trade partners of Chile and MERCOSUR countries, using 1994 import data from the Latin American Integration Association (ALADI). As the author warns, it is somewhat tricky to compare freight rates across countries because of difference in valuation, and it is certainly even more complicated to use them to draw conclusions about the quality of the infrastructure because of differences in geography and direction, scale and patterns of trade. Yet, the results are useful to pinpoint an order of magnitude for transport costs and, as can be seen (Figure 7), it ranges from 4.6% in Uruguay to 13.3% in landlocked Paraguay, with Brazil and Argentina occupying the middle ground.

Amjadi and Winters [1997], using the same ALADI database, but including insurance in their calculations, look at transport among MERCOSUR countries plus Chile and between these countries and the rest of the world (Table 2). The advantages of proximity are evident in the lower transports costs of intraregional *versus* extra-regional trade, and, as in Hummel's paper, Paraguay appears with the highest transport costs in the subregion, be that in the intra or extraregional trade.

Thomson *et al.* [2003] using import data from an Economic Commission for Latin America and the Caribbean (ECLAC) database have also tried to measure transport costs in South America, but covering a more recent year -2001-. Their results (Figure 8) are in the same ballpark as Hummels', but they generally suggest somewhat lower freight

expenses, particularly because, unlike Hummels', they include insurance costs. It is also worth noting that in all studies Paraguay came out as the country with the highest freight costs and seems to be paying a higher price for being landlocked than Bolivia. For the other countries, the ranking changes significantly, but Uruguay remains among the countries with the lowest freight costs.

Other studies such as Micco and Pérez [2001] and Clark *et al.* [2004] use trade mirror data to calculate freight costs, an approach that, as the authors themselves acknowledge, is plagued by differences in concept and measurement.[2] The results, though, are not that much different from Hummels' and Thomson (*op. cit*). In their calculations freight cost represented 5.25% of world imports, whereas for Latin America and Latin America excluding Mexico (whose results are affected by the proximity with the US) the same figure would stand at 7 and 8.3%, respectively (compared to 8% for Asia and 11.5% for Africa).

These figures, with perhaps the exception of Paraguay, may seem low, yet there are a number of issues that suggest that they are underestimating the magnitude and impact of transport costs. First, as Hummels (*op. cit,* p. 5) put it "aggregate freight expenditures are low because import choices are made to minimize transport costs". This is supported by the fact that trade weighted freight rates are usually at the low end of a wide range of observed rates. Second, even if trade weighted rates are taken at their face value, they tend to be higher than the preferential tariffs applied for most of South American intraregional trade. And third, econometric estimates suggest that trade flows are in fact quite sensitive to changes in transport costs. For instance, Limão and Venables [2001] found that a 10 percentage point increase in transport costs typically reduces trade volumes by approximately 20%. Likewise Clark, Dollar and Micco (*op. cit*) estimated that a reduction in country inefficiencies associated to transport costs from the 25th to 75th percentiles (the higher the percentile the greater is the efficiency) imply an increase in bilateral trade of around 25%.

A closer look at freight and tariff data for the largest country in the region -Brazil-reinforces some of these points. The data is from Brazil's Internal Revenue Service (*Receita Federal*) and covers imports from all South American countries that are members of ALADI.[3] Data includes freight and insurances charges (separately), mode of transport and port of entry. Apart from geography, and trade pattern and volume, the data reflects infrastructure conditions in both Brazil and its South American partners.

As can be seen in Figure 9, the weighted average freight rate is 6.8%, but the simple average jumps to 18.6%, underscoring the argument made above that trade weighted freight rates tend to underestimate transport costs, being the result of a cost minimizing exercise. It is also evident that freight rates are higher than actual tariff rates (tariff revenue divided by the value of imports), particularly when weights (FOB import value) are used. As in the case of transport costs, the difference between the weighted and simple tariffs reflects not only comparative advantages, but also changes in trade flows imposed by trade costs -in this case protection-. The high simple average tariff is a powerful reminder of the limits of trade liberalization in the region, but the fact that freight rates are higher corroborates the point made earlier that transport costs these days are a bigger impediment to trade than trade policies, and therefore, one needs a more balance approached to integration.

Figure 10 gives an overview of the differences between freight and tariffs across commodities at the 2-digit Standard International Trade Classification (SITC) level, ordered roughly by their degree of industrialization. The results show that freight rates are higher than tariff rates for most sectors, but the difference tends to decline as one moves from less to more industrialized goods. The fact that commodities have higher transport

costs is not something specific to South America or to Brazil, but the tariff escalation that characterizes Brazil's tariff schedule, and MERCOSUR common external tariff for that matter, also plays a relevant part in this declining trend.

Figure 11 and 12 look at freight and tariff rates across countries. As mentioned earlier, it is difficult to compare freight rates across countries because of differences in geography and trade patterns, but the results confirm the dominance of transport over trade policy costs for all the countries in the region. This dominance is particularly high in the case of Bolivia, Venezuela and Argentina, but, again, the results change significantly when the weights are dropped. In this case, transport costs remain dominant for all countries except for Uruguay (despite MERCOSUR!) and Venezuela, but both transport and tariff costs are much higher suggesting there is a good deal of work to be done in both fronts, even in the more integrated MERCOSUR.

In other to reduce the influence of different patterns of trade in the cross-country results, Figures 13 to 16 examine freight and tariff rates by broad economic categories. Figure 13 look at MERCOSUR plus Chile and show that for MERCOSUR countries both freight and tariff rates, when weighted by imports, are low by any standards, but it also shows that freight rates are the dominant cost for all category of goods except for capital goods in Paraguay and Uruguay. Since these countries are not significant producers of capital goods, these tariff peaks probably reflect inputs that do not comply with MERCOSUR's rules of origin restrictions. For not being a full member of MERCOSUR, Chile has higher tariff costs which top freight costs in most categories apart from industrial supplies and fuels. The simple averages, shown in Figure 14, reveal a somewhat different picture for the subregion, where both freight and tariff rates are higher, reaching a level which seems to be excessive by international standards, particularly given the countries' proximity and integration process. Tariff rates tend to be the dominant trade cost for capital, transport and consumer goods.

In the case of the CAN (Figures 15 and 16), distance, Brazil's tariff escalation and the lack of a fully implemented trade agreement seem to play a strong part in a scenario where most countries have higher tariff than transport costs in capital goods, transport equipment and consumer goods, even when weights are used. Unlike MERCOSUR where the most promising integration gains seems to be in reducing transport costs, with the Andean Community the agenda appears to be more balanced, with further trade liberalization also promising sizeable gains.

To gather further insights on transport costs in the region, Figures 17 to 20 look at freight costs by transport mode across Brazil's South American trade partners. Figure 17 reveals the transport mix by country. Road transportation plays a major roll in imports coming from MERCOSUR countries and Chile, particularly in Uruguay and Paraguay where it responds for more than 60% of total imports. Maritime freight is also important, particularly for goods coming from Argentina and Chile, but the shares of the other modes are very limited despite the geographical (fluvial) and cost advantages. In imports coming from the CAN, maritime freight is by far the dominant mode of transportation, with air transport coming as a distant second. The exception is Bolivia, which exports mainly natural gas to Brazil via a pipeline and is landlocked. The predominance of maritime transport in the CAN is not surprising giving the distances between these countries and Brazil's major markets, yet one wonders if the lack of infrastructure is not also holding back other modes of transportations, particularly with regard to trade with Brazil's North and Central regions.

Figure 18 goes one step further and compares freight costs by transport mode and broad economic categories (BEC) for imports coming from MERCOSUR and Chile.

As expected, airfreight tends to be the most expensive transport alternative for most categories and for most countries, whereas road freight is the cheapest. Yet it is worth noting that there is no clear inverse correlation between transport mode shares of total imports and freight costs (Figure 19).

For instance, in the case of Argentina, maritime freight accounts for 64% of total imports of food and yet its average freight rate is just a fraction cheaper than airfreight, which accounts for less than 1% of shipments. Likewise, even though rail freight appears to be the cheapest alternative for importing food, it accounts for only 1% of total imports. Given that there are a number of variable that cannot be observed (for example, quality and duration of the shipment), it would be inappropriate to draw strong conclusions, yet one of the reasons behind these results might be a transport cost minimization constrained by the lack of appropriate infrastructure.

Figure 19 presents the facts for the CAN and the same patterns emerge, with clear signs that there might be room for lower transport costs with improvements in the infrastructure and with the selection of a more costs effective transport mix (Figure 20).

In sum, partial estimates of transport and tariff costs in South America, taking Brazil as a hub, reveal that the former are in general higher than the latter. Clearly, there still work to be done in terms of reducing tariffs, particularly in manufacturing trade and in trade between MERCOSUR and the CAN, but the estimates do not warrant an exclusive focus on trade agreements. A more balanced approach, which takes into account the importance of transport costs, is more likely to produce a deeper integration. When taken at face value, transport costs seem relatively small, yet their actual impact is much higher because observed data already reflects an attempt by the private sector to minimize those costs.

IV. The Impact of IIRSA on Regional Disparities and Growth

IIRSA's primary goal is to develop South America's infrastructure and deepen regional integration. Yet one cannot loose sight of the initiative's impact on the countries' ultimate goals to reduce regional disparities and promote sustainable growth. This section takes stock of the links between infrastructure, regional development and growth, reviewing the theoretical and empirical literature.

The Regional Issue

Starting with regional development, it is well known that Latin America, in general, and South America, in particular, have serious regional disparities, with some of them being aggravated by trade liberalization. In Mexico, for instance, the benefits of North American Free Trade Agreement (NAFTA) were mainly felt in the Northern border region, which helped to increase the income gap *vis-à-vis* the South (Chiquiar [2005] pp. 257-277) and in Brazil, MERCOSUR has mainly benefited the South and Southeast regions, with little impact in the other, less privileged areas of the country (Haddad, Domínguez and Perobelli [2002]). It is also clear that exports in most countries are heavily concentrated on particular regions, a pattern that is not conducive to a smooth distribution of integration gains. In Chile, for instance, 3 out of 13 regions (Antofagasta, Metropolitana and Bío Bío) account for more than 50% of total exports.

Economic theory, particularly from an economic geography point of view, acknowledges the risk of a negative impact of integration, regional or otherwise, on

regional disparities. For instance, Venables [2005] points out four mechanisms through which integration my lead to a widening regional income gap: (1) trade liberalization may promote factor price divergence by lowering the returns of human and physical capital and promoting capital flight in some regions; (2) the costs and benefits of trade diversion in preferential liberalizations may be unevenly distributed, imposing income losses for the more disadvantaged regions; (3) "locations with good market access will tend to attract firms, and this can be a cause of disparity" (p. 3); and, (4) because of cumulative causation mechanisms, associated with economies of agglomeration, regional integration may lead to concentration of activity on established centers. Note that these forces may drive not only within-country, but also between-countries disparities.

One could argue that increases in regional disparities triggered by integration are part of process that makes the whole economy more efficient. Spatial concentration of industries may lead to externalities due to technological spillovers, labor market pooling and input sharing, raising overall productivity. If labor is free to move, there might be adjustment costs, but the country or the region as whole will be better off.

The problem with this argument is threefold: it overlooks the difficulties of the political economy of integration -political forces of the constituencies or countries that loose activities are not likely to be so high minded as to think just in terms of the overall welfare-. Second, in South America, spatial changes brought about by integration take place in an environment already marked by high level of disparities both within and between countries, so, if, indeed, integration deepens these disparities, it can make an already uneasy political situation unsustainable, endangering not only integration, but also the social stability of the region. This risk is all the more relevant because most agreements in the region do not allow for free movement of labor. Finally, the all too common mega-cities in the region suggest that there may be little to gain by further concentrating economic activities. In fact, given the extreme problems of congestion, pollution and housing shortage of South American mega-cities, concentration seem to have gone beyond the socially optimal level, that is, beyond the level that would maximize agglomeration economies.

It seems justified, then, that South American policymakers take the risks of greater spatial inequality very seriously and consider the policy options available to prevent it altogether or avoid its consequences. Unfortunately there are very few policy experiences to draw relevant lessons. The most relevant case is that of the European Union, where governments have taken a very proactive stance to promote economic convergence, mainly via the use grants to the less developed regions and countries. The result so far has been mixed. Between-country disparities were drastically reduced, but it is not clear what was the role played by the so-called structural and cohesion funds (Sapir [2003]). Moreover, within-country disparities had a noticeable increase (Puga [2002]).

There seems to be, though, a growing consensus among analysts that investment in infrastructure may be a powerful tool to, at the very minimum, level the regions and countries' access to the gains of trade. Venables (*op. cit*), for one, argues that disparities are more likely to develop at intermediate levels of integration. That is, a situation where trade costs are not high enough to prevent trade altogether, but are high enough to stop countries from reaping the full benefits of integration. The *rationale* is that low trade costs increase the number of tradable goods, giving regions and countries more options to allocate their resources efficiently and export.

If that is really the case -more empirical research is needed to corroborate this argument-increasing and leveling the stock and the quality of South America's infrastructure

can make a significant contribution to mitigate regional disparities. As discussed in the previous section, transport costs seem to be today, for most of South America, higher or as high as tariff costs. This point is also underscored by Behrens [2004], whose theoretical simulations suggest that transportation infrastructure "plays a crucial role in determining whether economic integration leads to more or less inequality within a country" (p. 4).

Both Venables and Behrens raise, however, an important caveat. Lower transport costs, as in the case of tariffs, may also widen disparities, since it makes easier to supply several markets from just one location and may encourage skilled labor to leave. Yet, judging by experiences such as that of Mexico with NAFTA and Brazil with MERCOSUR, where proximity (that is, low transport costs) made the difference in terms of regional impacts, one could argue that a well developed infrastructure may not be sufficient to ensure a smooth distribution of integration gains, but it clear seems to be a necessary condition. More to the point, it is positive impact may be assured by other policy initiatives involving fiscal and financial incentives designed to trigger development in the less privileged regions.

Growth Links

As two analysts put it "that infrastructure accumulation may promote growth is hardly news for developing country policymakers" (Calderón and Servén [2004b]). This seems to be particularly the case for Latin American policymakers, who are experiencing firsthand the devastating impact of growing infrastructure bottlenecks, the product of decades of declining investment (see Section II). But what is the theory behind this intuition?

The literature discusses a number of channels through which investment in infrastructure may promote growth, among them: (1) cost reduction of intermediate inputs (for example, transport, electricity and water), raising profitability, investment and therefore growth; (2) higher productivity of labor (for example, better health, less time in non-productive activities, better access to information) and capital (allowing for example, the use of electrical machinery) (Kessides [1993]); (3) trade-related gains fueled by lower transport costs; and (4) market enlargement effects, which raise productivity via greater competition, specialization and economies of scale (Prud'homme [2004]).

All these channels are relevant motivations for an initiative such as IIRSA, but it is in market enlargement that it can make a distinct contribution. By repairing a historical infrastructure bias against intraregional trade and therefore creating the conditions for an integrated market in South America, IIRSA can make a contribution to growth that would go beyond any other national infrastructure project in the region. But how large can this contribution be?

A precise answer to this question is beyond the scope of this document, but there is a growing empirical literature that suggests that the impact of infrastructure on growth can be fairly large. For instance, Calderón and Servén [2003] argue that the "infrastructure slowdown" of the last two decades would account for as much as one third of the difference in growth performance between East Asia and Latin America. Calderón and Servén [2004b] also suggest a substantial growth payoff from infrastructure development. Their estimates reveal, for instance, that if a country such as Peru were to raise its infrastructure to the level of Costa Rica (the leader in the region), its growth rate would rise by a hefty 3.5 percentage points. Other studies for other regions also point to a high rate of return for infrastructure investment, although estimates vary widely (see for example, Gramlich [1994] pp. 1176-1196). Note that since these estimates are all done at

the national level, they do not take into account the potential market enlargement effects of a regional initiative such as IIRSA.

True, these results have to be taken with a pinch of salt because of methodological and data issues (see, for example, Prud'homme [2004]). For instance, there are the simultaneity (growth can lead to infrastructure investment and *vice-versa*), valuation (how to input value to infrastructure stocks) and usage (what matters is not the stock available, used by most studies, but how much it is been used) problems, which researchers try to control for, but have not been able, so far, to completely eliminate possible distortions. These difficulties in measurement suggest that caution should be exercised in interpreting this literature, but infrastructure bottlenecks in South America are so evident and pressing that the relative weakness of the empirical results seems to take little away from the case for a "big push" in infrastructure, particularly at the regional level.

To argue that IIRSA is likely to have a substantial growth payoff does not imply arguing that any project would generate high returns or that investments in infrastructure should be pursued at any cost. The general need for infrastructure neither exempt projects from being submitted to a rigorous cost benefit analysis, nor exempt countries from respecting their fiscal, macroeconomic and environmental constrains.[4] Countries should look for sustainable ways to fund and finance their infrastructure, otherwise the costs in terms of macroeconomic imbalances, as the region knows all too well, would clearly outweigh any potential growth benefits. That is perhaps IIRSA's major challenge: to reconcile badly needed infrastructure investments with South America's hard pressing fiscal and financial constraints.

V. Final Remarks

IIRSA is an unprecedented multi-billion dollar regional initiative, which aims to develop infrastructure in South America. The economic motivation is clear and goes beyond the standard case for infrastructure. IIRSA is part of strategy to promote South-South integration as a means to reap the growth benefits of worldwide integration, while overcoming some of the disadvantages of small size and technology. Within this strategy, IIRSA is set to play a major role in creating a fully integrated regional market, ensuring that the potential scale and learning gains from deeper integration are fully realized and not held back by high trade costs, rooted in a faulty or even inexistent infrastructure.

The importance of this role is underlined by the poor conditions of infrastructure in the region, whose never so satisfactory services and whose historical bias against intraregional trade became even worse after decades of underinvestment. Estimates of transport and tariff costs in South America reveal that the former are in general higher than the latter, and even though they seem relatively small, the potential gains implicit in their reduction tends to be much higher. This is because the observed data already reflects an attempt by the private sector to minimize those costs. The growing importance of transport costs call into question the emphasis that has been given so far to formal trade agreements at the expense of the infrastructure components of trade costs.

IIRSA's role in developing an integrated South American market has also important direct implications for regional development and growth. There seems to be a growing consensus among analysts that infrastructure may be a powerful tool to reduce regional disparities or, at the very least, to prevent trade from aggravate them. Likewise, a number of empirical studies suggest that the growth payoff from investment in infrastructure,

particularly in the South America, tend to be high, a key result for a region which have been, with a few exceptions, struggling to resume a path of sustainable growth.

IIRSA also makes an important point in terms of the importance of bringing the state back to coordinate, fund and finance investments in infrastructure. Even though the privatization of utilities have brought substantial benefits to sectors such as telecommunications, it seems clear that technological changes have neither eliminated the public good nature of most infrastructure services, nor dealt with externalities in their production and use. The slump in the overall investment in infrastructure in the last decades seems to corroborate this point, although one has also to factor in the volatile macroeconomic environment that prevailed in most South America. Bringing the state back, though, is easier said than done, particularly due to the stringent fiscal constraints that affect the region. Public-Private Partnerships (PPP) seem to be a interesting way to reconcile the need for state coordination and intervention with its lack of funds and its management limitations. Chile's successful experience for instance illustrates this point. Yet, the contractual intricacies of the PPPs (Harris [2004]) and sheer amount of resources needed to meet IIRSA ambitious goals call for more direct government involvement. It is up then to the governments to meet this challenge and to find a way to channel resources into an initiative which may be risky but that offers the perspective of a high growth payoff.

Notes

1 Colombia and Chile are the only exceptions to this trend.

2 Trade mirror data use import Cost, Insurance and Freight (CIF) and export Free on Board (FOB) values to calculate freight rates.

3 Argentina, Bolivia, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela.

4 See Tanzi [2005] for the risks of ignoring those constraints.

Table 1

PORT TRANSIT TIMES COMPARED Days				
	Brazil	China	India	Malaysia
Imports				
Average	13.8	7.5	10.4	3.4
Longest	32.4	12.2	21.6	7.4
Exports				
Average	8.4	5.5	5.1	2.6
Longest	16.9	8.1	9.3	5.1

Source: World Bank, Investment Climate Assessments. 2004.

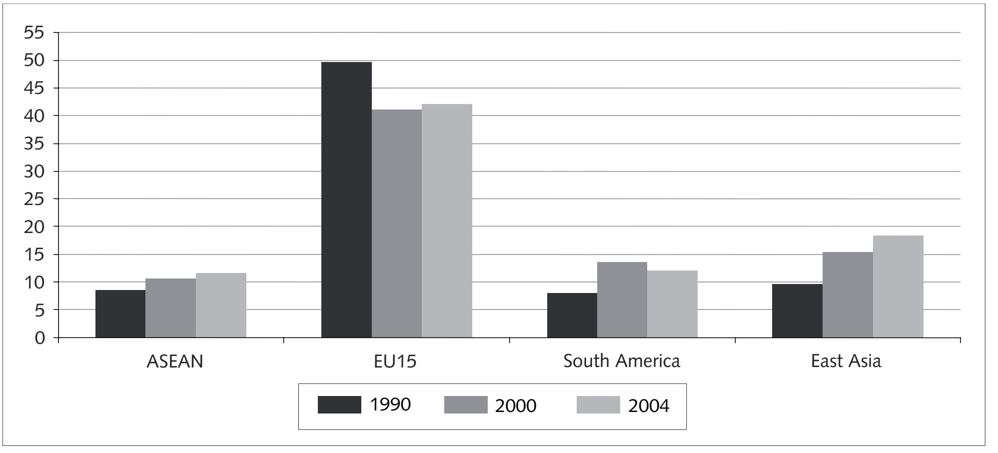
Table 2

AVERAGE TRANSPORTATION COSTS ON IMPORTS TO MERCOSUR COUNTRIES AND CHILE 1993 - %					
Exporter	Argentina	Brazil	Paraguay	Uruguay	Chile
MERCOSUR	6.2	5.6	10.8	2.6	8.9
Rest of the World (except Chile)	12.3	12.2	22.7	14.0	12.7
Argentina	---	6	12.2	2.4	8.3
Brazil	6.7	---	---	3.3	9.2
Paraguay	6.3	2.6	---	4.9	10.9
Uruguay	4.6	6.2	16.2	---	16.1
Chile	8.1	10.7	14.5	8.0	---
Europe	11.3	12.4	18.8	12.5	13.2
US-Canada	14.5	15.4	23.8	12.1	12.5
Asia	16.8	19.3	25.5	16.2	14.9

Note: Freight Rates as a percentage of imports. Weighted averages using imports from MERCOSUR as weights. Includes Insurance.
Source: Amjadi and Winters [1997].

Figure 1

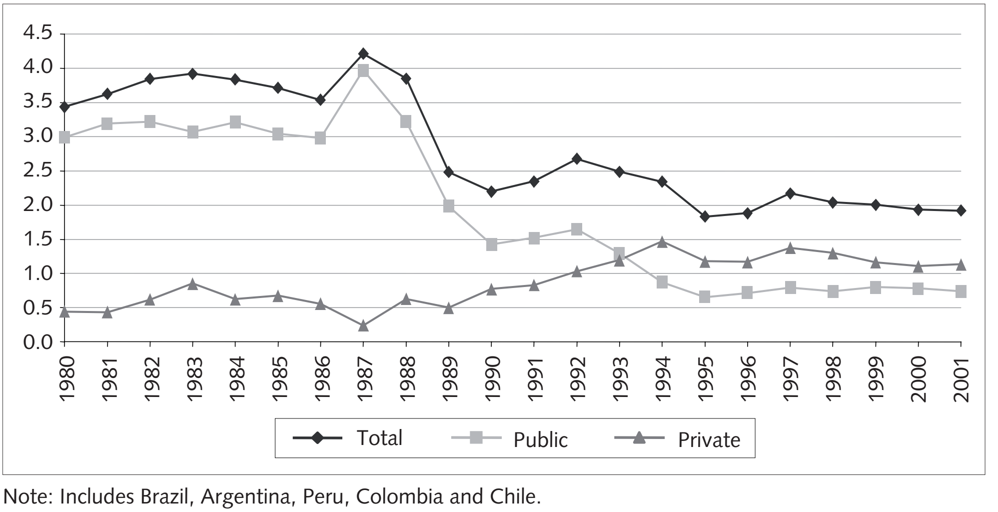
INTRAREGIONAL TRADE 1990-2004
% of Total Trade



Note: East Asia includes South Korea, Taiwan, Japan and China.
Source: Commodity Trade Statistics (COMTRADE).

Figure 2

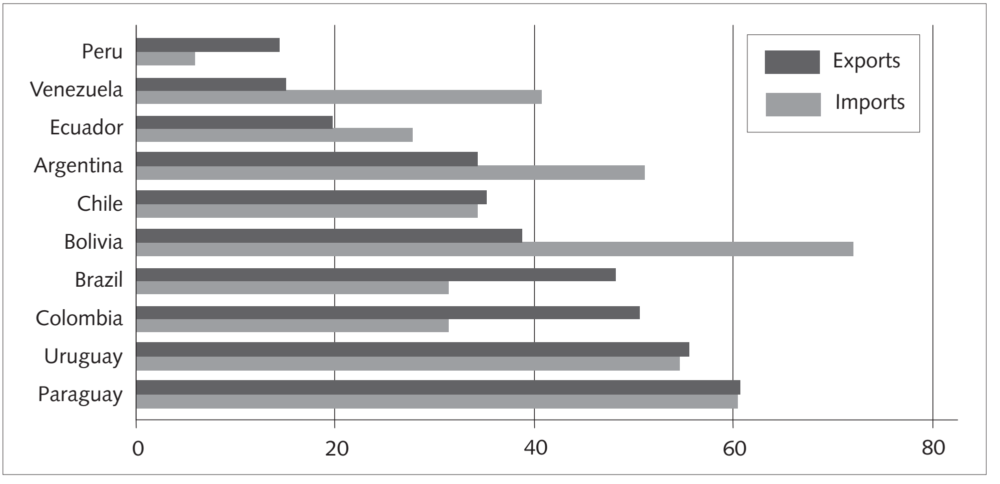
INVESTMENT IN INFRASTRUCTURE BY MAJOR SOUTH AMERICAN COUNTRIES 1980-2001
GDP Weigthed Average, % of GDP



Note: Includes Brazil, Argentina, Peru, Colombia and Chile.
Source: Data from Calderón and Servén [2003].

Figure 3

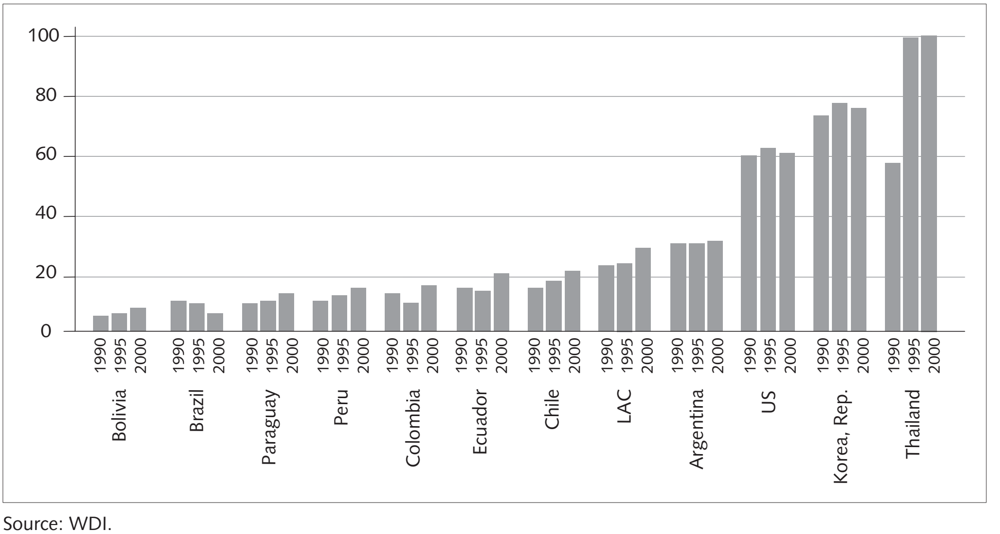
Share of Road Transport in Intraregional Trade
South America 2000 - %



Source: IIRSA [2003].

Figure 4

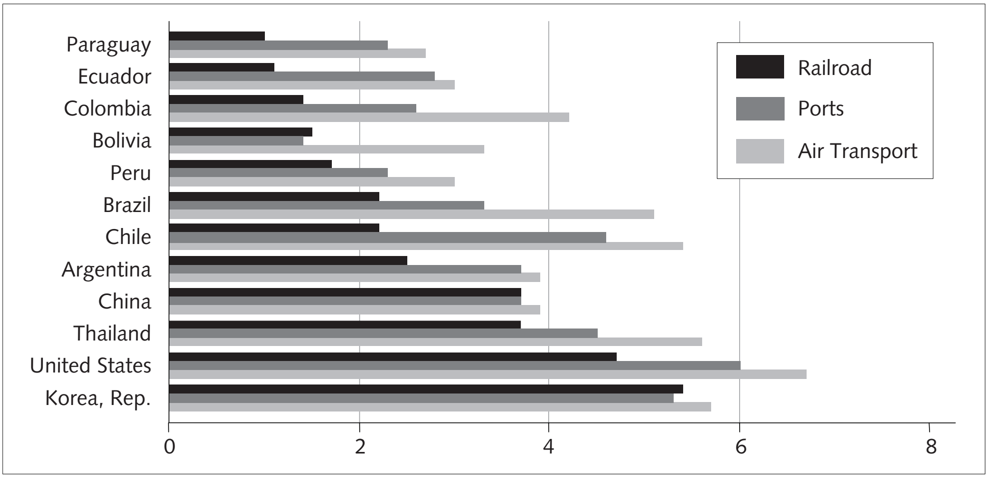
Roads Paved
Percentage of Total Roads



Source: WDI.

Figure 5

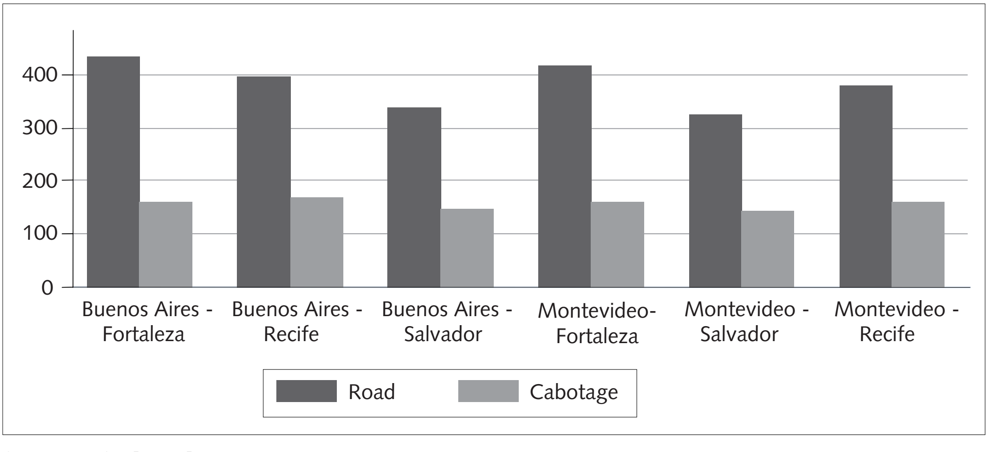
INFRASTRUCTURE QUALITY
Survey Scores



Source: World Economic Form [2003/2004].

Figure 6

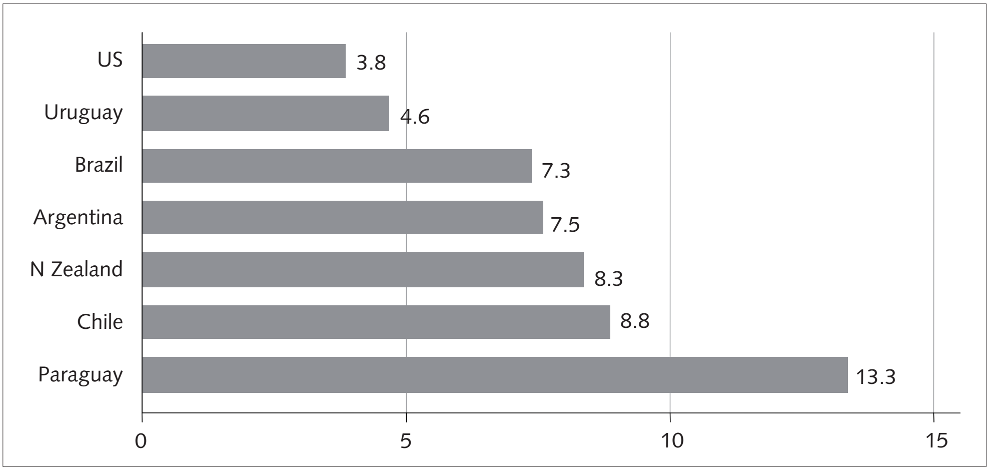
FREIGTH COSTS IN MERCOSUR
Brazil's Northeast, Uruguay and Argentina 2000 -R$/ton



Source: IIRSA [2002].

Figure 7

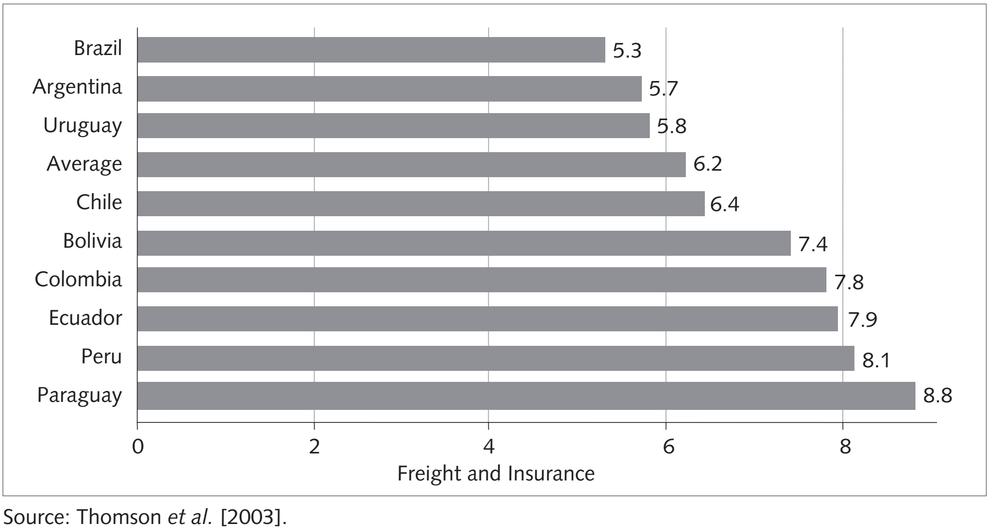
FREIGHT RATES
Trade Weighted over all Partners - 1994



Note: Freight costs as a percentage of imports.
Source: Hummels [1999].

Figure 8

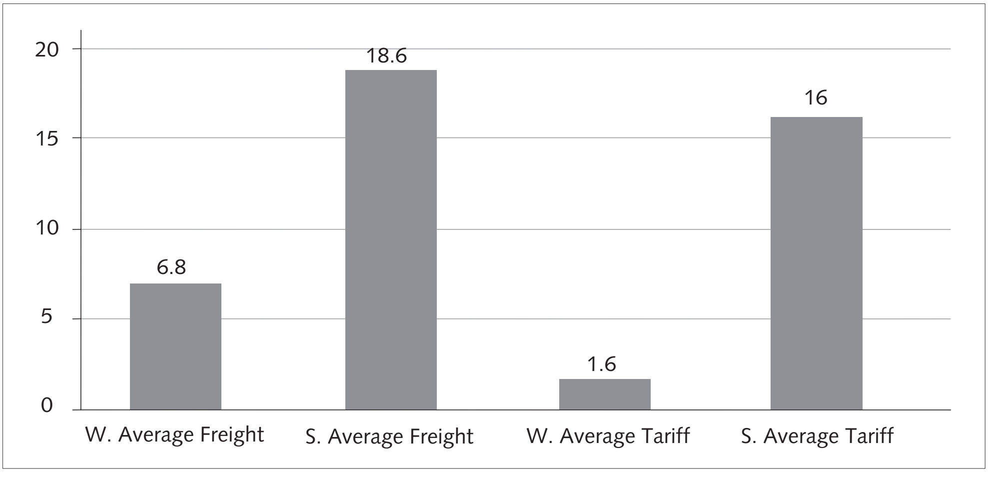
FREIGHT AND INSURANCE COSTS AS A % OF IMPORTS
All Partners for Selected South American Countries - 2001



Source: Thomson *et al.* [2003].

Figure 9

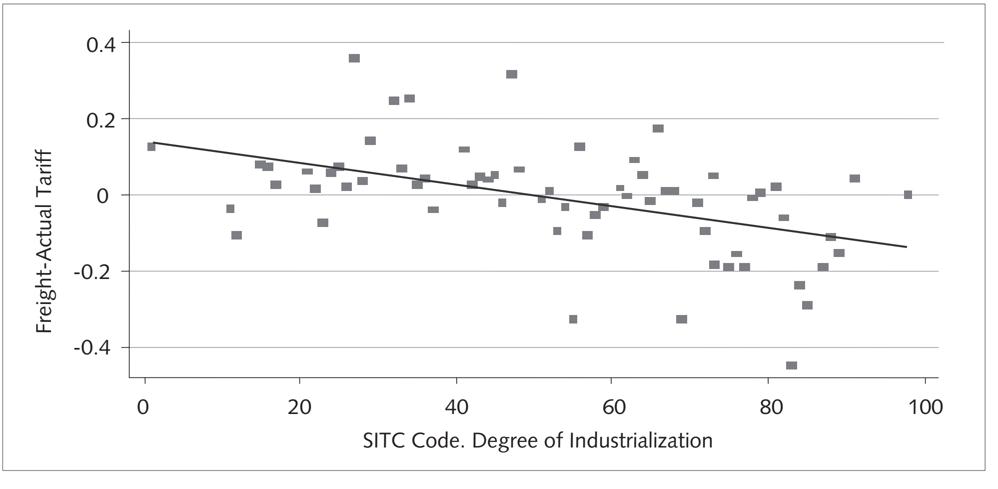
Freight and Actual Tariff Rates for Brazil's Imports from South America
Simple and Weighted Average - 2004



Source: *Receita Federal*, Brazil.

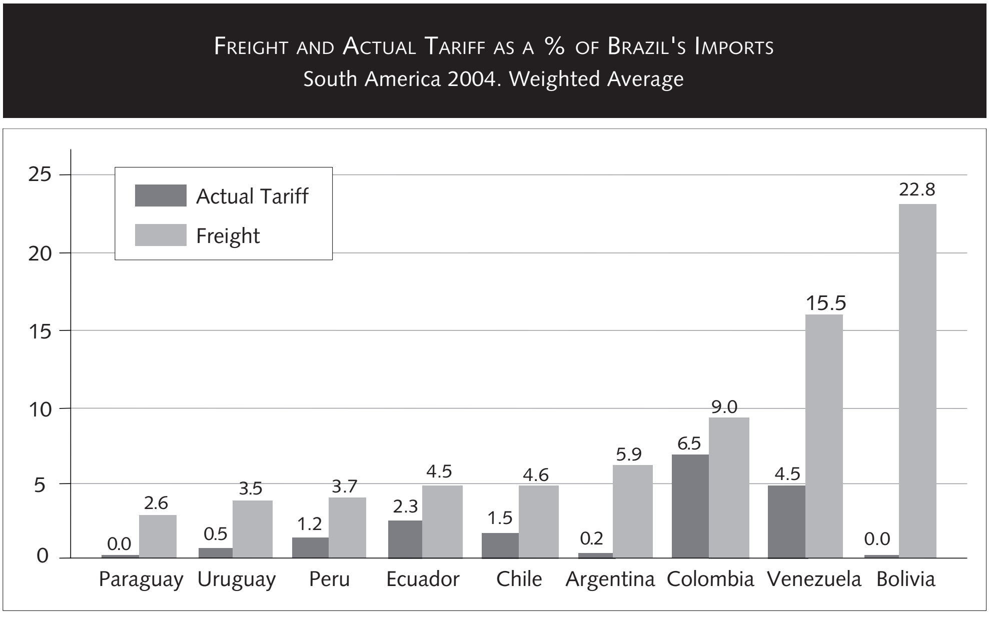
Figure 10

Difference between Freight and Actual Tariff Rates*
Brazil 2004. SITC 2 Digits. Weighted Average



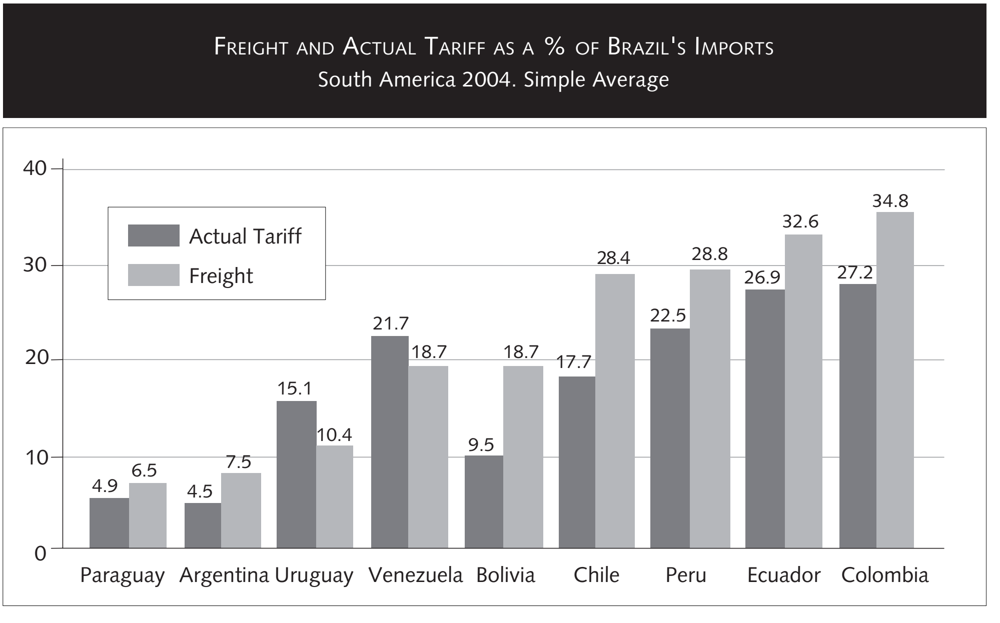
Note: * Freight and tariff costs as a percentage of imports.
Source: Own calculation with data from *Receita Federal*, Brazil.

Figure 11



Source: *Receita Federal*, Brazil.

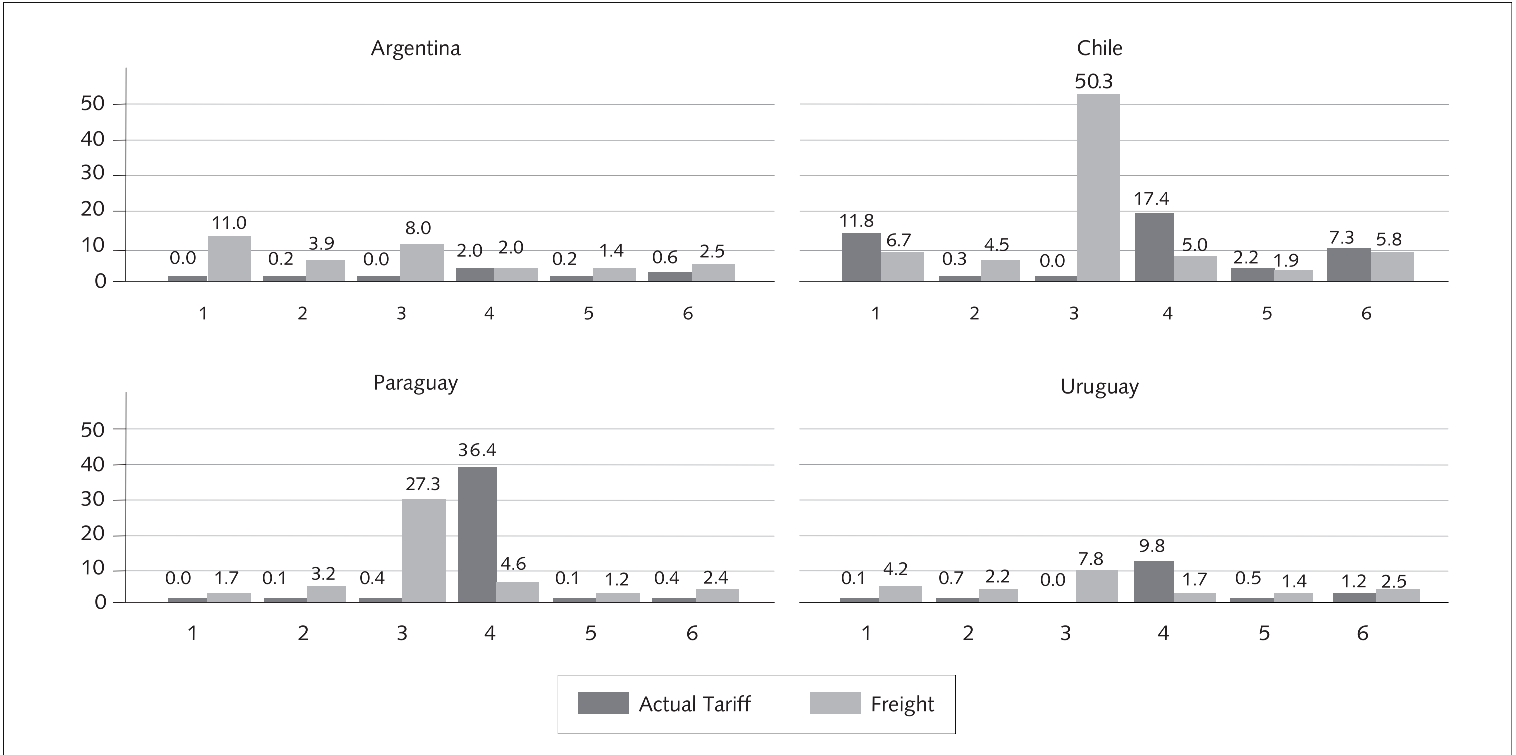
Figure 12



Source: *Receita Federal*, Brazil.

Figure 13

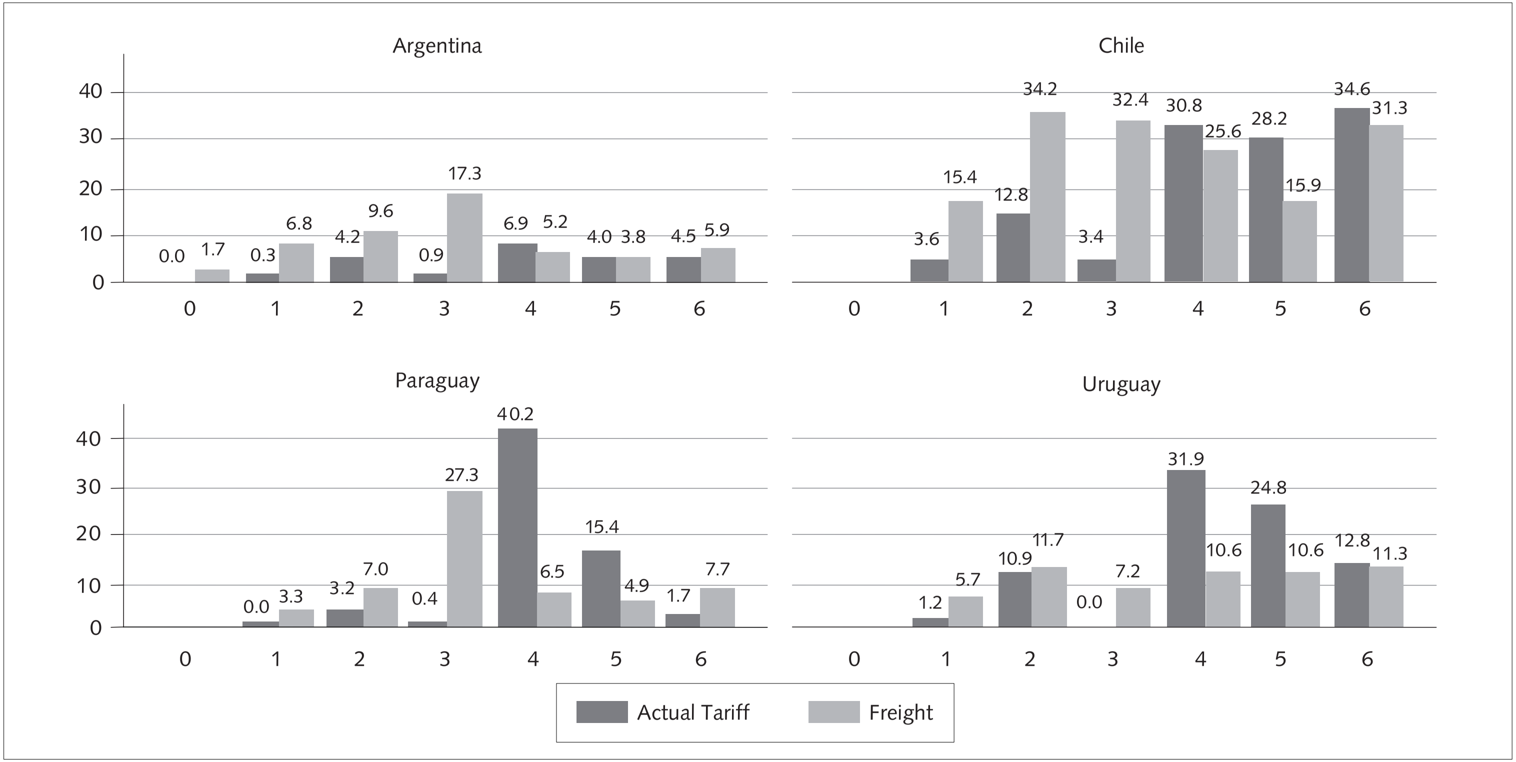
FREIGHT AND ACTUAL TARIFFS AS A % OF BRAZIL'S IMPORTS
MERCOSUR and Chile. Trade Weighted



Notes: 1: Food, 2: Industrial supplies, 3: Fuels, 4: Capital goods, 5: Transport equip, 6: Consumer goods.
Source: *Receita Federal*, Brazil.

Figure 14

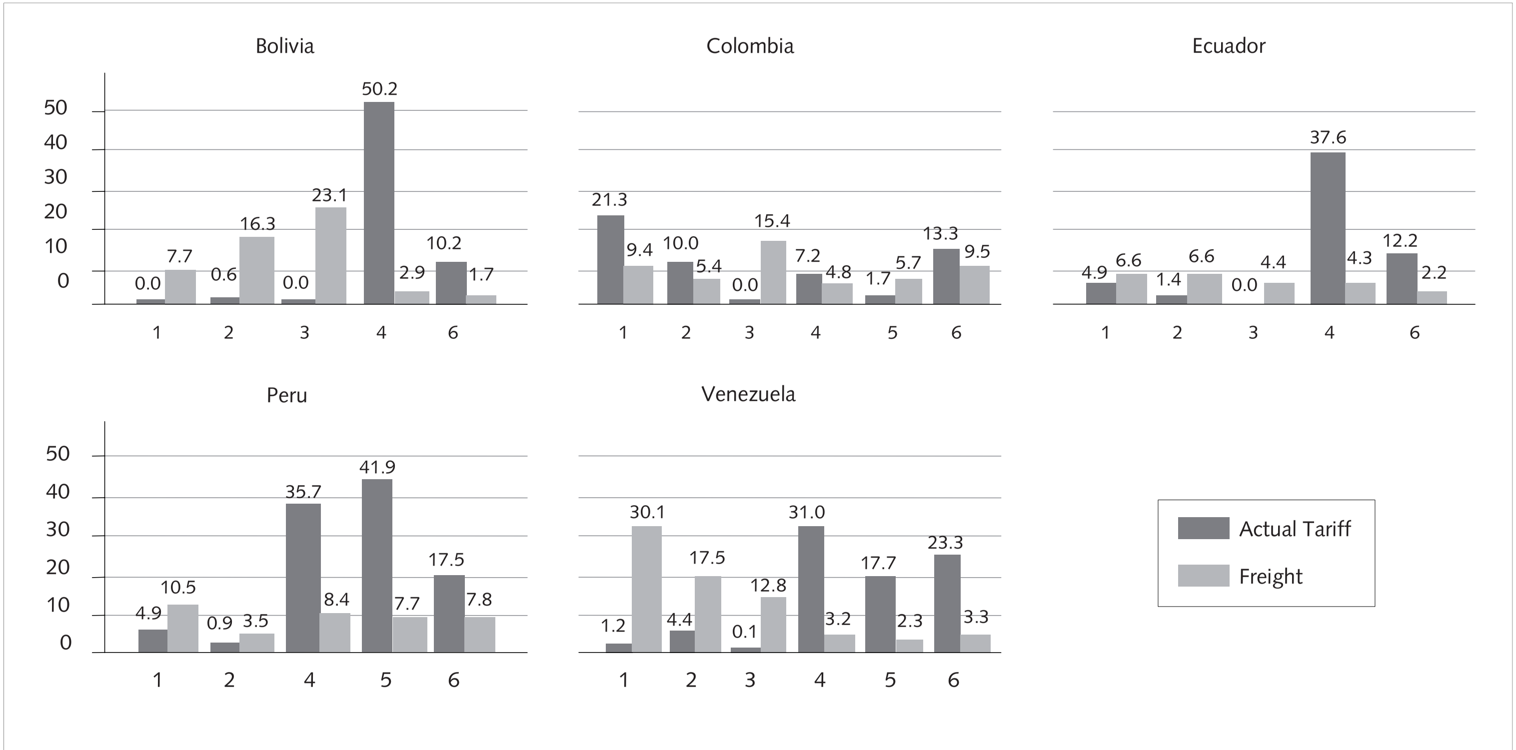
FREIGHT AND ACTUAL TARIFFS AS A % OF BRAZIL'S IMPORTS
MERCOSUR and Chile. Simple average



Notes: 1: Food, 2: Industrial supplies, 3: Fuels, 4: Capital goods, 5: Transport equip, 6: Consumer goods.
Source: *Receita Federal*, Brazil.

Figure 15

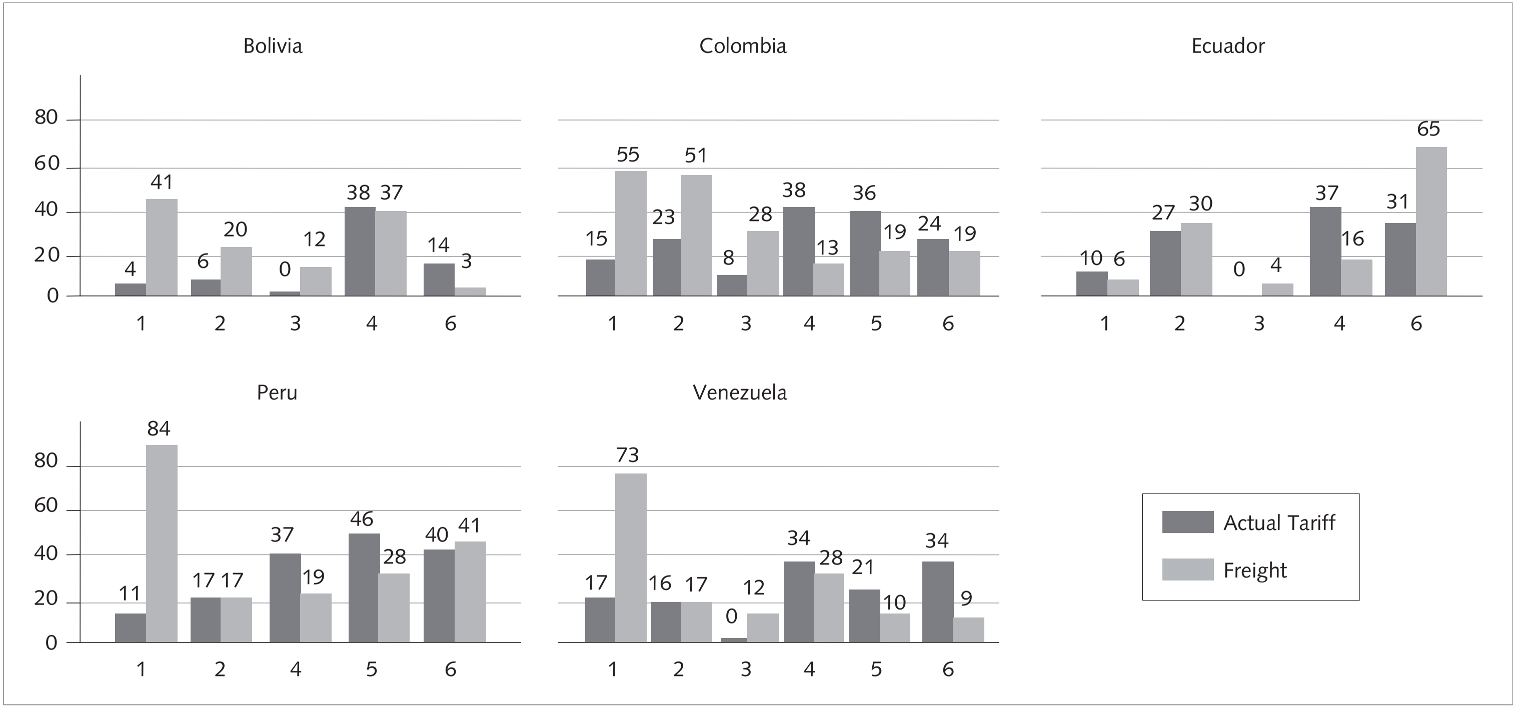
FREIGHT AND ACTUAL TARIFFS AS A % OF BRAZIL'S IMPORTS
CAN. Trade Weighted



Notes: 1: Food, 2: Industrial supplies, 3: Fuels, 4: Capital goods, 5: Transport equip, 6: Consumer goods.
Source: *Receita Federal*, Brazil.

Figure 16

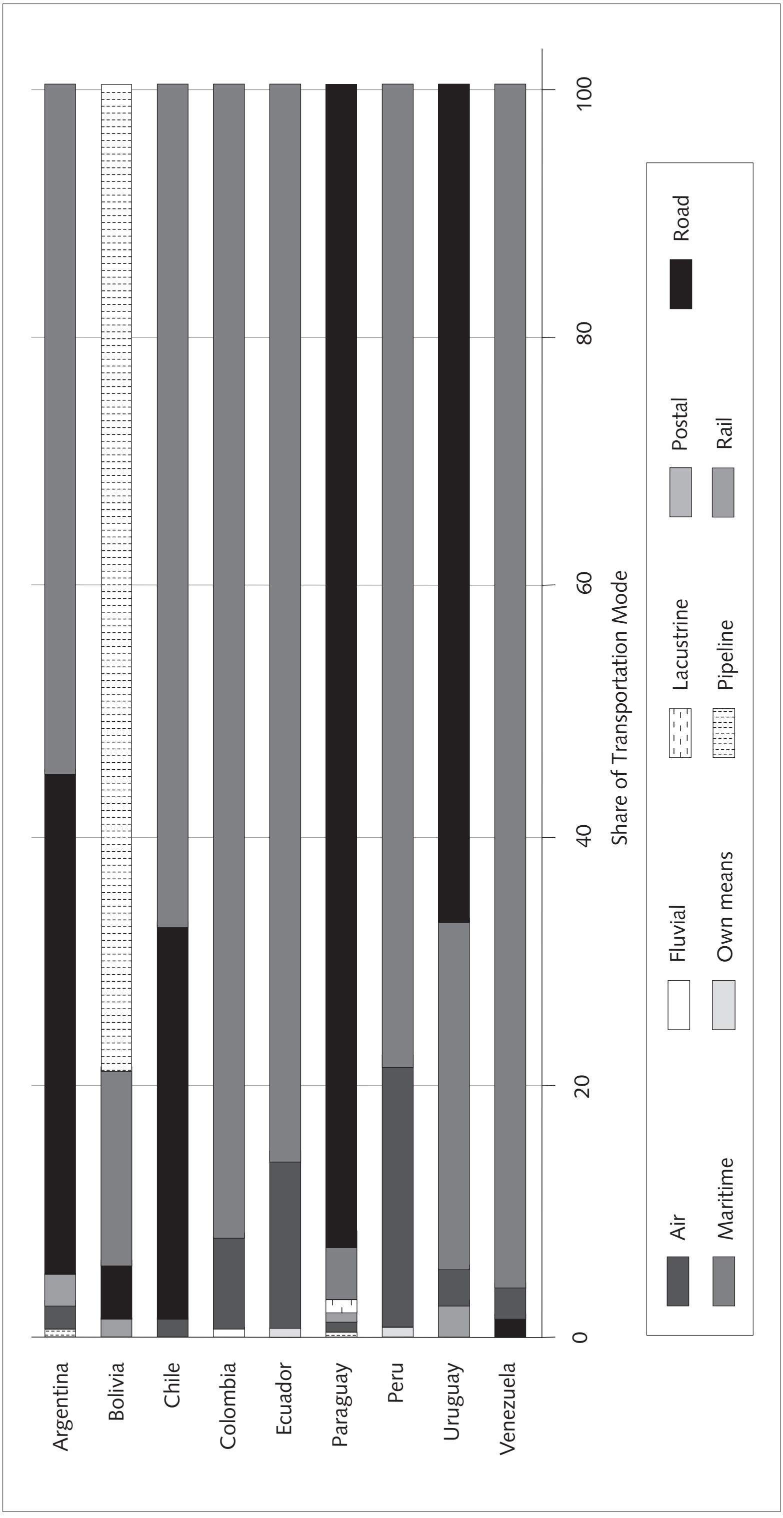
Freight and Actual Tariffs as a % of Brazil's Imports
CAN. Simple Average



Notes: 1: Food, 2: Industrial supplies, 3: Fuels, 4: Capital goods, 5: Transport equip, 6: Consumer goods.
Source: *Receita Federal*, Brazil.

Figure 17

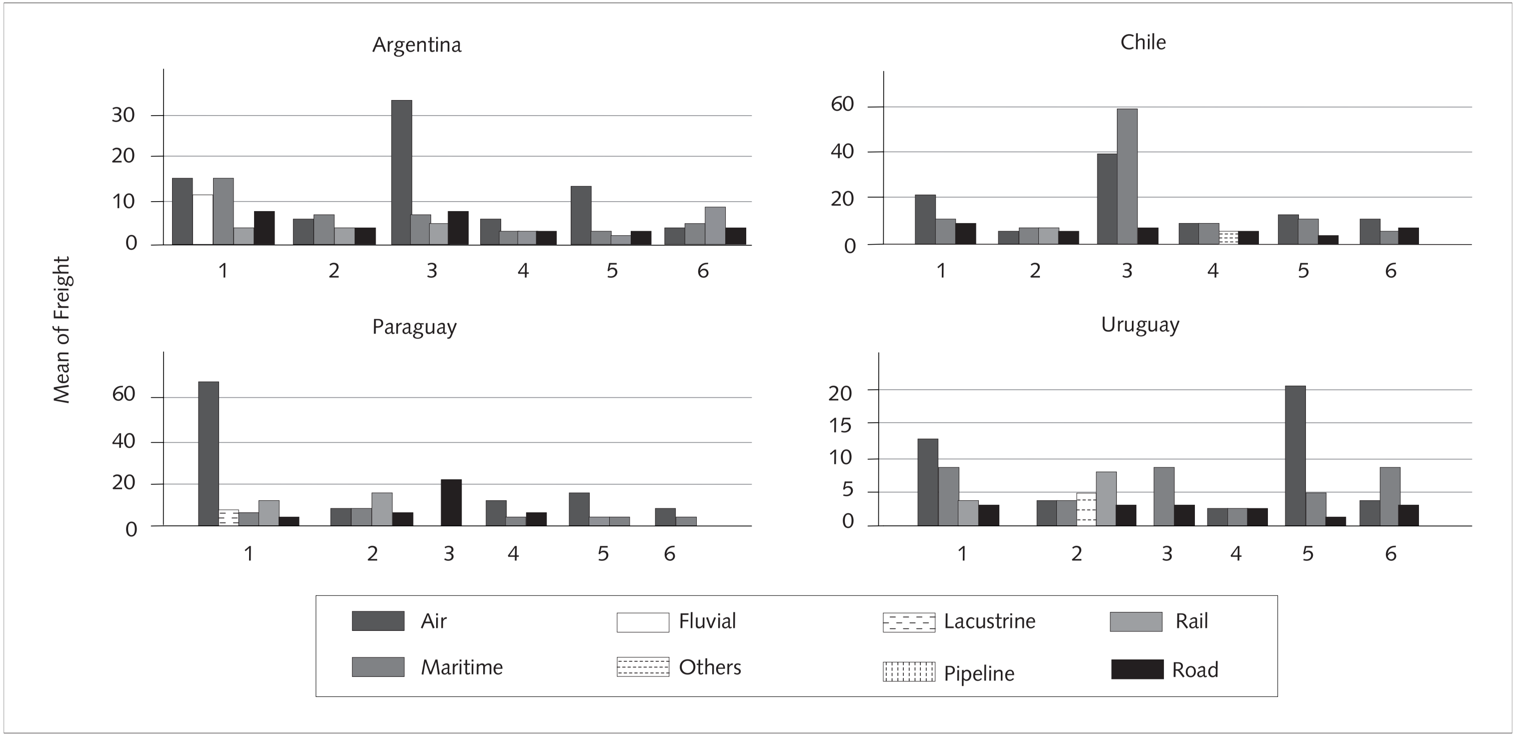
TRANSPORTATION MODE OF BRAZIL'S IMPORTS
South America 2004 - %



Source: *Receita Federal*, Brazil.

Figure 18

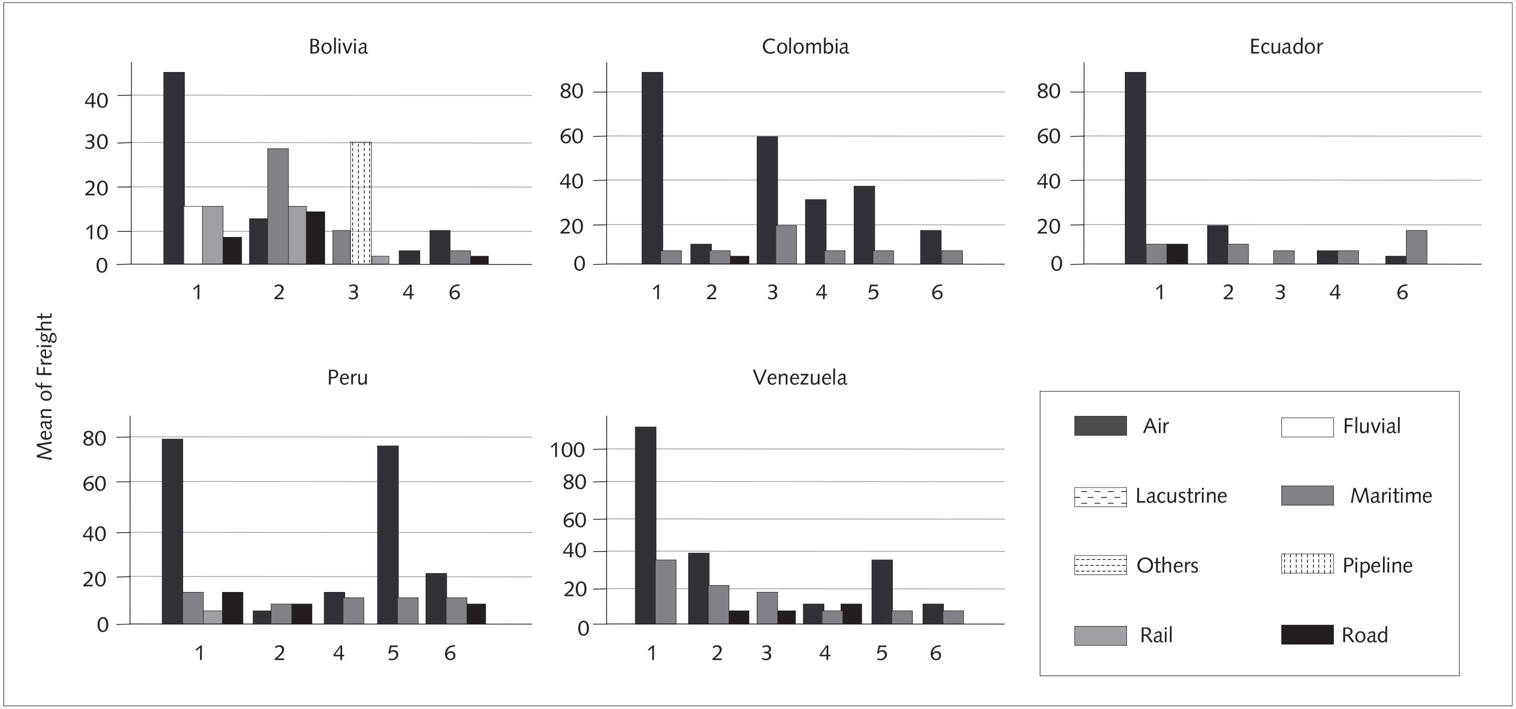
Freight Rates of Brazil's Imports by Transport Mode
MERCOSUR and Chile 2004 - %



Notes: 1: Food, 2: Industrial supplies, 3: Fuels, 4: Capital goods, 5: Transport equip, 6: Consumer goods.
Source: Own calculation with data from *Receita Federal*, Brazil.

Figure 19

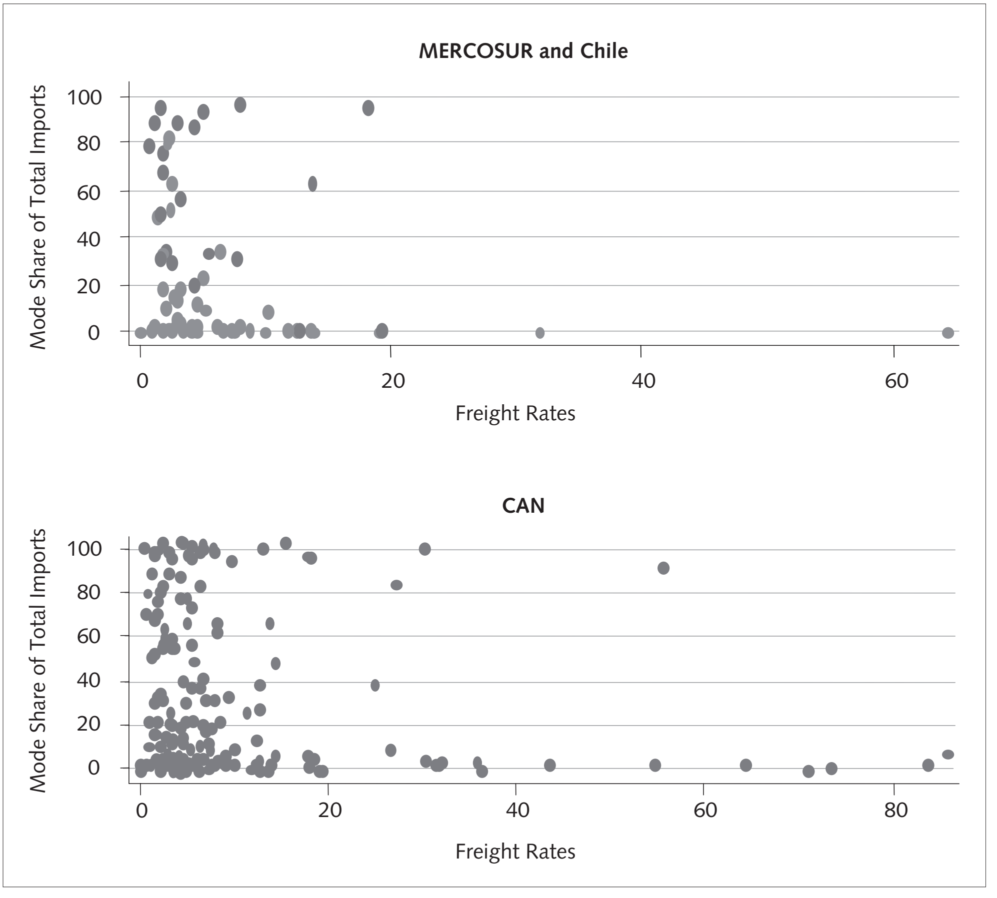
FREIGHT RATES OF BRAZIL'S IMPORTS BY TRANSPORT MODE
CAN. Trade Weighted. 2004 - %



Notes: 1: Food, 2: Industrial supplies, 3: Fuels, 4: Capital goods, 5: Transport equip, 6: Consumer goods.
Source: *Receita Federal*, Brazil.

Figure 20

Correlation between Freight Rates and Transportation Modes
Brazil's Imports by Broad Economic Category (BEC) 2004 - %



Source: Own calculation with data from *Receita Federal*, Brazil.

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Some Elements to Characterize Brazilian Interests in Infrastructure Integration in South America

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Summary

The integration of the region's infrastructure systems is seen by Brazilian diplomacy as a necessary component of the economic integration process. The Brazilian interest in the integration of the region's transport and energy network is not limited to its direct impact on trade. Brazil also has capabilities in the engineering services area as well as in the manufacture of equipment and construction materials, and has a relatively diversified capital goods producing sector. Regional projects are an alternative to the public investment restrictions existing in the domestic market.

The purpose of this paper is to present evidence that might be indicative of the fact that the Brazilian Government's support to Initiative for the Integration of Infrastructure in South America (IIRSA - Iniciativa para la Integración de Infraestructura Regional en Suramérica) in 2000 and the subsequent strengthening of the initiative at the 2004 Summit have played a role in the expansion of Brazilian firms in the South American territory. Research focuses on the area chosen to make the empirical and documentary evidence collection effort - namely, the public works engineering and construction sector.

In addition, the paper analyzes the announcements made within the framework of the Growth Acceleration Program (PAC - Programa de Aceleración del Crecimiento). It appears that the implementation of the PAC may result in the decision to give less priority to Brazil's regional integration. The reasons for this reordering of priorities may be found in the need to carry out electric power generation projects at the domestic level, and to seek domestic gas supply sources in order to reduce the country's dependence on the product from Bolivia.

I. Introduction

At the South American Presidential Summit held in Cusco in December 2004, twelve South American presidents signed an agreement intended to unify the region's two trade blocs, the Southern Common Market (MERCOSUR - *Mercado Común del Sur*) and the Andean Community, by launching an initiative to form the

South American Community of Nations, now renamed Union of South American Nations (UNASUR - *Unión de Naciones Suramericanas*).

Despite the search for diplomatic objectives, such as enhanced negotiating power and regional representation, the declaration places the economic integration of the regional space as a core objective. To make headway in that direction two strategies have been put forward: perfecting a free trade area[1] in the region, and integrating the energy, transport and communications systems "based on existing bilateral, regional and sub-regional experiences".

The idea of advancing towards the integration of South America within these schemes is not new.[2] Infrastructure investment and the integration of the region's infrastructure systems are seen, by Brazilian diplomacy, as a necessary component of the economic integration process and of the expansion of Brazilian sales in South America. Motivated by the relative lack of transport and communication connections between Brazil and its neighboring markets, Brazilian diplomacy has had this idea for a long time. The Initiative for the Integration of Regional Infrastructure in South America (IIRSA) was the product of ideas generated by diplomats and officials serving in the planning sector of the Brazilian Government. In addition, the incumbent Brazilian Government launched the idea of the South American Community of Nations -with great emphasis placed on infrastructure integration- and has probably been more proactive than prior administrations in terms of funding engineering works in the region that involved Brazilian projects, equipment and materials. Thus, the initiative for the integration of infrastructure systems, contained in the Cusco Declaration, is aligned with the Brazilian vision of the role that infrastructure investment plays in the economic integration process of the region.

The Brazilian interest in the integration of the region's transport and energy network is not limited to its direct impact on trade. On the one hand, Brazil also has capabilities in the engineering services area as well as in the manufacture of equipment and construction materials, and has a relatively diversified capital goods producing sector. Infrastructure projects may be a good way to make full use of, and expand, the production capacities of those three sectors. More specifically, the Brazilian engineering services providers and the equipment and construction material companies find in regional projects an alternative to the private and public investment restrictions existing in the domestic market.

There are few doubts about the advantages that Brazil will gain from an integrated transport and energy infrastructure. Likewise, integration will afford its neighbors new trade opportunities, as a result of lower transport costs, or due to the potential for attaining an enhanced integration of infrastructure subsystems.

The purpose of this paper is to present evidence that might be indicative of what major Brazilian diplomacy initiatives at the regional level converged with economic interests in infrastructure sectors that indicated the advisability of taking steps in the same direction. We do not intend to establish causal relationships; however, everything seems to indicate that the Brazilian Government's support to the IIRSA in 2000, and the subsequent strengthening of the initiative at the 2004 Summit, has played a role in the expansion of Brazilian firms in the South American territory. Research focuses on the area chosen to make the empirical and documentary evidence collection effort -namely, the public works engineering and construction sector.

It is not easy to find concrete evidence of this convergence of diplomatic initiatives and economic interests, partly because a broad-scope diplomatic initiative

such as the integration of infrastructure would hardly result from purely economic and sectoral motivations. Hence, this study sought to gather partial evidence of the economic reasons and the objective logistic needs that might have driven Brazilian diplomacy to emphasize infrastructure connection and integration issues at regional negotiations. To this end, we resorted to different information sources: statistical data, private and public stakeholders, official declarations, and public reports of the parties concerned.

This paper is structured as follows. The second section discusses the needs for infrastructure interconnection between Brazil and the rest of South America, and how the IIRSA initiative was designed to help satisfy those needs. The third section lists the current infrastructure difficulties, and how they motivated the announcements contained in the Growth Acceleration Program (PAC - *Programa de Aceleración del Crecimiento*). The study develops the hypothesis that the deterioration in the conditions of domestic infrastructure may lead to a reduction in the Brazilian energy necessary to carry out the projects designed to provide interconnection with the regional infrastructure. The fourth section examines the instability of the demand for construction services in Brazil and the need, on the part of the sectoral firms, to seek regional infrastructure projects in order to offset such volatility and absence of growth. Then, in the same section, we comment on the slow evolution of public-private partnerships (PPP) and concessions, which caused a reduction in investment in public goods, and also forced engineering service firms to seek to capture foreign markets. The fifth section presents an overview of the Brazilian Development Bank (BNDES - *Banco Nacional de Desarrollo Económico y Social*) financing and support of regional infrastructure projects, an undertaking conceived of as a financial support to the export of engineering services and construction goods. Finally, in the conclusions we review the central ideas discussed in the paper in an attempt to show the convergence of interests between the needs of engineering services and construction firms and the IIRSA initiative, as well as the difficulties -that might result from -and interfere with the initiative- redirecting the investment in public goods as announced by the PAC.[3]

II. Infrastructure Interconnection Needs in Brazil and the Rationale of IIRSA

Infrastructure Interconnection Needs in Brazil

Inter-regional interconnection within the Brazilian territory is still insufficient, and the economic infrastructure is inadequate in the majority of its regions with less relative development. This situation was not better by the mid-1990s. With the intent to overcome this situation, President Cardoso's Government launched the idea of planning investment and certain public expenditure items in terms of territorial integration and development hubs. What were the characteristics of such hubs?

In the words of the main promoter and executor of the idea, José Silveira [2001], an integration and development hub "is not a transport corridor, but rather a geo-economic space sharing common features, where there are demands and opportunities that must be met via integrated actions. Such actions must be carried out in the fields of economic infrastructure (transport, energy, telecommunications, water resources), social development (education, health, sanitation, housing), information and knowledge (professional qualification, technological development, information access and dissemination) and environmental management".[4]

In 1997, in order to advance towards the definition of the idea, the Brazilian Government commissioned several studies to identify integration and development hubs in Brazil. Such studies surveyed the country's economic infrastructure network in order to detect the areas where there were imbalances between demand for and supply of the different components of such infrastructure. The analysis of the mechanisms to meet such demands, from the conceptual perspective of the hubs, resulted in a portfolio of private and public investment opportunities, efforts to coordinate the different infrastructure components, as well as actions and projects in the fields of social development, environment, information and knowledge.[5]

After a debate between the civil society and the governments of all Brazilian states, the national Government included in its Pluriannual 2000-2003 Investment Plan some of the projects and actions identified in the studies on hubs. Such investment plan was called *Avança Brasil*.

Yet Brazil not only has an inter-regional connection problem within its territory; its transport infrastructure has not been designed to favor intra-regional trade. This is certainly not just a Brazilian problem since, as Moreira [2007] correctly points out, during the natural resource-intensive goods exporting era, the countries' infrastructure was primarily designed for extra-regional trade, basically with Europe. There were not many commercial ties among countries that would justify the creation of an interconnection infrastructure and, in addition, there were also major geographic barriers, such as the Andes, the Amazon forest and mighty rivers hindering the exchange of goods and production factors.

The import-substitution process modified the countries' production structures, but the strongly protectionist policies in force at the time did not favor trade within the region and, hence, there were no incentives or reasons to create an infrastructure that might serve such a purpose.

Finally, inter-country infrastructure connection was inadequate not only because of geographic barriers or trade policy orientation. We should bear in mind that, by mid-20th Century, countries were engaged in diplomatic conflicts, and that all those factors, coupled with political nationalism, conspired against their physical integration.[6] The resolution of that conflict agenda and the redemocratization of countries, as from the late 1970s, made it possible to move towards the design and construction of regional infrastructure connection points.

The growth in intra-regional trade in the 1990s evinced the inadequacy of transport infrastructure connections and unveiled, in turn, the integration opportunities in the energy field. But it was precisely during that period that investment in the different types of infrastructure plummeted in the region.

In the new context of democratization, conflict resolution and intra-regional trade growth, the Brazilian Government launched, in 2000, the IIRSA in an attempt to enhance the connectivity of its domestic hubs with its neighbors' transport and infrastructure systems.

In the view of the Brazilian designers of IIRSA proposal, the South American integration hubs pursued two objectives: (i) overcoming border connection problems with neighboring countries, and (ii) taking the Brazilian integration and development hubs as example, building a shared prosperity space in the region from a sustainable development perspective (Silveira [2001]). This original Brazilian idea was clearly expressed in September 2001 by the Brazilian Minister of Planning, Martus Tavares:

"the essence of the South American hub proposal (...) is that of encouraging the integration of countries from a broad sustainable development perspective". Brazil's expectations concerning its involvement in the IIRSA initiative "are not limited to the international expansion of the transport corridors or energy systems. What we wish is development -one that is capable of contributing to fighting poverty as well as the regional and social disparities that characterize our continent".[7]

Furthermore, mirroring two peculiarities of the Brazilian reality -insufficient gas supply and budget constraints- the country's planning sectors deemed it necessary that IIRSA should focus particularly on the harmonization of regulations in the energy sector in order to facilitate trade of energy inputs and encourage private sector involvement in project financing and co-financing.

Validity and Relevancy of IIRSA as a Response to the Problem of Integration

The IIRSA initiative seeks to develop and integrate regional infrastructure. Its actions include: (i) the strengthening of the national investment capabilities and inter-country coordination; (ii) the standardization and harmonization of the institutional and infrastructure regulatory contexts; and (iii) the development and identification of a set of projects that foster private sector involvement.

The IIRSA portfolio contains more than 330 projects totaling US$37 billion. From that set, 31 projects were selected as a result of technical debates and political agreements to form the so-called "Implementation Agenda Based on Consensus". These projects have been scheduled to be completed by 2010.[8]

Table 1 shows that, in line with the purpose of both facilitating transportation to connect the countries in the region and reducing its costs, the agenda is mostly made up of projects intended to interconnect national road networks -paving, duplication, improvements, bridges and border passes- accounting for 74% of the total amount to be invested until 2010. Of this total, 10 projects are underway and tenders for 5 other projects are about to be called for.

If we analyze the projects, we can see that there is a concentration of works connecting Brazil with other economies in the region as well as the Eastern region with the Western region and the Pacific ports, in this case through undertakings in the Andean region. These were undoubtedly two major deficits in the continent's road network. These projects will, therefore, facilitate trade from and to Brazil as well as the transportation of goods manufactured in the production clusters located in the Atlantic region to the Pacific region.

Three concerns may be mentioned in relation to IIRSA's current strategy. In the first place, the high concentration on road transport projects -particularly those located in the Peruvian Andes- is worthy of notice, as there is consensus about the fact that this is not the most efficient cargo transportation alternative. According to Brazilian specialists[9] consulted, maritime transport continues to be the most economical way of carrying products from the Brazilian Atlantic region to the Pacific coast, and that the projects designed to enhance the logistics and operation of Brazilian ports would be more efficient strategies to reach the Pacific region, and even the Asian market. Furthermore, there are doubts as to whether the most efficient way to export farming products from Brazil's western region is through the Pacific ports, when bulk transportation alternatives might be encouraged, at a lower cost per ton, involving the ports located in the Northern region of Brazil, and from there to Asia and the rest of the world.

It should be admitted, however, that on many occasions there are no alternatives to these road projects and that they are nonetheless justified because of the local benefits they generate. This may be the case of connection projects in border regions, linking economic activities on both sides of the frontier.

In the second place, several civil society sectors are worried about the environmental, social or cultural impact of some projects in the IIRSA portfolio. For instance, they are concerned about the fact that certain road projects may contribute to expanding the agricultural zone, thus accelerating or facilitating the destruction of ecosystems.[10]

In fact, many IIRSA projects are still blueprints or are not supported by a thorough study analyzing their feasibility and impacts. It is only natural to expect that a more in-depth assessment will help identify better the costs and benefits. In the opinion of the IIRSA Brazilian coordinator,[11] there is awareness about the concerns of the civil society and an effort is underway to improve project assessments in their different dimensions: logistics, social and environmental impact, and production chain competitiveness.

In the third place, the World Bank [2005] underscores the need to increase maintenance spending in Latin America to repair part of the existing infrastructure and extend the lifecycle of new projects. The organizations that are critical of IIRSA state the need to repair the infrastructure that is damaged before new large-scale projects are implemented. Adequate infrastructure maintenance is an old problem in Latin America. IIRSA idea is to expand infrastructure supply in the sense of facilitating integration. Therefore, it would not be fair to expect IIRSA to find a solution to the chronic lack of maintenance; yet it would be interesting to better integrate the issue of maintenance in its infrastructure supply expansion agenda.

III. Current Deficiencies in Brazilian Infrastructure and PAC Announcements

Due to budget constraints and governance problems, the compliance level of the *Avança Brasil* program was low. After 2003, budget constraints on infrastructure investment were not overcome and the situation remains critical. With the exception of oil and telecommunications, the different infrastructure sectors are undergoing a period of low public investment and legal uncertainty hindering private investment in the sector.

The main infrastructure problems are long-lived: progressive deterioration in the road network; poor quality of port management; delays in the implementation of electric power projects and works; public administration problems in transport, port, environment and basic sanitation sectors, and an institutional and regulatory context that ensures little certainty to private investors.

New problems have arisen lately: the fragility of natural gas supply as a result of the crisis with Bolivia[12] and the air transport crisis, which is not ignored by the airport infrastructure.

In spite of the above-mentioned problems, there are some positive aspects: the approval of the basic sanitation regulatory framework, which will ensure the provision of public sanitation services; the making of the first PPPs by some Brazilian states; signs of improvement in the management of public spending in infrastructure through the Pilot Investment Plan, and, finally, the launching of the PAC, with greater resources allocated to infrastructure and the adoption of a new management and accounting system.[13]

The PAC organized its projects and actions in three infrastructure sectors: logistics, energy, and social and urban infrastructure. Emphasis has been placed on completing projects underway, on rehabilitating existing infrastructure and, just like with the idea of the old "Integration and Development Hubs", on coordinating the implementation of complementary projects so that they may boost their positive development externalities.[14]

For the 2007-2010 period, the PAC has estimated investments for R$504 billion (approximately US$252 billion) which, if distributed in four years, represents an average investment of US$63 billion per year or 3.5% of the gross domestic product (GDP). Not all PAC decisions can be deemed as an addition to the investment that the Brazilian economy is already making, either because some projects are already underway or because the planned investment flows, as in the case of housing projects, are included in the ordinary annual investment that the public sector makes.[15]

More than 50% of the PAC investment amount -around US$135 billion- will be used to fund energy infrastructure projects, basically in the oil and natural gas (US$90 billion) and power generation (US$34 billion) sectors. Social and urban infrastructure projects account for 34% of the expected investment, and logistics works represent approximately 12% of the estimated total (US$29 billion).

It is for this reason that the PAC is focused on energy projects, which reflects, in the first place, the fear that economic growth combined with the recent lack of investment in generation may result in a new electric power crisis in 2009-2010, similar to the one the country faced in 2001. In the second place, the crisis with Bolivia stimulated the search for domestic gas sources and prioritized generation projects that were not dependent upon the Bolivian input (hydroelectric plants). In the third place, it evidences the need for investing in the intensification of oil field prospecting in order to adjust the supply to the future demand that will result from the expected economic growth.

Finally, the focus on energy generation is also associated with financing availability. Petrobras is the major investor in the oil and gas sector, where mechanisms are in place for the granting of concessions to the private sector. In the field of electric generation and transmission the BNDES is expected to provide financing, and Electrobras is expected to take part in PPPs for energy generation purposes.

What is the relationship between the need to invest in domestic infrastructure, particularly in the energy sector, and the proposals to encourage connection infrastructure and to fund regional investment projects in which Brazilian enterprises are involved?

From the viewpoint of the organization of public and private infrastructure investment, there is no contradiction between the two, as both may be deemed to be complementary, particularly in the case of domestic logistic projects and regional connection logistic projects.

It is worth noting, however, that the fact that most PAC investments are concentrated on energy results, in part, from the regional integration difficulties that forced Petrobras to change its investment location decisions and accelerated hydroelectric generation projects in Brazil.

In sum, the fear of a new energy crisis and the urgency to improve domestic logistics, particularly in the areas of roads and ports, should compel the Government to concentrate its efforts and resources on domestic infrastructure.

One additional element may reinforce the present focus on domestic projects, and it has to do with the PAC financing structure. Of the US$252 billion allocated for

investment, only US$34 billion will come from the national budget. The remaining US$216 billion will come from other sources. Publicly owned Petrobras and Electrobras will contribute US$110 billion, and the remaining US$106 billion will be funded by public and private banks.[16]

The main public bank that will provide PAC with funds is the BNDES. However, it is not clear -from the bank's announcements of its involvement in the PAC projects and from the intentions to use the BNDES to finance regional projects- how financing demands and funding availability are to be reconciled. Annually, the bulk of the bank's funding for infrastructure is used domestically, and only a small portion is earmarked to finance construction equipment and services in South America. There will probably be little room to expand financing to South America, and the bank is likely to focus on figuring out how to reconcile the different domestic investment demands for financing.[17]

For instance, in 2006 the BNDES disbursed US$24 billion, of which approximately US$7.9 billion were used to finance infrastructure projects. Assuming that the recent growth in the share of infrastructure in the total disbursed by the bank continues, a total of US$13.5 billion in loans can be anticipated for 2010. Yet such amount is much lower than the financing demands placed on the bank. According to the information available on PAC financial sources until 2010, the BNDES is expected to finance US$2 billion per year in logistics infrastructure. In addition, the Bank will have to help finance around US$8.5 billion in electric power projects and almost US$8 billion in social and urban infrastructure annually.[18]

During its first term, the Lula administration faced budget constraints, prioritized current expenditure, and encountered serious governance obstacles to carry out infrastructure works. This caused a deterioration in the situation of domestic infrastructure and an increase in the supply deficit in various infrastructure sectors (roads, generation, airports). The PAC constitutes an attempt to reduce governance problems, create a better framework to encourage private sector investment and make a more intensive use of the BNDES, as well as of publicly owned companies to guarantee the provision of higher public investment amounts. The domestic dilemmas and the need to make up for the time lost will reduce to a certain extent the effort and attention being given to the regional infrastructure interconnection problems.

IV. Reasons for the Internationalization of Engineering Service Providers

The engineering services sector in Brazil developed a great potential for conceiving and carrying out infrastructure projects. Some of these companies gained part of their experience in projects outside Brazil, and that international activity was instrumental in their development *vis-à-vis* the sluggish growth and fluctuations of the domestic market.

This section will discuss two topics. Firstly, the role that the volatile growth of the domestic demand for engineering services played in the internationalization process undergone by the companies in the sector. Secondly, the role that the difficulties for managing public investment and ensuring the involvement of the private sector played in the investment in public goods.

The Slow Growth and Fluctuations of the Domestic Market as Factors Promoting the Internationalization of the Sector Since the 1980s

What is known as "engineering services" comprise three segments: (a) project engineering, (b) construction, and (c) industrial erection. Typically, firms in this sector operate in more than one segment, so that they are responsible not only for the conceptual development of a project but also for the management, execution and set-up of the works.

Figure 1 shows the monthly output of cement[19] in the last thirty-seven years. Cement is a key construction input and may be deemed as a proxy for the level of construction activity in the country.

The economic expansion in the 1970s made it possible for large engineering firms to attain technological development and increase their production capacity. By the late 1970s, Brazilian engineering firms began their internationalization process by capitalizing on the abilities developed in the Brazilian public investment market and seeking to absorb a portion of large investment projects in Latin America, Africa and the Middle East oil-producing countries.

The early 1980s recession was instrumental in the companies' internationalization strategies. The more than 25% plunge in cement production between 1981 and 1985 serves to illustrate the magnitude of the crisis. When the domestic market contraction became permanent, after 1982, the size that some companies had acquired left no room for minor adjustments to ensure subsistence with what was left of the domestic demand, and forced them to intensify their internationalization efforts. It is then important to highlight the three factors that fostered such internationalization.

Firstly, the financial surpluses accumulated during the previous decade allowed to partially finance the search for new foreign markets. Secondly, thanks to their technical and managerial capabilities, developed in the preceding decade, the capture of markets in Latin America, Africa and the Middle East continued. Finally, the availability of public financing and the existence of public insurance and guarantee mechanisms made it possible for businesses to expand beyond the limits that their self-financing capacity would have imposed.[20]

Between 1985 and 1995, monthly cement production fluctuated between 1.7 and 2.5 million tons, exceeding on few occasions the 1981 record level. The volatility and stagnation of domestic demand reinforced the internationalization process, and at the same time compelled firms to restructure and diversify their domestic activities.[21]

From 1996 to the end of 2002, cement sales recovered considerably, and its production reached between 3.0 and 3.5 million tons per month. This was due to the rise in public investment as compared to its low levels in the first half of the 1990s, but mainly to the recovery of the residential construction sector, propelled by the improvement in the actual income of the population. During this period, cement sales to families grew more than sales to businesses.

Moreover, private investment experienced a recovery, which had a positive impact on industrial erection works. As from 2000, this economic recovery process lost stamina and only in 2002 did a positive trend in cement sales take place as a consequence of the flight of financial assets caused by the increased uncertainty in the political panorama.

From this highly stylized scenario, it becomes evident that the major engineering services firms only partially gained back, between 1996 and 1999, the demand dynamism they had enjoyed in the 1970s. But this recovery had very different characteristics. Firstly, there was an increased share of residential construction undertaken on an informal basis or by homeowners themselves. Secondly, public investment recovered only partially -very far from the levels attained in the 1970s. Thirdly, although private investment opened up new opportunities, the engineering services market had already undergone a transformation with the arrival of multinational enterprises.[22]

As a consequence of the situation described so far, engineering services providers and construction material firms rank among the major Brazilian groups having international investments and operations. Table 2 shows Brazil's seventeen leading multinational groups, seven of which -highlighted on the table- are related to the engineering services, construction, and construction materials sector. Odebrecht, Andrade Gutierrez and Queiroz Galvão are engineering and construction firms. Two groups operating in the cement business -Votorantim and Camargo Correa- decided to internationalize their operations due to the sluggish growth of the domestic market. Two groups are in the construction material business: Gerdau and Tigre. Finally, more than 25% of Gerdau and Odebrecht's income is generated abroad -in fact, Gerdau is Brazil's third largest multinational group in terms of sales volume.

The Slow Evolution of Public-Private Partnerships and Concessions

In the last years, monthly cement production was around the 3 million tons, i.e. below the average levels recorded between late 1997 and 2002. The private construction carried out by homeowners remained the major component of cement demand. As from mid-2005, production witnessed a highly volatile growing trend, as a result of the rise in family income. Only in late 2006 did monthly cement production exceed 3.5 million tons, the peak level during the 1997-2002 period.

Public investment by the Federal Government, already low by the end of President Fernando Henrique Cardoso's Government, remained depressed during First Lula's Presidency (2003-2006). This performance is typically attributed to the need to meet the primary surplus targets. Yet, in the face of increased income, the Government chose to maintain the surplus targets by prioritizing current expenditure and, hence, leaving little room for public investment. This was a deliberate fiscal policy decision.

In 2003, President Lula's Administration seemed to be convinced that the way to resolve the dilemma of investing more in public goods and maintaining the primary surplus -with increased current expenditures- was to encourage the creation of PPPs and grant concessions for certain public goods and services to the private sector, especially roads. Yet, four years later, the Federal Government has not managed to establish any PPP. There are several reasons for this, but it is clear that this situation of leaving little space for public investment, either directly or through different private participation modalities, has exerted additional pressure on the search for external markets by sectoral firms.

One main reason was the delay in the creation of a comprehensive legal and regulatory framework for this type of partnerships. This framework, with all its details, was only finalized in 2007, although from the legal point of view, the Government was prepared to call for tenders since the beginning of 2006.

Throughout 2003, the Government worked on the proposed PPP legislation it subsequently submitted to the National Congress for approval. Due to defects in the bill and the complexity of the subject, the parliamentary debate lasted the entirety of 2004, and the bill was only passed and enacted by the end of that year. Once enacted, its implementation was regulated and decisions were made as to how certain mechanisms, such as the guarantee fund, would work. This process took practically all 2005, a year when governmental actions were very much affected by the political crisis.

One controversial issue regarding the implementation of the law (how to record PPPs' potential liabilities) was only defined by the end of 2006, i.e. one and a half year after the law was enacted. Through a resolution of the National Treasury, it was determined that if a government entity -the national, state and/or municipal government- assumes a certain risk in a project implemented under the PPP modality, the entity must record such obligation as a debt and comply with the limits laid down in the Fiscal Responsibility Act.[23/24]

But not only the definition of the legal-regulatory framework was slow. There were also delays and difficulties encountered in the economic and financial formulation of the projects. This is one of the deficits of Lula's Government in this area.

At the end of 2003, the Government defined 23 projects that could be carried out under the PPP modality, but made very little progress in structuring the economic and financial proposal and model of such projects during the two years that the enactment and regulation of the law took. Consequently, at the end of 2005, the Government only had two projects at a more advanced definition stage, and only then did it begin to work on the financial details of the proposal.[25] Finally, in April 2006 the tender specifications -indeed a pre-requisite for any bidding process- were sent to the National Audit Office (*Tribunal de Contas da União* - TCU).[26] Then, in compliance with the law, it was necessary to submit the bidding specifications to the interested parties' consideration in a public hearing, an event that took place in September 2006, when the Government decided it would call for tender only in 2007.

By December 2006, only four of the 23 projects launched in 2003 were considered a priority, and only one had its feasibility study and economic and financial model completed.[27] Several of those 23 projects were removed to be granted to concession, but the concession process did not make much progress either. The authorities attributed this patent stagnation to the excess of control exerted by the TCU, government attorneys and environmental agencies (Fiocca [2006]).

The third factor that stalled the establishment of PPPs was the ideological disputes within the Government as to whether these partnerships and concessions were really necessary to enhance infrastructure investment. Apparently, those who questioned the need to entrust the private sector with public goods investments demanded extremely high compensation schemes from the private sector in the bidding specifications, which ended up being hardly realistic and attractive for investors and giving rise to permanent debates on the economic and financial parameters of partnerships and concessions. This dispute may be considered another management deficit of the Government in terms of infrastructure investment.[28]

The case of the construction of the North-South railway serves to illustrate the conflict existing within the incumbent administration. In December 2003, this project was given top priority among those to be put up for tender under the PPP modality. Later it was announced that it would be granted in concession, which meant

that public moneys would not have been shared with the private party under the PPP scheme. Between 2005 and 2006, three calls for tenders were made, but they were suspended due to disagreements within the Government as to the economic and financial model (Fiocca [2006]).

A second example is the case of road concessions. After almost seven years of studies and discussions, in November 2006, the TCU approved the conditions to grant concessions for 2,600 kilometers of roads. When everything was ready to call for bids, in January 2007, the Government decided to reconsider the question of tolls as it understood that they rendered the concessionaire excessive yields. The revision of the potential concessionaire's profitability affected the first PPP project, which was ready for execution since its profitability scheme was similar to the one established in the original concession documents. In short, in March 2007, the economic and financial parameters of the first PPP and concessions were again subjected to revision. In July 2007, the TCU approved the new concession specifications, with lower yields and tolls, and the Government announced that by October of the current year the bidding process would be finalized. Moreover, it decided to turn the PPP project into a concession and to reduce tolls after conducting a new study on traffic flow and on the likely reduction of the expected returns.

It is no surprise that, due to the limitations and characteristics of the Brazilian demand for engineering services, the sector's leading firms need geographically diversified markets. This makes these companies' interests be in line with the need to improve and integrate the regional infrastructure. Large firms have the capacity to work in regional projects and this may serve them as the vehicle to stabilize the use of their capacities.

However, financing is a crucial factor in the capacity of businesses to take part in competitive bids for a major infrastructure project. According to a study commissioned by the Ministry of Development, Industry and Trade (MDIC - *Ministerio de Desarrollo, Industria e Comercio*) in 2002, the Brazilian civil construction sector is fairly concentrated in terms of capital volume. In spite of being in a position to compete at the global level, the firms analyzed in this study stated that they needed the financial support of international counterparts. Without such support, their permanence abroad turns out to be difficult.[29] It is here where the role of the BNDES becomes important.

V. The Role of the BNDES in Long-Term Financing and in the Internationalization of Firms in the Engineering Services Sector

Public financing was important in the internationalization of engineering services companies in the past. Today, the BNDES plays a significant role in this process. Indeed, in the last years, Brazilian engineering services firms were awarded the execution of several infrastructure projects in South America as a result of combining their capacities and the BNDES' financial support in project structuring.

The role of financing becomes obvious if we think that in a public work construction project, the construction firm must advance a portion of the wages, the material purchase and equipment rental. The financing needs do not end with the initial advance payments since, on many occasions, as a project progresses, the construction firm may be required to increase its working capital and, in this process, the lending agency plays a central role.

A bank like the BNDES may grant long-term financing under highly competitive conditions, which will be instrumental for the firm's bidding quotation, and therefore,

for improving its position in the project-awarding process. In other words, funding makes the project viable and enables the engineering firm to initiate the works with bridging credit, thus meeting their cash needs until payments are actually received.

The Role of the BNDES in Long-Term Financing

The fact that the BNDES is funded with public resources enables it to structure longer-term operations than those available in the rest of the Brazilian financial system. The Bank's fund structure as of 2006 was made up of contributions from the Unemployment Insurance Fund (FAT - *Fundo de Amparo ao Trabalhador*)[30] (more than 50% of the total); special contributions from the Social Integration Program (PIS - *Programa de Integração Social*) and the Civil Servants' Savings Program (PASEP - *Programa de Formação do Patrimônio do Servidor Público*)[31] (14%); external sources (8%); equity capital (10%) and other minor sources. By the end of 2006, its total assets amounted to US$88 billion and its credit portfolio amounted to US$69 billion.[32]

As mentioned in the third section, the BNDES' annual disbursements totaled US$24 billion in 2004 and experienced a significant rise in the last two years as a result of the bank's enhanced activity and the Brazilian economic recovery that began at the end of 2005.[33]

Figure 2 shows the evolution of the two credit segments in Brazil -the targeted and non-targeted credit segment[34]- *vis-à-vis* the GDP throughout the 2001-2007 period. This Figure further illustrates the BNDES loans as a share of GDP. These account for approximately 5% of the Brazilian GDP and represented between 50% and 60% of the targeted loans in that period. In addition, the Figure shows the recent growth in non-targeted financing, from 15% of the GDP in 2002-2004 to more than 20% of the GDP in 2006-2007.

The average cost of the BNDES' domestic resources is lower than the cost of the National Treasury domestic resources. There are two remuneration rates for the FAT funds transferred to the bank: the long-term interest rate (*Taxa de Juros de Longo Prazo* - TJLP),[35] which is applied in the case of the ordinary or traditional operations funded by the bank (e.g., the financing of purchases of domestic capital goods), and the LIBOR rate plus exchange rate variation for the funding of projects involving the production and marketing of goods intended for the international market. The bank pays a maximum rate of remuneration of 6% on the FAT ordinary resources per year.[36] PIS/PASEP special deposits are remunerated at the TJLP as from the liberalization of the loans granted to final beneficiaries.[37]

The interest rate charged to the borrowers of the BNDES is composed of the bank's financial cost (TJLP or LIBOR + exchange rate variation), a basic rate of remuneration to the bank (up to 3% per year to cover operating expenses),[38] and a credit risk rate ranging between 0.8% and 1.8% per year

Hence, there is a subsidy for borrowers, resulting basically from the difference between the BNDES' long-term financing cost and the same financing provided by the private banking sector or the private securities market. But the fact is that this kind of private market is virtually non-existent in Brazil. When a firm is unable to obtain funds from the BNDES, it must resort to external funding for its long-term operations or give up the idea altogether.[39]

It is possible to estimate, however, the fiscal cost involved in the fact that a public sector asset (FAT) is remunerated below the minimum cost of the public sector's

internal debt. The counterpart of this public sector cost represents a benefit for the private sector, which borrows from the BNDES at the TJLP rate, and is able to lend the Treasury at the SELIC rate, which is higher.

This fiscal cost in terms of the gross domestic product depends on the difference between the SELIC and the TJLP rates as well as on the relation between the FAT assets and the public GDP. The greater the rate difference, the higher the fiscal cost for a given FAT/GDP ratio. In the last years that rate differential has diminished, as compared to the second half of the 1990s, but the FAT assets grew in GDP terms. Table 3 shows Giambiaggi's [2007] calculation of the fiscal cost of the SELIC-TJLP rate difference in the current decade.

The Role of the BNDES in the Support of Engineering Services Exports

In the second half of the 1990s, the BNDES created an export financing system, with different credit lines and conditions. According to the data shown in Table 4, the disbursements made through the various export credit lines between 2000 and 2006 amounted to around US$4.3 billion, with a minimum US$2.6 billion in 2001, and US$6.4 billion in 2006. Although these are significant amounts, when compared to the total annual export figures for the same year, the proportion of BNDES-financed sales was about 5%, with a maximum 6.5% in 2002. You may say, then, that the BNDES financing is not significant for Brazilian exports as a whole, as the sector has other credit lines available. However, BNDES financing may be important for certain types of producers or sectors.[40]

Export credit disbursements account for a little less than 30% of the bank's total disbursements and are distributed in more or less equal parts between pre and post-shipment financing, as shown in Table 5. In the last years, there was an increase in the share of pre-shipment financing in total export credits.

The BNDES' operations to finance infrastructure works abroad are devised as engineering services export operations, under the post-shipment modality. But in the case of these services, financing must comply with certain requirements. Basically, for Brazilian exports of goods to be eligible to be included in the project, they should account for at least 35% of the total financing. This percentage may be lower depending on the profitability of the project, or higher depending on the potential for maximizing the export of goods associated with the engineering project. Basic and detailed engineering projects may be totally financed and may even be considered as exports of Brazilian goods when calculating the required minimum 35%.

The financing cost consists of the basic interest rate plus the commission charged by the BNDES and the financial entity performing the transaction. The basic interest rate is the London Interbank Ordinary Rate (LIBOR) rate in the term of the credit granted by the Brazilian exporter to the foreign importer. The BNDES' Commission is 1% on the financed amount. Credits may be given for a maximum period of 12 years.

The documents that structure the operation must be secured by a banking institution or credit insurance. Recently many credit operations to finance service exports were performed within the framework of the Reciprocal Payment and Credit Agreement (CCR - *Convênios de Crédito Recíproco*). The CCR is a mechanism combining multilateral offsetting with a bridging credit and guarantee system for balances offset among 12 central banks.[41] This mechanism is used to guarantee bank instruments issued by the banks in the countries participating in foreign trade transactions. It offers three

types of guarantees: convertibility, transfer and automatic refund. The CCR makes it possible for the exporter to eliminate trade risk and transform the sovereign risk of the importer's country into sovereign risk of its own country.

In sum, Brazilian engineering services providers can resort to a financing mechanism offered at international costs, for a maximum term of 12 years and with either private or official risk mitigation mechanisms. Table 6 shows the sectoral distribution of export credits in all their modalities.[42]

Construction services received in average between 1% and 1.5% of the credits between 1995 and 2002. In 2003, financing rose to 3% of the total foreign trade, and in 2004 and 2005 its share ranged between 5% and 6%, to drop again to 3% in 2006. The share of construction and engineering services does not compare with the magnitudes of automobile vehicles and transport equipment (airplanes) but their growth in recent years has been really significant.

What construction and engineering service export projects is the BNDES financing in South America? Table 7 shows the main operations already approved in South America, including engineering services and other projects. Loans total US$1.7 billion. None of these projects is included in the IIRSA portfolio. Even though the BNDES has not provided additional information about the nature of these projects, available data -sales of EMBRAER (*Empresa Brasileira de Aeronáutica*) airplanes to TAME in Ecuador, irrigation, harvesters, subways- makes it difficult to classify them exclusively as integration projects, at least in the sense used by IIRSA for the term.[43] Such projects contribute to the improvement of the transport and energy infrastructure as well as to the agricultural development of the countries where the projects are undertaken, but they do not appear to have as their central goal the facilitation of the economic integration of the South American countries.

The BNDES seeks to support construction projects that generate additional exports of Brazilian goods and services. According to a BNDES estimation, the ten greatest endeavors financed by the bank in the areas of energy and transport in the region generated exports for US$287 million for more than 1,600 firms.[44]

Ten engineering services export project are currently being analyzed by the BNDES. As it can be seen in Table 8, of all the projects under study, four belong to the IIRSA portfolio and only one is included in the Implementation Agenda Based on Consensus. The four IIRSA projects are at a very early stage of the process of analysis, as they are at the prospect stage.

The projects whose credits have already been approved and the projects still under analysis are highly concentrated on the energy sector (gas pipelines and hydroelectric works), and this may be associated with the capacities of Brazilian firms, which have greater expertise in this type of projects already executed in Brazil or in their international experiences.

Box 1 presents the example of the financing operation related to the expansion of the San Martin Gas Pipeline in Argentina, a typical export credit for engineering services, associated with the exportation of materials manufactured in Brazil and whose guarantee system was structured according to the CCR scheme.

In sum, the BNDES seems to be acting as an export credit bank that conditions its financing facilities to the use of Brazilian capital goods, making use of the competitive advantages of domestic firms in engineering services provision, and in the machine and equipment manufacturing sectors. However, the evidence gathered

so far indicates that the rationale of the integration projects financed by the BNDES is different from that of the projects in IIRSA portfolio, which are focused on the connection of infrastructure systems. The BNDES works within a shorter-term horizon, funding projects which become immediately mature by generating greater exports of Brazilian machinery and capital goods (for instance, subway cars), while IIRSA projects would not result in higher export rates until roads are completed, new markets are captured or distribution networks are established.

VI. Conclusions

Brazil needs to integrate its infrastructure with the rest of the South American countries and, in turn, each country concerned needs to improve its connections with its neighbors. The integration and development hubs discussed and designed by the Brazilian planning sector in the 1990s were direct predecessor of IIRSA, an initiative put forward by Brazilian diplomacy in 2000 that seeks the integration of different geographic and economic hubs through investments in infrastructure connection and other complementary development actions. Brazilian diplomacy used the vision of its country's planners to devise and put

forward an initiative that met the requirements of Brazil's trade and territorial integration. However, it must be made clear that this initiative flourished because, despite the strong identification to its origin and design, IIRSA expresses a need for all the South American countries.

This paper sought to illustrate the objective convergence of interests between the regional infrastructure integration initiative and the need of firms in the engineering services and construction material sectors to gain international markets, while showing the weaknesses and characteristics of the Brazilian construction industry and its motivations for the internationalization of the companies in this sector.

Domestic demand for engineering services and construction materials experienced slow growth and high volatility rates since the 1980s, compelling Brazilian firms in the sector to seek access to new foreign markets and settle abroad to offset domestic difficulties. Among Brazil's 17 leading internationalized economic groups, seven of them are engineering services companies, cement firms and construction material manufacturers. In recent years, there has been no improvement in the areas of investment in public goods and large engineering projects in Brazil, circumstances that have added further pressure to this search for external markets.

The BNDES has recently contributed to the development of this convergence of interests between the integration initiative and the companies' needs by financing the exporting effort of Brazilian engineering services firms and their suppliers, who are taking part in infrastructure works in the region. The financed amount is a small portion of the bank's export credit portfolio and most of those projects are more geared to attain internationalization than connection. The evidence gathered about the BNDES's role seems to suggest that regional infrastructure integration is subordinated to the more general strategy of supporting the exporting and internationalization effort of firms in the sector.

If we analyze the announcements made within the framework of the PAC, it appears that the incumbent Government's priorities seem to be redirected towards investment in domestic public goods (energy and, to a lesser extent, roads). The

implementation of the PAC may result in the decision to give less priority to Brazil's regional integration. The reasons for this reordering of priorities may be found in the need to carry out electric power generation projects in order to avoid an energy crisis in the near future, and to seek domestic gas supply sources in order to reduce the country's dependence on the product from Bolivia, which has become a riskier source.

If progress is made in the implementation of the PAC, there will be an excess of demand for BNDES funds. Given the reorientation of investment towards domestic objectives, the BNDES's future financing should focus on infrastructure and public goods projects in Brazil. As a result, the funds to support engineering and infrastructure connection projects should be subordinated to the central priority, i.e. invest within the Brazilian territory.

For Brazil, infrastructure integration in South America has another component: the search for and prospecting of oil and, mainly, gas reserves. Petrobras has been actively involved in this endeavor since the mid-1990s by expanding its regional investments in the production of oil and gas and, to a lesser extent, in the production of other energy resources, oil refining and by-product distribution.

For future analysis of infrastructure integration in South America, it seems necessary to study Petrobras' internationalization strategy in the region from a perspective similar to the one adopted in this paper. Undoubtedly, the company succeeded in diversifying its operations and in securing, in the past, the supply of gas to Brazil; however, the difficulties that arose with the supply of Bolivian gas seem to have raised new concerns about the future strategy of Brazil and the company in this field.

Notes

[1] During the last two years, a great diversity of subjects has been added, and the predominance of the trade dimension in the negotiations aimed at defining the thematic agenda of this integration project has become diluted.

[2] In 1993, Brazil boosted the building of a South American Free Trade Area (ALCSA - *Área de Libre Comercio Sudamericana*). In 2000, the first South American presidential meeting was held, and it is within that context that the infrastructure integration project was launched through the IIRSA initiative. Such initiative is intended to develop the region's transport, energy and telecommunications areas. Since its inception, IIRSA has had the formal support of the Inter-American Development Bank (IDB), the *Corporación Andina de Fomento* (CAF), and the Financial Fund for the Development of the Rio de la Plata Basin (FONPLATA). At present, in addition to these institutions, the Brazilian Development Bank (BNDES - *Banco Nacional de Desarrollo Económico y Social*), a Brazilian public banking institution, deems the initiative to be a priority and is willing to earmark funds to finance projects contemplated in the same.

[3] This article draws on, and enlarges on, the arguments contained in Iglesias [2008].

[4] José Silveira served as Strategic Planning and Investment Secretary of the Ministry of Planning during President Cardoso's administration.

[5] Nine hubs were identified: Northern Arch, *Madeira-Amazonas, Araguaia-Tocantins*, West, Trans-North-eastern, *São Francisco*, Southeastern, South West, and Southern. According to the President's Address to Congress [2002], public and private investments worth US$137 billion were planned for the 2000-2007 period.

[6] Some examples are the choice of the railway gauge in border areas and the delays in building border bridges linking Argentina and Brazil.

[7] This statement makes it clear that the goal of overcoming border connection and national system interconnection problems was central, but not the only one. It was initially proposed to replicate for IIRSA the same objectives that had guided the definition of the integration and development hubs in Brazil. Later in his speech, Minister Tavares suggested using the same methodology as the one applied in the definition of hubs in Brazil and in the organization of the *Avança Brasil* program -i.e., "conducting studies and debating their outcomes with the society, encouraging private investment decisions, seeking institutional and legal improvement and putting in place an efficient and transparent public governance and management" (Tavares [2001]).

[8] IIRSA, like *Avança Brasil*, has established a project classification system under which projects are grouped by integration hubs, i.e. geographic or economic areas that would have greater development prospects by working on an integrated basis.

[9] Interview held with the infrastructure coordination board of the Brazilian National Industry Confederation.

[10] The Lima Declaration of July 2005, signed by a group of 29 South American, European and American civil society organizations, highlighted several controversial aspects of IIRSA. These organizations make up the IIRSA Articulation, a group of non-governmental organization

(NGOs) dedicated to exchanging information and promoting civil society engagement around IIRSA initiative. To these organizations, many of IIRSA's projects are located in areas of great natural wealth and high biological and cultural diversity. There are doubts as to whether these projects will help to integrate their people or, contrarily, will adversely affect them by impacting the ecosystems on which they depend (BIC [2005]).

[11] Presentation by the IIRSA Brazilian coordinator at the Brazilian National Industry Confederation, August 15, 2006.

[12] Nearly one half of the domestic supply of such product comes from Bolivia. The crisis resulting from the decision to nationalize Bolivian gas threatens the supply of natural gas and reinforces the need to seek alternative supply sources and adopt a new legal framework for the sector that may attract new investments since the gas sector, according to specialists, lacks a regulatory framework that organizes the market, sets the conditions for the various uses of the product and promotes the involvement of the private initiative in the different services of the gas production chain.

[13] The creation of a Managing Committee, which is to back and monitor investments, as well as the obligation of the Executive Branch to render accounts every four months to society are very positive steps in terms of public investment management.

[14] In addition, the PAC has a wide-ranging legislative agenda including measures intended to reduce the current expenditure on the public sector, limited tax allowance on capital goods purchased to carry out infrastructure works, and several legislative reforms that would foster infrastructure development, such as a new regulatory framework for the natural gas sector, a regulatory framework providing for the competence required at the different public administration levels in environmental matters, and improvement of the legislation regarding regulatory agencies.

[15] The Government estimates that the PAC will be able to raise the investment rate by one percentage point of GDP in 2007 to 22%, and expects that rate to be 25% of the GDP in 2010.

[16] Actually, the PAC identifies a series of investments that should be privately funded through PPPs, concessions and other mechanisms.

[17] One of PAC measures was to tone down the bank's lending conditions by extending the grace as well as the loan repayment periods.

[18] The BNDES authorities are aware of the dilemma they will have to face in the future. The bank's financial director announced that there will be a US$1.5 billion excess demand for funds in 2007. For this reason, among other strategies, the bank will reschedule an issue of external bonds maturing this year and funds in the international market again as from next year (Valor Econômico, August 23, 2007).

[19] To soften its fluctuations, the value of the month is equal to the moving average for the last three months.

[20] Actually, public insurance and guarantee mechanisms were more significant in the mid and late 1970s than in the 1980s.

[21] Some leading companies shifted to other production segments.

[22] It is worth noting that, as from 1995, as a result of the constitutional reforms proposed by the Cardoso administration, foreign companies are allowed to take part in bids for public works.

[23] This accounting methodology will be compulsory (a) if the public partner receives more than 40% of the expected income or (b) assumes more than 40% of any contingent additional cost of the project, or (c) pays more than 40% of the contract consideration.

[24] In January 2007, the National Audit Office (*Tribunal de Contas da União* - TCU), the administrative and legal audit agency of the Executive Branch, determined that the National Treasury Secretariat's resolution was legally defective and had to be modified.

[25] According to news reports, in January 2006, the federal project that was to be put up for tender under the PPP modality -two federal highway sections in the state of Bahia (BR 116 and BR 324)- was being analyzed by the Ministry of Planning, the BNDES and the International Financial Corporation. The other project, declared to be of governmental interest, was the *Pontal* irrigation project, located in *Petrolina* (state of *Pernambuco*).

[26] The TCU revision was delayed and the bidding specifications were approved in July 2006.

[27] A technical deficit example may be found in the federal government's executive order of 2006, which authorizes the private sector to submit PPP studies. Should the studies be satisfactory, the entity that conducted the studies is to be paid by the winning bidder.

[28] According to press reports available, the debate focused on the toll or subsidy ceilings, which had to be expressly stated in the bidding specifications, on the basis of which interested firms had to make their bidding proposals. Additionally, there was the concern that the dispute would not result in a sufficient reduction of toll values, due to the participating firms' propensity to collude.

[29] Of the 150 firms with some foreign market experience analyzed in this study, only two had constant presence abroad (MDIC [2002]).

[30] The Constitution mandates that at least 40% of the FAT funds must be earmarked for the BNDES employment generation projects in Brazil. The remaining 60% must be used for unemployment insurance funding. In 2006, 54% of the bank's capital consisted of FAT funds. This fund is made up of two contributions: the PIS, which is calculated on sales of private firms and on payroll; and the PASEP, which is calculated on the federal, state and municipal government revenues.

[31] The results of the financial applications of the FAT are the fund sources of these special deposits, which are allocated to finance BNDES-administered employment promotion programs.

[32] "*El apoyo de Brasil a los proyectos en Sudamérica*" a BNDES' presentation at IIRSA meeting held in July 2007 (*http://www.iirsa.org*).

[33] The value in US dollars of disbursements also grew as a result of the appreciation of the domestic currency.

[34] Targeted funds implies that they are allotted to a given use, such as the loans for housing or for the purchase of capital goods, which is the BNDES' main activity.

[35] The TJLP is lower than the SELIC rate, which is the basic rate used as a reference for the monetary policy as well as the minimum rate paid by the Treasury in connection with domestic funds.

[36] The difference between the effective annual TJLP and the 6% per year is capitalized into the outstanding balance owed by the bank to the FAT.

[37] Non-allocated special deposit resources are remunerated at the SELIC rate.

[38] When private banks act as financial intermediaries, this 3% is the intermediation commission for the private institution.

[39] In spite of the lack of a domestic long-term credit market, not always is there excess demand for the BNDES funds. When this is the case, the bank gives preference to the most profitable transactions until its lending capacity becomes exhausted. Any profitable project approved but not financed in a given period is given priority in the subsequent period.

[40] Private banks offer short and mid-term pre-shipment credit lines, and large exporters, who have very good credit ratings, have access to long-term facilities structured on the basis of their revenues from foreign sales. In 2002, private trade financing was substantially reduced, as well as other foreign sources of financing to Brazil. The BNDES acted in order to offset the lower supply of financing from private lenders.

[41] All Latin American Integration Association (ALADI - *Asociación Latinoamericana de Integración*) members participate in the CCR excluding Cuba and the Dominican Republic.

[42] This shows the total distribution of export credits. No data was available on the sectoral distribution of post-shipment finance.

[43] Some of them, like the Caracas Line 4 Subway were already being financed since 2001.

[44] Statement by the BNDES Foreign Trade Superintendent (Globo, August 6, 2006).

Box 1

Expansion of Gas Pipeline Capacity in Argentina. San Martin Pipeline. *Transportadora de Gas del Sur*

The BNDES approved a credit for up to US$237 million for exports of Brazilian goods and services to Argentina, for the project aimed at expanding the natural gas transport capacity of *Transportadora Gas del Sur* (TGS) a subsidiary of *Compañía de Energía S.A.*, in which *Petrobras Energía S.A.* (PESA), a subsidiary of *Petrobras Argentina*, owns an interest. The expansion of the transport capacity of TGS will result in enhanced gas and electricity supply to the Buenos Aires region.

More than 80% of the BNDES loan will be allocated to the services involved in the project of *Constructora Norberto Odebrecht* (CON) as well as to the construction equipment and material. The remaining percentage will be used to acquire the pipes manufactured by CONFAB. The credit is given to the Brazilian firms in the supply credit modality, and a special corporation was created in Argentina to assume the counterpart entry for the materials and services used in the construction.

The loan is given under the terms of ALADI's CCR. The CCR provides for the offsetting of payments resulting from export and import operations among countries in the region. The Brazilian Government suspended the use of this mechanism in 2000, a decision that obstructed the financing of export operations, thus increasing the risk of the countries in the region.

Table 1

IIRSA Projects – Their Nature and Amounts Implementation Agenda Based on Consensus

Sector	Sub-Sector	Number of Projects	Estimated Investment (US$ Million)
Transport	Roads	16	4,629.4
	Bridges	6	102.3
	Border Passes	3	10.7
	Railroad	2	551.0
	Waterways	1	108.0
Energy	Gas Pipeline	1	1,000.0
Communications	Miscellaneous	2	2.2
Total		*31*	*6,403.6*

Source: IIRSA.

Table 2

Brazil: Major Multinational Firms and their Foreign Operations, 2004-2005

Firm	Sector	Sales (US$ millions)	Operations in Regional Markets [a]					Internationalization Category [b]		
			LAC	NA	EU	AP	OTH	(>50%)	(>25<50%)	(<25%)
Petrobras	Oil	40,763	x	x	x	x	x			x
CVRD	Mining	10,377	x	x	x	x	x			x
Gerdau	Iron and Steel	7,383	x	x	x				x	
Usiminas	Iron and Steel	4,607	x							x
Embraer	Aircraft	3,854		x	x	x				x
CSN	Iron and Steel	3,692		x	x				x	
Camargo Corrêa	Cement & Textile	2,796	x							x
Norberto Odebrecht	Engineering & Construction	2,205	x	x	x	x	x	x		
Votorantim Cimentos	Cement	1,733		x						x
TAM	Air Transport	1,703	x							x
Andrade Gutierrez	Engineering & Construction	1,372	x		x	x	x			x
Klabin	Paper & Cellulose	1,028	x							x
Weg	Engines	830	x		x	x			x	
Queiroz Galvão	Engineering & Construction	---	x					---	---	---
Marcopolo	Vehicle & Auto Accessories	605	x		x	x	x		x	
Tigre	Pipes & Connections	437	x				x			x
Sabó	Auto parts	---	x	x	x				x	

Notes: [a] LAC = Latin America and the Caribbean; NA = North America; AP = Asia Pacific; EU = Europe; OTH = Others.
[b] Calculated as a percentage of turnover (or payroll) of subsidiaries abroad.
Source: ECLAC [2006].

Table 3

Fiscal Cost of the SELIC-TJLP Difference

Year	(% of GDP)
2000	0.2
2001	0.3
2002	0.3
2003	0.5
2004	0.3
2005	0.5
2006	0.4

Source: Giambiaggi [2007].

Table 4

BNDES Export Credits

Indicators	2000	2001	2002	2003	2004	2005	2006	2007-07 (until July inclusive)
Brazilian Exports (US$ billion)	55	58.2	60.4	73.1	96.5	118.3	137.47	87.3
BNDES Export Finance Disbursements (US$ billion)	3.1	2.6	3.9	4	3.9	5.9	6.4	2.4
BNDES Export Disbursem/ Brazilian Exports (%)	5.6	4.5	6.5	5.5	4.0	4.9	4.7	2.7
BNDES Export Disbursements/ Total Disbursements (%)	24.5	23.5	31.5	33	27.9	29.6	26.6	15.4

Source: BNDES (*http://www.bndes.gov.br*).

Table 5

Export Financing Facilities - Amounts
US$ million

Export Support Modalities	2000	2001	2002	2003	2004	2005	2006	2007 (until July inclusive)
Pre-Shipment	810	410	67	1,407	1,578	2,953	3,959	2,057
Short-Term Pre-Shipment			634	90	15	82	50	29
Special Pre-Shipment	494	559	577	485	328	131	506	183
Post-Shipment	1,779	1,633	2,670	2,025	1,940	2,697	1,863	141
Total	*3,082*	*2,602*	*3,948*	*4,007*	*3,861*	*5,863*	*6,377*	*2,409*

Source: BNDES (*http://www.bndes.gov.br*).

Table 6

Sectoral Distribution of Export Credits
Percentage

Year	Total (US$ thousand)	Food & Beverage	Basic Metallurgy	Metal Products	Machinery	Electrical Material & Machinery	Automobile Vehicle	Other Mat. & Equipemnt Material	Construction	Remaining Sectors
1995	368.90	0.1	2.3	5.0	51.0	13.3	23.7	2.4	0.1	2.3
1996	402.60	0.2	0.7	7.7	39.2	16.3	26.1	0.0	1.1	9.9
1997	1,209.70	15.9	1.7	1.4	17.9	4.0	5.5	39.4	0.1	14.2
1998	2,091.60	5.3	1.6	1.5	16.9	2.1	8.5	48.1	1.5	16.1
1999	2,091.50	9.4	9.4	2.5	8.8	1.5	7.6	39.2	1.5	21.6
2000	3,076.40	7.9	6.8	0.5	6.6	4.0	12.6	46.9	1.1	14.8
2001	2,602.20	16.8	2.3	0.7	5.2	2.1	7.1	53.9	1.7	11.8
2002	3,946.20	11.3	1.5	1.5	5.4	0.9	4.1	59.4	1.0	16.0
2003	4,005.90	8.1	0.7	0.9	2.6	0.7	19.4	48.5	3.0	19.1
2004	3,861.00	6.2	1.0	0.3	5.3	1.2	20.5	53.2	5.9	12.3
2005	5,861.90	3.0	1.4	0.4	11.3	2.3	27.6	40.9	5.0	13.0
2006	6,376.40	6.1	0.3	0.2	10.7	3.2	31.1	27.9	2.8	17.7
2007 (until July inc.)	2,409.00	6.0	0.0	0.8	13.2	4.1	26.5	25.4	2.6	21.3

Source: BNDES (*http://www.bndes.gov.br*).

Table 7

BNDES Financed Projects in South America Exports of Engineering Services and Others

Country / Project	Financing in US$
Argentina	516,000,000
TGS - San Martin Gas Pipeline	200,000,000
TGN - Norte Gas Pipeline	37,000,000
Albanesi - Gas Pipelines	279,000,000
Chile	208,000,000
Santiago Subway Expansion	208,000,000
Colombia	28,000,000
Transmilenio Transport System	28,000,000
Ecuador	511,565,000
Embraer Airplanes for TAME	61,600,000
San Francisco Hydroelectric Plant	242,965,000
Manabi Irrigation	113,000,000
Tabacundo Irrigation	64,000,000
Interoceanic Highway	30,000,000
Paraguay	77,000,000
Highway 10	77,000,000
Uruguay	29,000,000
UTE Transmission Line	3,000,000
Maldonado Irrigation	26,000,000
Venezuela	326,400,000
La Vueltosa Hydroelectrical Plant	121,000,000
Caracas Subway, Line 4	107,500,000
Caracas Subway, Line 3	78,000,000
Corn & Cattle Prod. Upgrade / Fondafa II	19,900,000
Total	*1,695,965,000*

Source: BNDES [2005].

Table 8

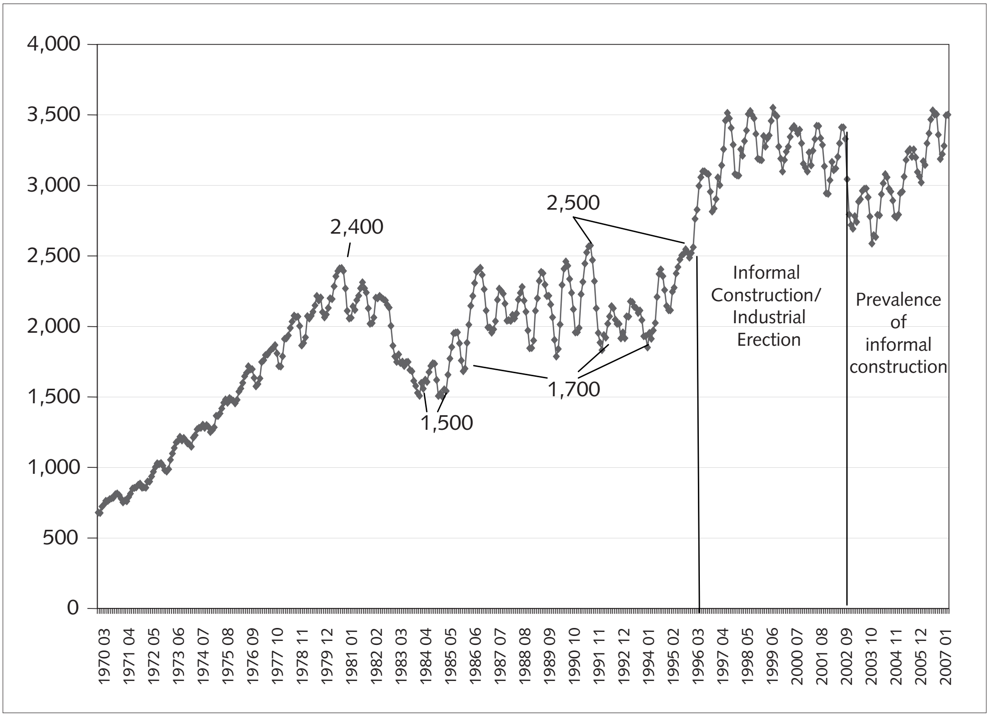
Engineering Services Export Projects to be Approved by the BNDES South America

Country/Project	Stage	IIRSA
Argentina		
TGS - San Martin II Gas Pipeline	Structured	
Santa Fé Aqueduct	Structured	
Central Trans-Andean Railway	Prospect	Yes
Northeast Gas Pipeline	Prospect	Yes / Agenda based on Consensus
Ecuador		
Toachi Pilatón Hydroelectric Project	Structured	
Tena Airport	Prospect	
Colombia		
Meta River Waterway Complex	Prospect	Yes
Peru		
Paita-Yurimaguas Highway	Prospect	Yes
Venezuela		
Tocoma Hydroelectric Project	Structured	
Orinoco River, Third Bridge	Prospect	

Source: CNI [2006].

Figure 1

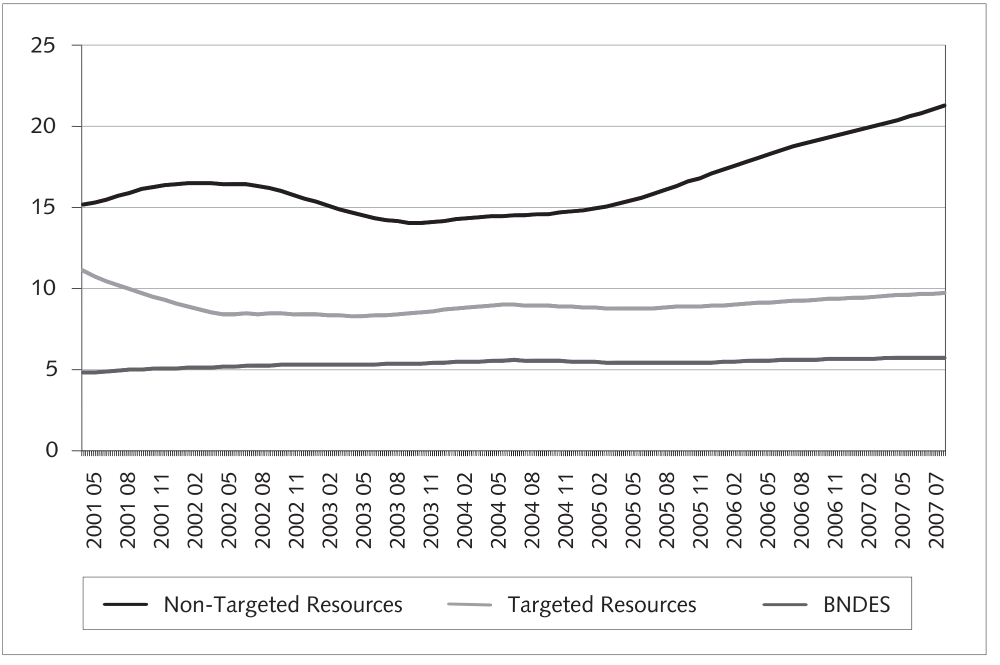
CEMENT PRODUCTION (THOUSAND TONS) 3-MONTH MOVING AVERAGE



Source: Prepared by the author based on data from the National Workers' Union of the Cement Industry (SNIC - *Sindicato Nacional de la Industria del Cemento*).

Figure 2

Structure of Loan Operations in Brazil (% of GDP)
12-Month Moving Average



Source: Brazilian Central Bank.

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Contents

The Infrastructure Integration in South America: The Case of Chile

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Summary

This paper intends to explain the reason for Chile's participation in the Initiative for the Integration of Regional Infrastructure in South America (IIRSA). The hypothesis is that, even though the Chilean strategy on commercial policy prioritizes exports to the main centers of world demand, the main suppliers of Chilean imports are its neighboring countries; therefore, intensifying commercial relations and improving physical infrastructure with the region would justify its participation in IIRSA. Likewise, the study encompasses an analysis of the Chilean commercial strategy, the provision of physical infrastructure for its integration as well as its institutional framework; whit the purpose of observing the impact and affinity of Chile's foreign policy with respect to the proposal made by IIRSA, thus generating a discussion stage that embraces the relations, interests and strategies of the players involved in this initiative.

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I. Introduction

During 2004 and 2005, within the framework of the political Statements made in the meetings of the Community of South American Nations (CSN - *Comunidad Sudamericana de Naciones*), a wide variety of projects to strengthen the South American integration were discussed and prioritized in order to optimize trade and overcome obstacles to the development of the countries of the region. Against this background, the proposal was to implement those infrastructure projects based upon integration hubs structured through

the multinational forum of dialogue called Initiative for the Integration of Regional Infrastructure in South America (IIRSA - *Iniciativa para la Integración de la Infraestructura Regional Suramericana*).

This paper arises as an attempt to explain the sense of the Chilean participation in this Initiative. The hypothesis is that, despite their strategy of commercial policy that prioritizes the export towards the main centers of world-wide demand (Asia, European Union -EU-, United States -US-, etc)., the fundamental suppliers of the Chilean imports continue being their neighboring countries and therefore, to intensify the commercial relations and to improve the physical infrastructure with the region would justify its participation in the IIRSA. In this sense, this study aims at observing the impact and affinity of the Chilean foreign economic policy in terms of the strategy advocated by IIRSA, thus resulting in a debate scenario that includes the relationships, interests, and strategies of the players involved in this initiative.

The paper layout consists of three sections. Section II offers an insight of the Chilean commercial strategy and a framework of the physical infrastructure in Chile. For such purpose, basic statistical data of the Chilean foreign trade is provided in the first place. Below, there follows an overview of the Chilean infrastructure provisioning in the airport, port, road, and railway sectors, to further focus on the dynamics of IIRSA's projects in Chile.

In Section III, we study the institutional framework for the infrastructure, including the regulatory changes in the country and their impact on the policy and privatization decentralization process through the concession and public-private partnership (PPP) financing system for public infrastructure. Then, there follows the role of the different players: the State, the private sector and the multilateral lending agencies.

Section IV consists of an assessment of the interaction among the different interests of national players in Chile under IIRSA: the government, companies and civil groups. Furthermore, some regional debates are addressed, relative to the impact of certain policies on integration partners.

Finally, Section V provides an outline of the final comments and conclusions.

II. Commercial Strategy and Physical Infrastructure in Chile

Chilean International Trade. Basic Statistical Data

The 1990s saw an export boom in the region. Latin American trade expanded by an annual average of 10%, greater than the world average (Inter-American Development Bank -IDB- and World Bank). Since the beginning of last decade, and until today, the Chilean governments (1990-2005) placed a priority on increasing the Chilean economy's links to the world. Official speeches emphasized the importance of the export sector and its role as an engine of growth, and this was translated into maximizing the number of free trade agreements (FTAs) and attracting the greatest number of foreign investors (Economic Commission for Latin America and the Caribbean - ECLAC).

Considering basic data about the Chilean international trade structure, exports as a proportion of gross domestic product (GDP) grew from 16% (1970) to 23% (1990), and then to 35% in 2005.

Imports and Exports by Region

Encouraged by the price increase of major raw materials, Latin American exports boomed during 2004 and 2005. Intra-subregional trade flows in the various integration

blocs increased at higher rates than extra-regional exports; however, intragroup trade is still limited compared to that of other regions worldwide (Asia or Europe). The case of Chile shows such behavior. (Table 1).

The total exports of Chile in 2005 were almost US$38.540 billion -nearly 35% of GDP-, representing a 110% increase compared to the year 2000. The relative weight of exports to trading partners was Asia (36.2%), EU (23.5%), North American Free Trade Agreement (NAFTA) (23.1%), Southern Common Market (MERCOSUR - *Mercado Común del Sur*) (6.4%), Andean Community (CAN - *Comunidad Andina de Naciones*) (5.1%), Africa and the Australian Continent (0.3%); whereas 5.1% was absorbed by other destinations. During the 2000-2005 period, the blocs that most actively absorbed Chilean exports were Asia (150%) and NAFTA countries (120%), whereas the MERCOSUR was the destination with the lowest increase (40%), even below Africa (50%). In addition, both the US and Brazil account for nearly 70% of Chilean exports targeted to NAFTA and MERCOSUR countries, respectively. It should be noted that during the five-year period under analysis, Paraguay was the only destination where the traded value of Chilean exports went down (-10%), while Canada was the destination with the greatest traded value increase (340%). (Table 2).

The total imports of Chile in 2005 were almost 29.840 billion dollars, representing an increase of 0.8% compared to the year 2000. The relative weight of imports from trading partners was MERCOSUR (29.5%), NAFTA (19.7%), Asia (19.3%), EU (16.8%), CAN (6.4%), Africa (5.4%), Australian Continent (0.7%); whereas 2.2% corresponded to other origins. Unlike exports, the hike in imports to Chile during 2000-2005 was more uniform among regions providing them, almost doubling in Asia, CAN and MERCOSUR and going up to 70% in the EU. A note should be made of the increase of imports from Africa to Chile (210%) during the period under analysis -even if the traded value is still insignificant within total imports-and the lower relative growth of imports from NAFTA countries (30%).

During said period, the US accounted for over three fourths of imports to Chile from NAFTA countries, and within the MERCOSUR, Argentina was Chile's major import provider (61%). It should be noted that during the five-year period under analysis, Venezuela and Canada were the only countries of origin of imports to Chile that had a lower traded value, going down to 40% and 20% respectively, whereas Peru was the country of origin where the traded value increased the most (330%).

As we have seen, overall traded values went up, but given the low relative share of intragroup trade, we might say that both Chile and the other countries in the region failed to gain enough advantage of the resulting room left by intrasubregional tariff preferences to boost their exports. Several reasons explain this performance. On the one hand, Chile's international economic policy is substantially different from that implemented by most countries in the region since the country has focused on a strategy that is more related to the concept of "open regionalism". For practical purposes, this means that Chile makes an effort to integrate with major worldwide demand and consumption economic centers in order to diversify its foreign trade among the US, the EU, Southeast Asian countries and Latin America. At the same time, this reflects a composition of exports case: the main export of Chile remains copper and other minerals,[1] and it is a fact that South America isn't a big consumer of this metal because it doesn't have such industrial needs, contrary to East Asia or North America. On the other hand, the failure to make good use of trade potentialities provided by such integration is also a result of institutional and macroeconomic coordination deficiencies and inadequate connectivity and infrastructure.[2] This last aspect has a significant impact on transportation costs, increasing the final price of any traded products and reducing traded flows.[3] Infrastructure and transportation service improvements are a crucial factor

to effectively integrate the regional territory and contribute to development and insertion at a global level.

As previously mentioned, even though Chilean exports to South America are of a relatively low importance, it is worth mentioning that, in contrast, MERCOSUR is the major imports supplier in this country (about 30%). In this sense, it becomes of great importance to deepen the integration bonds between Chile and the region, especially in the reduction of trade barriers and the decrease of infrastructure bottlenecks.

Imports and Exports by Product Groups

As regards the structure of foreign trade, we can see that the average composition of Chilean exports in the 2000-2005 period was headed by mining (47.4%), followed by industry[4] (43.4%) and then farming, forestry and fishery (9.2%). (Table 3).

Even though mining is certainly the main sector within Chilean exports, it should be noted that copper accounted for, on average, approximately 88% of mining exports and 42% of total exports by Chile during the period. However, it is important to mention that despite the essential relevance of copper in Chilean exports, its share in exports has fallen over the past few decades. There has been a healthy diversification in the basket of exported goods. Before 1970, it was believed that only copper had comparative advantage; it made up 80% of exports in 1970 but had decreased to less than 40% at the turn of the century (2001). Its share rebounded in 2005, growing to 47.1%. The share of copper in total mining exports also fell from 91% in 2000 to 81% in 2005.

In the export composition by markets, Chile exports to Developed Countries around 60% of natural resources, 35% of processed natural resources, and 5% of other industrial products. Exports to Latin American countries are 35% natural resources, 35% processed natural resources, and 30% other industrial products.

Most imports, instead, are industrial products. The average composition of imports during 2000-2005 shows that 61.7% were Intermediate Goods, 21.3% Capital Goods, and 17% Consumer Goods (Table 4). It is important to mention that the agricultural protectionism of Chile, by different barriers, discourages this last kind of imports from MERCOSUR.

Imports and Exports by Mode

Total exports in 2000 were US$17.902 billion[5] and they represented 16,577,000 tons. Total imports, instead, were 16.831 billion and represented 16,994,100 tons. The sea and river modes accounted for 84.7% of total export value and 68.4% of total imports by Chile. The air mode comes second, with 9.1% of export value and 16.9% of imports, followed by transportation by road (5.7% and 10.2%), railway (0.3% and 0.4%), and other modes (0.2% and 4.1%). (Tables 5 y 6).

If figures are considered in tons exported by Chile only to Latin American and Caribbean countries, the amount is 4.6 million tons.[6] In this case, the sea and river modes of transportation continue to account for the greatest share (78%), but they are followed by the road mode of transportation (21%), and finally the railway and airborne mode, which have lower concentrations (the remaining 1% is distributed among them). Regarding the imported tons by Chile only from South America,[7] the sea and river modes (56%) stand out, followed by the road mode (43%).

Considering imports, it should be emphasized the important role played by pipelines in order to introduce fuel into Chile. The production of oil and gas is not enough

to satisfy the annual needs of the country, so the rest is principally imported from Argentina through pipelines. According to data of the Chilean National Commission of Energy, during the year 2000, the main hydrocarbon imports of Chile were: crude oil (10.8 million of m^3), natural gas (4.5 million of m^3) and liquefied gas (1.2 million of m^3).

As regards transportation, the dynamism of trade productive activities in Chile implies a growing demand of port, road and railway infrastructure. Taking into account the main sectors of international trade, the use of cargo transportation depends on the type of production. The non-metalic mineral sector, which is not so relevant in terms of value but it is significant in terms of export load volume, makes an intensive use of ports and sea transportation, and depending on transportation cost fluctuations, it also uses domestic cabotage and railway transportation. In the metal mining sector, nearly all copper production and copper by-products are oriented to exports, which are shipped from ports located in Regions I and VI, whereas iron, the second largest metal produced domestically, is hauled to ports by railway. Large cargo volumes from the industrial sector, which accounts for most Chilean imports (mainly oil and by-products, natural gas, liquefied petroleum gas and methanol), are hauled through ports -particularly, bulk liquid sea transportation- and to a much lesser extent by road and railway. Most oil and natural gas imports come from Argentina, Chile's MERCOSUR partner, facilitated by the existence of gas and oil pipelines.

Given the steady increase of cargo volumes, an efficient infrastructure and transportation system is needed to meet such transportation load. As noted by Figueroa and Rozas [2005], most infrastructure requirements indicated in the Lead Program of the Ministry of Transportation are related to road and port planning to meet the needs of traded cargo flows. Failure to address such demands would entail a risk for the Chilean economy process of insertion at a regional and global level.

Provisioning of Infrastructure in Chile for Regional Integration

According to the Report on Global Competitiveness 2006-2007 of the World Economic Forum, which assesses the general infrastructure sufficiency of 125 countries in the world, although Chile ranked 35th,[8] it managed to be ahead of the 20 Latin American and Caribbean countries (Considering the Global Competitiveness General Index, Chile is in the 27th position).[9]

Over the past decade, Chile went through a strong internationalization process, based on the accelerated economic growth, strengthened competitiveness, and the export sector boom. Therefore, it became necessary to invest in port, airport, and road transport infrastructure to improve connectivity, enhance relationships with MERCOSUR partners, and boost Chile's insertion in the world. In this regard, significant progress has been made in terms of both physical and international integration, mainly in border crossing improvement and paving, as well as in port and airport investment.

In the airport sector, Chile features a network of 9 concessioned airports, with a US$300 million investment. By year 2004, air traffic amounted to 6.2 million passengers and 306 thousand tons[10] (80% international cargo and 20% domestic cargo). Almost all international cargo is hauled through Airport *Merino Benítez*, in *Santiago*. Moreover, very little international involvement is evidenced in the Airports of *Iquique*, *Punta Arenas, Isla de Pascua* and *Arica*. A concession system helped achieve significant progress in the sector and build new airport terminals. Overall investment in international airports over the past

decade evidences a 16.4% increase against the 1980-1989 period. The Ministry of Public Works (MOP - *Ministerio de Obras Públicas*) plans to complete a highly efficient airport network based on concessions and public investment.

The port sector has provided for management autonomy, including the private sector in new investments. The sector tripled its capacity between 1990 and 2001. The most significant works of this decade were the improvements in the ports of *Valparaiso* and *San Antonio* in Region V, the enlargement of the port of *San Vicente* in Region VIII, and the new port of Punta Arenas in Region XII. The overall investment in ports over the past decade is tenfold higher than that in the 1980-1989 period. Chile has 10 State-owned ports for public use and 25 private ports (15 for public use and 10 for private use). In 2004, the tonnage hauled through Chilean ports amounted to 64 million tons, approximately,[11] (65% exports, 35% imports). It should be noted that, to a certain extent, Chile lies in geographic isolation from its main markets and, thus, sea transportation accounts for a large share of its exports and imports (cars, capital goods, and oil), which pile up in ports and create bottlenecks. On the other hand, Chile has few natural bays to be used as deep-water ports; therefore, large investments to build artificial protection systems and loading quays, both in the existing and prospective ports, are required. Taking into account the importance of State-owned ports because of their relevance as a source of income, their concession should be carefully granted. The main goal of the concession program is to migrate from a multi-to a single-operator system. The main problem of the first system was that investments were discreet (not divisible), so it turned out difficult for the different operators to coordinate investments and operations. Therefore, ports became congested due to lack of investment in appropriate equipment, and to deficiencies of internal organization, that prevented the optimization of the harbor activities. The advantage of the single-operator system was that this unique operator would internalize the externalities that the regime of multiple operators generates, would invest in equipment and would improve the internal process in such a way that ports can be used with the maximum capacity allowed by its fixed infrastructure. The single-operator system is implemented in the 3 main ports of Chile: *Valparaiso, San Antonio*[12] and *San Vicente*, but it does not include all port terminals, as the smallest are still under the multi-operator system. More concessions are expected in the near future. This decade, the MOP plans to increase the sector investment by 65% against the previous decade, thus creating an important supply of port competitive services, bringing the Atlantic and Pacific Ocean coasts together in order to trade with Southeast Asia.

The Chilean road sector is 80,475km long, out of which 16,500km are paved roads (58.7% more than in the early 1990s) (MOP [2003]). The Public Works Concession Law provided for infrastructure private financing and managing, and released public resources to allocate them for investments with a strong impact on society. Between 1990 and 1999, the annual road investment increased almost six-fold against the average reached in the previous decade. The largest project deployed by the concession system was the development of Route 5, the main road link of the country, which helped achieve a premium two-way road from *La Serena* to *Puerto Montt*, stretching over 1,434 km, with an overall investment of over US$2.3 billion. Moreover, in the early 1990s, there was only one paved border crossing (*Cristo Redentor*); however, with an overall investment of US$163.3 million, there were 5 paved border crossings throughout the national territory by the end of the decade. *Tambo Quemado* border crossing was paved up to the border with Bolivia, as well as *Huemules* border crossing in Region XI, while progress was made in *Jama* border crossing over the Northeast of Argentina and *Pino Hachado* border crossing

that connects *Concepción* with *Neuquén*. To provide for a smoother international trade, the MOP plans to develop strategies to supplement the access both to ports and international border crossings. As to international routes, it plans to improve 350km -mainly the border crossings *Cristo Redentor* in Region V and Pehuenche in Region VII, in addition to the rest of prioritized border crossings- and 290km of the Southern Network (*Red Austral*), and to pave 130km of the Foothill Route (*Ruta Precordillerana*).

The Chilean railway sector consists of tracks stretching over 8,858km. The network is concentrated on a railroad hub parallel to Route 5, from *Iquique* to *Puerto Montt*, and some crossing branch lines generally used by private companies that haul large cargo volumes (mainly mining and forest cargo in the South). FEPASA and TRANSAP are the leading cargo carriers followed, to a lesser extent, by *Ferrocarril Arica-La Paz*, which transports cargo between *Arica* and *Visviri*, on the border with Bolivia. Virtually all cargo (94%) is hauled along the State-owned network, which stretches from Region V to Region X, through FEPASA. Among the private agents hauling mainly mining products from production centers we can mention *Ferrocarril Antofagasta-Bolivia* (FCAB), *Ferrocarril del Norte* (FERRONOR), *Compañía Minera del Pacífico* (CMP), *Sociedad Química y Minera* (SQM). In 2004, railway cargo transportation amounted to 25.3 million tons, while passenger transport reached 13.3 million people (INE [2004]). Both in terms of cargo and passengers, railway operations recovered and made progress over the past years. To further increase transportation opportunities in the country, one of the challenges is to enhance both public and private railway infrastructure.

Infrastructure improvements started in the 1990s evidence a very different country from the one existing before. However, there are still many challenges to meet in order to get an infrastructure level that will put Chile among the developed countries of the world.

Current Dynamics of IIRSA's Projects in Chile

IIRSA was launched at the Meeting of South American Presidents held in 2000, where the representatives decided to coordinate large projects on transportation, energy, and telecommunications infrastructure in order to integrate the 12 South American countries and to promote a smoother and sustainable regional growth, enhancing its competitiveness worldwide.

Within the framework of IIRSA, South American governments created a portfolio consisting of over 335 infrastructure projects which would require a US$37 billion investment. At the end of 2004, the countries defined an "implementation agenda based on consensus" (*Agenda de Implementación Consensuada* - AIC), which prioritizes 31 selected projects -regarding bridges, border crossings, roads, railways, channels, gas pipelines, and telecommunications-, with an investment of almost US$6.3 billion, to be completed by 2010. At present, 10 AIC projects amounting to US$3.2 billion are under way.

Chile is involved in 5 of the AIC projects, estimated at US$558 million, approximately.[13] Two of them are telecommunications projects involving the 12 countries. Additionally, there are two Chilean road projects for US$305 million in progress and a call for bids for a Chilean-Argentine railway project estimated at US$251 million. Table 7 sums up Chilean projects as per AIC 2005-2010.

From the three infrastructure projects in which Chile is involved as per the AIC, one is a railway project and the other two are road projects. The highlights of each one are in the Annex.

According to IIRSA's Report on Projects in Chile prepared by the Bank Information Center in August 2005, the overall number of IIRSA's official projects in Chile is estimated at 32 (4 in the Capricorn Hub, 13 in the MERCOSUR-Chile Hub, 7 in the Southern Hub, and 8 in the Central Inter-oceanic Hub). The estimated budget for these projects amounts to US$1,381,500 approximately.

On the other hand, the MOP provides information about the international infrastructure projects in which Chile is involved. In line with the strategic guidelines of strengthening the export model, moving forward in an open regionalism, and remaining on a Public-Private Partnership platform, the emphasis for international connectivity lies on integration corridors, among the infrastructure and management programs deployed by the Ministry. In this connection, Chile's proposal is to provide for economic, cultural, and social relationships among the South American countries, linking the continent inland with both oceans, thus contributing to the process for territory occupation and better use. The main international corridors aimed at structuring inter-oceanic communication links are shown in the Annex.

Many bioceanic corridors still lack the required activity to be defined as such; however, they seem to make up an integration and consensus space on both sides of the border. IIRSA has consolidated itself as a central instance to establish a joint agenda of regional, physical integration actions and projects. Chile has meaningful relationships with its neighboring countries, and the benefits derived from boosting economic bonds among nations are an important spur per se to provide for better cross-border connectivity conditions. In this respect, being able to create a regional vision based on consensus from a project portfolio based on a strictly domestic viewpoint is a major advance.

Chile has potential for reforms in the transport sector with a strong impact on the future development and integration of the region. Based on sustainability, equality and efficiency, progress in road, air, sea, and river transportation play an increasingly important role in the development of economy. IIRSA may help encourage and provide for the organization and development of the infrastructure projects required to build stronger cross-border relationships. The current challenge is to make the scheduled investment effective. The foundations are already laid.

III. Institutional Framework for the Infrastructure

Regulatory Changes and Impact of Policy Decentralization

The 1990s are probably regarded as the period with the greatest transformation and evolution in Chilean infrastructure. The previous situation of the sector evidenced a high deficit -estimated at US$11 billion by the MOP- and investment levels well below those required, thus becoming an obstacle to the country's economic growth and a loss in competitiveness estimated at US$1.710 billion.[14] Consequently, and as the Treasury lacked the financial, organizational, and human resources required to face this situation, the government implemented an ambitious concession program based on a Build, Operate and Transfer (BOT) agreement system. According to this "pay per use of infrastructure" approach, private capitals would fund infrastructure projects and they would eventually collect the return on their investment by charging a fee to users.[15] Therefore, by means of a concession system, a private company builds, operates and funds the infrastructure project and then charges for the use of the service during the term of the agreement -generally between 10 and 30 years- until the work is transferred to the State. (Table 8).

Between 1993 and 2000, private investment in infrastructure grew steadily from US$1.9 million to US$689.3 million. Likewise, public investment also increased significantly between 1990 and 2002, from US$240 million to US$636 million. Towards the end of 2003, there were 14 projects under construction for over US$2 billion and 24 works in operation for over US$3.4 billion, especially in roads and airports.

Regulation

Considering the concession system regulations, in 1991, Law 19,068 aimed at promoting private capital involvement, protecting the interest of the different players taking part in the system (the State, users, concession holders, and lenders). Therefore, laws applicable to all public works and all activities alike -construction, repair, preservation, and operation- were enforced through the adoption of a flexible mandatory public bidding system for public works which limited the legal authority of the State in the agreement, and provided for a legal equality framework between the parties. Law 19,460 from 1996 clarified the legal purview about private undertakings; bidding system; concession agreement execution and relevant term; broadening of the public work concession legal concept, and protection of the rights of third parties who lend to the concession holder (thus creating the special public work concession pledge). The impact of this law can also be clearly seen in Table 8, which shows the high investment's growth rate (94.3%) in 1996. Likewise, together with the Public Works Concession Law, it was necessary to supplement the special legal rules and regulations with additional tax regulations, laws to provide for concession holder's return on income and financial system-related rules to boost investment.

The amendment to the VAT Law allowed concession holders to recoup the taxes paid to their vendors in this respect during construction -since the concession holder charges a VAT-free toll-, thus forcing the State to refund the amount from the MOP's budget. Moreover, the Revenue Law was amended to include special criteria on the amortization of certain assets and the concession holders' tax base estimate. Additionally, other amendments were adopted, such as: the amendment to the General Banking Law (to increase loan amounts to concession holders and construction companies), the amendment to the Law regulating Pension Fund Management Companies, Insurance Companies, Mutual Funds, and Foreign Capital Mutual Funds (to get them involved in concession holders' financing), the amendment to the Securities Law (to securitize concession flows), and the Tele-toll (*Telepeaje*) Law (to ensure the payment of the toll through an electronic system).

In the last years, the regulatory change proposal is to limit supplementary works and establish criteria to specify when to call for bids in order to prevent this from being a decision of the acting minister, thus setting the legal framework used by the MOP. Indeed, one of the most challenging aspects was finally addressed: the renegotiation of conditions imposed by the concession holder companies during the construction works. Therefore, the occurrence of unexpected events which may require the performance of supplementary tasks will no longer allow for increased rates or State contributions within the framework of negotiations in which the government is caught between the devil and the deep blue sea due to the pressure exerted by the different sectors. Nowadays, there should be a call for bids for any supplementary work required, thus leaving aside the rather flawed habit of offering an original bid for an enticing though insufficient amount to cover its requirements, which allowed the awarded company to get better conditions when the work was under construction.[16] Likewise, certain management improvements arise, given the need to prepare a field-based management project, training tax inspectors and improving control

mechanisms by establishing an agency with increased self-government to monitor service quality, rates, and to conduct an external assessment of supplementary agreements.

Decentralization

As an impact of policy decentralization it should be noted that the involvement of the private sector in the infrastructure investment system released resources of the public sector to allocate them for investments with a strong social impact though no private profitability. Before the concession system was in place, users paid a toll to the State and the latter maintained and improved the road system with that money. At present, users pay a similar rate[17] to the concession holder but receive a higher-quality service (MOP [2003]). While it is true that the State does not collect the toll revenue, it is no longer its duty to maintain the road system. However, between 1997 and 2002, the State revenue amounted to US$428 million by way of assets and duties used during the concessions.[18] Therefore, since 1992, and due to both the Concession Law (which established that any individual could submit a project) and the awards provided for in its regulations, the number of private undertakings submitted for subsequent assessment through the concession system has increased. Likewise, there are other benefits, such as operating cost savings due to the reduced use of resources as the infrastructure is more secure and in better conditions, and the reduced project cycle, as the concession holder's budget does not depend on any ministry and it prefers to complete the works as soon as possible to start collecting.

In general, the Chilean experience is regarded as extremely positive in terms of its concession processes against that of other counties. As noted by Engel, Fisher and Galetovic [2000], one of the most important strengths of the Chilean concession program is that the legal framework has proven to be effective in dispelling expropriation fears, thus significantly strengthening property rights and mitigating concession holders' concern in this respect. Another strength of the Concession Law is that all concessions must be granted in competitive biddings, open to foreign companies[19] and, therefore, limiting the "chasing" chances of the regulator or open corruption,[20] since this ensures a certain degree of transparency that would not be possible if the concession holder were chosen by the State in bilateral negotiations, as is the case in many countries. Finally, it should also be noted that, under the concession program, the State does not agree to share costs with concession holders and, except for certain cases,[21] the latter must bear those extra costs.

Private and Multilateral Financing

In connection with financing and repayment of infrastructure projects, the process is simple. Financing is a tool which, through resources granted on loan or as capital contributions, helps extend the repayment flow timing which should be complied with by either the public sector (as the project execution moves forward) or by the users (through a toll). In the latter, if the rates charged to users are not enough to repay the overall cost of the works, the public sector will be forced to increase its expenditure in order to offset the difference, regardless of the financing source used.

As previously explained, to finance its works Chile used a Public-Private Partnership system based on a concession program under which the private sector developed the infrastructure projects and eventually collected the return on its investment by charging a fee to users. It is worthwhile to point out that institutional stability, legal certainty, and the proper legal framework are essential to implement this kind of system. Observance of property rights, compliance with agreements, and predictable tax and economic policy

rules are critical variables in order to get low-cost private financing. The case of Chile is both exemplary and atypical in this field, where most Latin American countries are regarded as high-risk settings due to their volatility and lack of institutional reliability.

According to data from World Bank,[22] during the 1990s, the private fund flow for the infrastructure transport sector in South America amounted to US$43.6 billion, being Chile (US$5.2 billion) the third South American country that allotted more funds to this field, followed by Brazil and Argentina. It is important to say that within the total amount invested by the private sector in Chile, it was registered a strong investment particularly in roads and ports.

The issuance of corporate bonds in local currency is a very important tool for infrastructure project funding. Unfortunately, in general, domestic financial markets are not very developed in Latin America but, on the contrary, they are small and short-term focused, thus being unsuitable for financing long-term works as those related to infrastructure. Chile, however, makes a healthy exception to the above. It features the most developed market of the region, supported by strong macroeconomic conditions, clear institutional stability, and a solid reputation as an innovative country with the creation of the first private pension funds in 1982. Based on that, it could implement the so-called Infrastructure Bond placements as private financing source. By means of 9 issuances of this type of corporate bonds, the concession holders in Chile achieved funds which, at the end of 2003 amounted to US$1.725 billion for private infrastructure concession holders, with a term of over 20 years and at rates around 5% or 6% (Millán and Rotaeche [2004]).

Infrastructure Bonds, issued by the infrastructure concession holders, played a key role in the private financing of this type of works, mainly in freeways and some airports. These bonds were mostly taken by pension funds and insurance companies. Private pension funds became the largest prospective investors for infrastructure concession holders due to the large number of resources they manage. Nevertheless, due to reasonable rules and regulations, these funds can only be invested in investment-grade corporate bonds; therefore, in the Chilean process it was essential that the issued corporate bonds should be backed by multilateral lending agencies as a guarantee to achieve that valued rating.[23]

Due to the high insurers' fees, bonds are now issued in smaller numbers without the security of those companies, a trend which might grow in the mid-term given the reliable profile of Infrastructure Bonds. It should be noted that only 3% of pension fund management companies' portfolio is invested in Infrastructure Bonds. That portfolio is currently assessed at US$40 billion, with a monthly increase amounting to US$250 million which should be allocated for new investment. Likewise, life insurance companies manage US$12 billion (*Ibid.*). Therefore, Infrastructure Bonds in Chile stand as an excellent opportunity to attract investment from these institutions and use them as work financing instruments.

From the multilateral financing perspective, also notice the proposal submitted at the Summit of Heads of State and Presidents (*Cumbre de Jefes de Estado y de Gobierno*) in 2003 for the creation of the South American Infrastructure Authority (*Autoridad Sudamericana de Infraestructura* - ASI) (*Ibid.*). The ASI would be a trust fund made up of member countries as trustees, geared to completing a variety of infrastructure works both inside and outside the scope of IIRSA. Its resources would consist of capital contributions from its members, and it would be allowed to issue bonds, offer guarantees, and operate freely in the financial market. Its ability to raise funds would be given by both its legal structure and how much trust it instills in the markets based on the institution's financial exposure to future capital contributions made by its members. Moreover, the creation of a Regional Trust Fund for Infrastructure Development, made up of these agencies, the

countries of the region, and the Paris Club member countries, was proposed in 2003, in order to finance infrastructure projects without using national funds. However, these initiatives have not grown up yet.

IV. IIRSA and the Political Economy of Integration

Interests and Policy Preferences of National Actors

IIRSA's strategic role consists in overcoming the most significant obstacles to physical integration (bottlenecks, missing stretches, etc.), fostering intra-regional trade; encouraging production chain reorganization; helping create a more integrated, competitive and dynamic South American economy within a framework of social and environmental sustainability; promoting the involvement of the private sector; championing the harmonization of public policies and regulatory frameworks across countries and sectors, and reducing commercial and distribution costs through infrastructure development in transport, energy and telecommunications sectors. However, there are opposing views about the appropriateness of these projects. The different actors involved in these integration processes advocate different views, usually reflecting opposed interests and preferences when it comes to supporting or opposing projects.

Government Interaction

The Chilean international trade and negotiation strategy pursues an "Open Regionalism" model based on agreements which do not limit -neither in legal nor economic terms- the autonomy or capacity of the country to expand its trading policy to any region which best suits its national interests, or upsets the macroeconomic balance gained. This means that Chile makes an effort to integrate with the major worldwide demand and consumption economic centers in order to diversify its foreign trade among the US, the EU, Southeast Asian countries and Latin America, as it deems best. In this respect, the regional integration topic in Chile represents an important variable of political definition. However, regardless of any interest in the area, Chile usually shows a trade balance deficit with MERCOSUR or the region inland. Nevertheless, Chile regards integration as convenient not only for commercial reasons, but also due to the socioeconomic and political aspects of integration, which implies a sense of belonging to the region and sharing a series of common factors. Therefore, dynamics are heading in that direction.

Chile needs the region as much as the region needs Chile. Chile may be considered a small country, since it does not have a large market density with a volume consistent with economies of scale. Over the past fifteen years, the Chilean corporate investment level in the region has grown significantly -for example, in Argentina, Peru, and Colombia-, finding opportunities to integrate into the region. On the other hand, the region can take advantage of some of Chile's characteristics, such as its infrastructure -regarded as relatively efficient-, or its opportunity to be an outer harbor to the Pacific Ocean that renders services -phytosanitary and zoosanitary controls conducted in Chile, etc.- for certain types of regional production, thus reducing costs for the rest of the region. In this connection, IIRSA expedites the development to allow for reduced transportation and logistics costs in order to help the products of the region neighbors reach their target markets with a better price. For Chile and its government, the challenge is to identify more opportunities to complement each other.

When compared, in several countries of the region such as Peru or Brazil, IIRSA seems to have greater renown or relative echo than in Chile, either because of the political

interests and strategies of the governments of the above countries, or due to the remarkably controversial nature of certain critical projects in the eyes of a civil society concerned over their social and environmental impacts -for instance, those affecting the Amazonian regions. In general, it could be said that, in Chile, IIRSA-related issues have aroused virtually no controversy and, in fact, they still have not been included in the public debate agenda. The case of Chile and the degree of involvement of its government in these regional initiatives for physical integration is in line with the already mentioned strategies and trends typical of its foreign policy. However, the government shows signs of interest and involvement towards these proposals of integration and investment in international connectivity through both its Ministry of Foreign Affairs and the resolutions adopted by the Ministry of Public Works and the Ministry of Economy. One of the facts illustrating this is that, in the event of international integration projects competing with national attempts, such competition would be unfavorable to the former, as the social return of local projects is usually higher than that of cross-border projects; however, investments are made nonetheless.[24] In this connection, the key question is how to do this as efficiently as possible. Against this background, IIRSA works as an instrument that picks the main international projects -there are many others- which are relevant to the country in terms of regional connectivity. The Chilean government shows to be involved through its participation in this forum.

Interaction of Civil Groups and Companies

For this item it is important to understand that, in Chile, IIRSA (its projects and impacts) is not known enough to become a true decision variable, either to civil movements or to companies.

As to the civil society, there seems to be great interest in IIRSA, considering the kind of claims or information requests that this sector usually makes regarding the Initiative in Chile. Interests range from academic curiosity to questions such as how these projects might impact or how to get opportunities for individuals, groups, or regions. The environmental is the best-organized and participatory group identified. This group is concerned to learn about the projects and the area that they might impact.

Perhaps due to the ignorance of the project details and the initiative itself,[25] it is difficult to accurately identify Chilean organizations that voice their opinion strongly enough to lobby against IIRSA in Chile. Certain social communities are concerned over some actions but, in general, this happens because they have been historically addressing those problems rather than because of IIRSA's specific proposal. Of course in Chile there are complaints from communities affected by certain actions, such as the one involving a 13-kilometre tunnel over the *Andes* which arouses criticism and pressure from the affected communities both in Rancagua and on the Argentine side. However, their complaint is not related to a project of IIRSA, since this is a pre-existing project, and there is no complaint against any specific project of IIRSA's Prioritized Agenda for Chile.

Chile includes three IIRSA-prioritized projects under the AIC 2005-2010. The Chilean-Argentine "*Los Andes-Mendoza*"[26] Railway Project, within the MERCOSUR-Chile Hub, is a private initiative granted in concession prior to IIRSA, i.e., regardless of whether it is part of IIRSA or not, it will be carried out if necessary funds are available. Here there is a profitable business model provided by the private company Tecnicagua but, despite of having public support (without this being a guarantee) and being promoted by IIRSA, the risk is private. In connection with the participation of private companies in IIRSA's projects, it should be noted that some of the criticism against this regionalism initiative expressed by

the opposition points at accusing the companies involved -above all, energy and construction companies- of supporting IIRSA not for its vision of regional integration that encourages development, but rather because they pursue their interests and needs to get the regulatory convergence and extended State financing; and thus, they suggest that the initiative would mean a corporate social assistance instead of a strong vision of progress.

The Project of "International Route 60 CH (*Valparaiso-Los Andes*)," within the MERCOSUR-Chile Hub, included its own lane prior to the creation of IIRSA and, given the flows that travel along it, it is eligible for concession. This project seems to follow a local rather than an international logic, and was about to be granted in concession but, as it was considered part of the corridor with the MERCOSUR, it was included in the AIC (originally without Chile being aware of this). Perhaps the current social reluctance to this kind of projects is more related to the fact that both the construction and design of these faster roads, for instance, prevent pedestrians in the area from crossing the route at any point, being forced to do so using the pedestrian bridges placed over it. This results in complications for the local population, which argue that they have to walk to the place where the ramps are located, and that crossing is not as easy as it used to be. Moreover, other individuals or companies claim that routes should not pass through certain stretches, and suggest a plan to change the route layout -this frequently resulting in economic benefits for the claimant (e.g., in order to generate high expropriation payments for properties which, otherwise, would be impossible to sell) (MOP). However, many of the complaints are legally acceptable and account for cases where installing a given infrastructure really impacts the quality of life of certain communities.

The third AIC Project, the "Recovery of the *Iquique-Colchane* Route", in the North, within the Central Inter-oceanic Hub, connecting with Bolivia, is a desert area and the most common types of complaints relate to the need to speed up works and shorten times, since that route grants the communities of the *Altiplano* a better access to the services on the coast, where the most important cities of the area are located. All in all, while some projects for national infrastructure works are criticized by environmental agencies in Chile, none of them are related to IIRSA-prioritized projects for Chile (MOP).

The railway integration project of Trasandino del Sur with Argentina is included in the future portfolio of IIRSA and might arouse controversies, at least on the Chilean side, as the bidding is for a preinvestment project and the companies that take part in the call for bids and submit different projects to set up transfer zones will release substances which might pollute the environment in certain areas.[27] This will probably result in serious environmental issues which should be mitigated, since one of the risks is the contamination of a river which supplies water to an entire farming valley. However, for now environmental groups are only alert, trying to increase awareness, since the project should be previously authorized by the National Commission on the Environment (CONAMA - *Comisión Nacional de Medio Ambiente*), which is usually rather stringent, and this will imply a public process as social control mechanism.

Although it is necessary to foster these integration projects, the romantic vision of consolidating an inter-oceanic hub from port to port (through a sequence of projects) seems to be regarded as unprofitable. It is rather complex to assume, for instance, that somebody in Buenos Aires would cross through Argentina and a part of Chile to head to California or Asia from there, because the journey may result, all in all, more expensive than crossing through a single border (MOP). The risk associated to crossing two borders may become so high that it may be preferable to pay more (considering also a cash flow

to reduce the insurance risk). This is the right time to think if incurring in these costs will really result in a reduction for the end user in the country to which exports are targeted. If the road provided for that, then the effort was worthwhile from the economic integration viewpoint; otherwise, it results in further restrictions. In this connection, it should be noted that, in Chile, there are more politically extreme groups that oppose the dispatch of foreign goods through the Chilean ports in the Pacific Ocean. However, the lobby is not strong enough to influence this kind of decisions. On the other hand, some of the arguments put forward by certain international civil society organizations (for example, BICECA, Coalición Ríos Vivos, Núcleo Amigos de la Tierra, etc.). about the ambitious initiatives proposed in this forum claim that IIRSA suggests a series of high-risk megaprojects which would result in huge indebtedness and changes in the landscapes and forms of life in the region. Likewise, among the main weaknesses of IIRSA, they point out: limited and unsatisfactory access to information on the projects and political reforms proposed; weak social and environmental standards and inappropriate impact mitigation programs; limited institutional account rendering; inappropriate monitoring programs; lack of a clear focus on poverty mitigation; lack of transparency and participation of the people, and unsatisfactory non-inclusive process without the relevant parliamentary debate in each country.

Bruce Babbit's[28] comments evidence major criticism from regional civil society groups, as he points out that "the different experiences all over the world have shown us that, while great infrastructure development plans may result in economic changes, they do not ensure improvements in the standard of living in the long term. First, this kind of projects often disrupts people's lives, destroys the social fabric of local communities, and annihilates traditional cultures. Second, these plans will inevitably trigger environmental reactions -deforestation, loss of biological diversity, soil and water degradation, and loss of productivity-, which endanger the well-being of both the present and future generations".

At present, the business world in Chile follows its own dynamics. In general, there are not enough debates about IIRSA in this sphere, which may be due to business culture issues. Since the mid-1970s, when Chile withdrew from the Andean Pact and unilaterally opened its borders to the world economy, Chilean businessmen have begun acting on corporate practices within an open economy framework. Consequently, although now few public signs show that Chile has decided to take part in an initiative like IIRSA to provide for international trade, this does not cause a huge stir because it is regarded as consistent with the practice already in place for a long time.[29] Moreover, we should take into account the composition of the business sector and the strength/strong/ relations of "strength"/ power relations established within it. In the country, businessmen from the transportation sector, especially those engaged in road transportation, are not part of this business elite, which is the strongest lobby.

As the development of *Mejillones* port complex, in the North, and the modernization of Route 60 CH (*Valparaiso-Los Andes*) are the main projects of IIRSA in Chile -both favorable to the export interests related to mining and the agricultural industry-, there is no truly objective grounds to stir up a discussion. While there is no significant objection, perhaps this might not be the case with the reestablishment of the railway service between *Los Andes* and Mendoza. It could be said that the transportation sector, especially the truck drivers (Confederation of Truck Owners - *Confederación de Dueños de Camiones*), is the most active group in this field. For example, the Central Trans-Andean project under IIRSA, which deals with a cargo railway between the town of *Los Andes* and *Caracoles* Tunnel on the border with Mendoza, Argentina, is very close

to the road; thus, the sector is concerned over how much of its business might be taken away. In this respect, railway and truck transportation sectors are locked in a struggle, trying to take their complaints before the government (MOP), which, in turn, justifies itself explaining that the goal is to improve the system and that it will only be implemented should there be a reduction in the freight price transferable to the end user. However, the government should also check that every sector remains active.

Another group considered within the companies is the logistics sector. This sector is interested in conducting surveys and making suggestions because many aspects of its business might be affected. The problem here is that the pace of the companies is faster than that actually considered in projects like IIRSA's; thus, they find the promises of compliance with these initiatives rather blurred, since they are subject to high risks in terms of whether they will be implemented or not, depending on economic and political issues. Therefore, this sector prefers getting involved once it is evident that the project is under way.

The participation of private companies in the concession of infrastructure related to these projects should be carefully considered. This is mainly due to the fact that many of these projects are really significant in terms of business development and integration potential, though they need not be profitable to grant them in concession. For example, in many stretches -such as in *Cristo Redentor*, between Chile and Argentina, crossed by almost 1,100 vehicles/day-, transportation may imply a lot of money from the hauled cargo viewpoint, though the vehicular traffic is scarce. Therefore, if a sector is strategic for both countries and it is essential that the border crossing remains operational in very good conditions, the involvement of private capitals to maintain it through a toll would not result in a reasonable price range, thus discouraging its use.[30]

In general, in this kind of project, when the State calls for the construction of a given road or infrastructure, they consider how the bidding is awarded and, therefore, the companies become the interested parties. In fact, above all, the construction sector is the most interested party in this connection. Another kind of industrial companies generally begin to get involved when they become aware that a given work will be carried out and consider determinants which might concern them (such as when it will be finished, its layout, whether it will appreciate or depreciate the value of their property, whether the installation of their factory is convenient, whether their business or work area will improve). However, they make their decisions once they have a guarantee that the work is effective or even when it is almost finished. For instance, when a project such as a road is already consolidated as effective, the port sector will try to figure out how to haul cargo beyond the *Andes*, though at present they are more focused on how to capture the national traffic, as they have not reached a local cargo overflow.

In general terms, the prioritized projects in Chile propose an improvement in the existing infrastructure, thus it is reasonable to find not much opposition. This shows the reason why, among others, the society has not questioned the initiatives. It is evident that the scenario that the above-mentioned projects face in the case of Chile differs from the much more environmentally sensitive IIRSA initiatives, which have been scheduled for other countries (such as the Amazon ones).

All in all, to help to consolidate regional infrastructure integration and to improve the dynamism, the alternatives and proposals of IIRSA it will be essential to establish a more participatory system, to provide for enhanced integration among the different sectors and to make an effort to provide its informative diffusion. To such aim, a Council made up of the different sectors involved -such as representatives from the government, the private sector,

the non-governmental organizations (NGOs), the civil society, and researchers- could be created in order to promote public debate about IIRSA, which is still lagging behind.

Regional Discussions

Considering regional infrastructure cooperation projects implies facing the difficulty of dealing with the different priorities and interests of the countries involved. As Beato, Benavides and Vives [2002] argue, the conflicts stem from three factors: (i) poor information across countries about project costs and benefits, (ii) political and economic constraints to bearing the cost of infrastructure built in another country, and (iii) lack of schemes for distributing costs and benefits across countries. Evidently, a project is often of greater interest to one country than another. It may occur that a project that connects a relatively isolated country with a country that has more relatively strong connections to the rest of the region will usually be of greater interest to the isolated country. This is because the well-connected country already enjoys many of the benefits of inter-regional trade, and thus has much less to gain from the project. Definitely such differences in priorities and resources make agreement between the countries more difficult.

In the case of Chile, the country provides political support to the South American integration process and subscribes to the CSN. However, it also keeps its characteristic peculiar independence strategy in terms of the insertion to the global economy. In this respect, Chile aims at becoming an investment platform for trans-national corporations from developed countries which want to get involved in the CAN or the MERCOSUR, favoring a tactic that combines its "global bets" -through agreements signed with the US, the EU, and those to be signed with China, India and Japan in the near future- with their "sub-regional bets" -through free trade agreements with the MERCOSUR and the CAN member countries.

Under an initiative such as IIRSA, an important factor to take into account is that, within the framework of diplomatic relations, both Chile and its neighboring countries have managed to normalize their historically difficult relations in the political sphere to provide for the regional physical integration processes. One of the great advantages of IIRSA, precisely before the final settlement of the diplomatic problems among these countries -Bolivia, for instance, continues claiming for an access to the sea, and Peru claims for a redefinition of the maritime limits-, is that it is a debate forum for the development of the region where, based on the kind of initiative, they work on very specific issues. Here political discussion issues relate to whether it is convenient or not to work in a road or railway stretch, or a border crossing, and where to develop them. However, as they are currently working based on Integration Hubs, the issue is more consolidated and diplomatic discussions have no room in this forum, since IIRSA questions how to work for joint improvement and on unity issues. Therefore, in this forum there is no delicate discussion in political terms, which helps continue working on the understanding that differences do exist but, fortunately, issues are posed as relatively solved in this scenario. Nonetheless, though this may not be the case of Chile[31] these days, there is always a possibility of eventual conflict, such as that on the border between Peru and Ecuador, in a jungle area where a connection used a river as national boundary. This issue affects the possibility of developing a waterway because, as it is not fully defined, it results in an estrangement and will remain shelved until the underlying political discussion is settled.

On the other hand, it should be noted that Chile is regarded as a country with an extremely tight migration policy for its neighbors in the north, Bolivia and Peru. In this respect, one may question the compatibility between controlling these migration flows, on the one hand, and developing more border or international infrastructure links for goods

exchange, on the other. The infrastructure improvement may develop a greater migration pressure, thus it is fundamental to sign agreements with border countries[32] and with the region.[33] Another topic worth mentioning is border crossings and required documentation. This is not an issue merely related to restricting the entry but, at present, there are regional agreements to remove these barriers and, therefore, there are more incentives to find alternatives to reduce costs and waiting times at the border, from both sides. Drug dealing and crime affect all the countries of the region. The implementation of controls to reduce them is necessary not only at a national but at a regional level too, as this kind of scourges expand across borders, becoming a problem for all rather than for a country in particular. It is not merely about restricting the entry of neighbors to Chile, but exerting active controls tending to limit this type of situation, being a mutual problem shared by all the countries of the region. Something similar happens with phytosanitary, zoosanitary, and taxation problems; however, this kind of debate does not have a strong influence on IIRSA, but rather, it is addressed in FTA forums.

V. Conclusions

Chile's trading profile evidences an open economy integrated into the rest of the world through an open regionalism strategy. Its foreign trade is diversified among different regions, exporting mainly to Asia, Europe, and the NAFTA, while importing mainly from MERCOSUR, NAFTA, and Asia. In this connection and based on its foreign trade product mix, Chile strives for becoming part of the major demand and consumption centers of the global economy. Just like its regional counterparts, the progress made by the country in terms of infrastructure provisioning, regulatory changes, mechanisms for project financing, and policy decentralization -especially since the 1990s- reflects a new different country. However, there are still many aspects which require improvement in order to take advantage of the development potential which would result from an enhanced integration into the region. Therefore, IIRSA's proposal -through the coordination and promotion of joint regional infrastructure projects- plays a critical facilitating role in furthering the integration process of these nations.

The successful achievement of the goals outlined in the above initiative will depend on the interaction of a set of variables with impacts on the domestic, regional, and international spheres. Within this universe of variables and with a focus on the Chilean perspective, this paper aimed at dealing with some of them in particular. Therefore, we have pointed out that the limited development of domestic capital markets in Latin America, the heavy investment required for the projects to be carried out in each country, and the asymmetries identified among the members of IIRSA hinder individual project financing to a great extent. Consequently, those costs must be shared by several countries, thus being essential to rely on the assistance of multilateral lending agencies to fund these initiatives in each country, as well as to appoint a neutral organization to help reach an agreement on what percentage of the infrastructure cost should be borne by each country, and how the subsequent service rate setting will be established.

IIRSA's strategic role consists in fostering intra-regional trade by overcoming the obstacles to physical integration, thus helping create a more integrated, competitive and dynamic South American economy. Given the characteristics of the Chilean foreign policy -whose strategy aims at an "open regionalism" model which does not limit its autonomy to expand its trading policy to any region which best suits its national interests-, the regional

integration could be regarded as a controversial topic in Chile. Against this background, Chile's degree of involvement in a regional infrastructure integration initiative for South America may result, at least, questionable. However, keeping a tactic intensification of relations outside the region does not turn its participation and integration incompatible. Moreover, it should be borne in mind that the main supplier of Chile's imports is a subgroup of countries in the region. The government shows its will to take part and support this initiative. Despite these signs favoring the integration with South America, the efforts to include IIRSA's goals and projects in the Chilean public debate agenda have proved rather unsatisfactory. Perhaps, due to the above inherent characteristics of the projects prioritized in Chile, it could be argued that -regardless of some isolated questioning-, IIRSA's initiative has not caused a huge stir in either the business environment or the organized civil society nationwide. Therefore, it would be necessary to establish an effective and more participatory system to spread information -possibly through a Council made up of the different sectors involved, such as representatives from the government, private sector, NGOs, civil society, and researchers, to promote the public debate about IIRSA-, providing for enhanced integration among the different sectors and improve the dynamism of the initiative proposals.

Different views of the integration proposals coexist in the region. The challenge is to combine such diversity based on the fact that South America is not a homogeneous country that devises its development strategies and, thus, it is impossible to address projects and solutions from a common perspective for all cases. Therefore, the projection of the region to the world should be pursued as a common venture though, in turn, the diversity of national development strategies should also be considered.

Consequently, in the case of Chile, its strategy tending to attain its political and economic interests and its willingness to co-participate in all these regional initiatives should not be conceived as contradicting but supplementary, as their ultimate goal is to boost trade, investment and development.

Notes

[1] A fact also greatly reflected in its industrial exports (refined or half processed copper).

[2] As confirmed by Jan Hoffman [2001] -stressing transportation by sea- Chile is seeking a greater economic integration with the other Latin American countries; however, restrictions on transportation hinder these commercial relations preventing the profit that would be expected. Any obstacle which hampers the integration of production processes in Latin America is directly converted into an obstacle for the competitiveness of its economies and, the still-existing restrictions in Chile's transportation constitute such obstacle.

[3] Several econometric estimates suggest that if a country's transportation cost doubles, this will result in an 80% drop, or higher, in its trade (Limao and Venables [2001]).

[4] It should be noted that chemical products accounted for approximately 21% of industrial exports in 2005. Copper, iron and manganese related products also represented an important relative share - for example: metal products, machinery and equipment (6.3%), basic metals industry (4.7%), copper wire slim (1.4%) and manufacture of metals (0.9%). Likewise 12% of the industrial exports belonged to pulp, paper and others.

[5] The values presented above do not match perfectly because different sources were used.

[6] Based on data from ECLAC, International Transportation Database (BTI) included in "International Trade and Transport Profiles of Latin American Countries, year 2000".

[7] Except Guyana, Suriname and French Guiana. Data from BTI, ECLAC.

[8] The rest of South America was below the 60th position. On the other hand, although Chile's general infrastructure quality ranked relatively high, the railroad infrastructure ranked only 58. Chile's overall infrastructure quality still lags significantly behind that of East Asian Newly Industrialized Countries (NICs) and the most developed countries in the world. It is worthwhile to point out that Chile reached the 1st place in macroeconomic variable management worldwide: fiscal deficit-surplus, national savings rate, inflation, interest rate spread, national debt/GGP, and real exchange rate.

[9] Colombia (65th), Brazil (66th), Argentina (69th), Uruguay (73rd), Peru (74th), Venezuela (88th), Ecuador (90th), Bolivia (97th) Suriname (100th), Paraguay (106th) and Guyana (111th).

[10] Civil Aeronautics Board (*Junta Aeronáutica Civil*).

[11] Source: General Directorate of Marine Territory and Merchant Navy (*Dirección General del Territorio Marítimo y Marina Mercante*).

[12] Together, the ports of *Valparaiso* and *San Antonio* -less than 60km away from each other- are the largest container port of South America, with 600,000 twenty-foot equivalent units (TEU) (Engel, Fischer and Galetovic [2000]).

[13] Chile is involved as neighboring country in Bolivian projects like the Construction of the *Pailon-San Jose-Port Suarez* Route; the *Toledo-Pisiga* Route and the Rehabilitation of the *El Sillar* Section.

[14] Based on data from the Chilean Construction Board (*Cámara Chilena de la Construcción*).

[15] Traditionally, infrastructure works were mainly funded by taxpayers instead of users.

[16] This is a very important matter because of the involved amounts. The extra money spent in complementary works ascends to US$1.2 billion -which is not a small amount, neither in absolute nor relative terms. The discrepancies, because of these problems, between the Minister Eduardo Bitran and some of the concession companies determined that these last ones stopped the works and that the new authorities threatened to do a second call for bids. The government is introducing regulatory changes to call for a new bid for the complementary work, when this is inexorably required, trying not to assign it to the company involved in the main work, as it occurs today. The present framework gives the possibility to companies to artificially present low proposals that will allow them to win the bidding and, increase their budgets in this way, when the State is already "tied" and captive of this situation.

[17] For more information about user prices see *http://www.vialidad.cl/peajes/index_peaje.asp.*

[18] Nineteen out of 36 projects adjudicated to the private sector are interurban road projects (of US$3.7 million) and 9 airport projects (US$327 million) (MOP [2003]).

[19] Regarding the participation of foreign companies, most of the concession projects have been developed by big multinationals (for example: *El madrileño Grupo ACS*, participates in three road concessions and in the airport of *Santiago*); moreover, the Chilean companies of construction also have participated by associations with bigger foreign representatives (Business Chile, June 2007).

[20] Given the historical experience of Latin America, it is rather hard to argue that opening bids to the participation of multinationals would necessarily lower corruption. However, having open bids does help.

[21] For example, earthquakes, floods, and civil war.

[22] World Bank's Private Participation in Infrastructure Projects Database (*http://ppi.worldbank.org/*).

[23] Among the most significant bond issuances we can mention:

- The issuance for *Talca-Chillan* freeway in November 1998 by a company made up of *Cintra Chile*, *La Empresa Constructora Delta* and *CB Transportes e Infraestructura*, for US$152 million with a 9-year term, at an 8.15% rate. MBIA Insurance Corporation, rated AAA by Standard & Poor, Moody´s Investors and Fitch IBCA, was the insurance company in charge of insuring the issuance.

- The issuance of *Santiago-Valparaíso-Viña del Mar* freeway in April 2002 by *Sociedad Concesionaria Rutas del Pacífico*, for US$285 million (US$260 with a 23-year term and US$25 with a 12-year term). The issuance was secured by the IDB and co-secured by the insurance company Financial Security Assurance.

- In November 2003, *Sociedad Concesionaria Autopista Central* issued bonds for US$368 millions exclusively guaranteed by the insurance company MBIA Insurance Corporation.

- In December 2003, *Sociedad Concesionaria Costanera Norte* issued bonds for US$267 million guaranteed by the IDB and co-secured by AMBAC Assurance Corporation.

[24] Personal interview with Eric Martín González, MOP.

[25] Even though the government offers information about its infrastructure projects; it does not provide enough precisions about the initiatives involved in IIRSA's portfolio.

[26] The project is based on reconstruction, rehabilitation and maintenance of 260km existing works, (190km in Argentina) and the construction of new works. It includes the 500m tunnel on the Argentinean side and two cargo transfer terminals: *Los Andes* and Mendoza. The estimated cost of railroad reconstruction amounts to US$300 million (*http://www.iirsa.org*).

[27] Personal interview with Patricio Rozas, ECLAC.

[28] Former Secretary of the Interior during President Clinton's administration, who recently chaired the IDB Blue Ribbon Panel on the Environment.

[29] Personal interview with Patricio Rozas, ECLAC.

[30] It is worth mentioning that a solution considered for projects whose tariff does not cover the cost, consists in bidding the subsidy that the concession holder will receive, to the private operator. This system is equivalent to a BOT agreement (Ricardo Carciofi, personal communication).

[31] In Chile's case, a relevant situation derives from the gas integration with Argentina. Even though such integration was beneficial for both countries, it was not free from problems and tensions, which have consequences in bilateral relations among partners.

[32] In Chile, the National Bureau of Borders (*Dirección Nacional de Fronteras y Límites*) of the Ministry of Foreign Affairs deals with matters of Physical Integration related to the transit of individuals through the border as well as vehicles and goods. Their Integration Committees, Mixed Technical Groups and Border Committees with Argentina, Bolivia and Peru are working on the initiatives related to the development of transportation networks. For further details on the agreements reached with border countries and related initiatives, visit *http://www.difrol.cl/integracion/index.htm.*

[33] See South American Conference on Migration at *http://www.oimconosur.org*

Table 1

Chilean Exports by Region FOB in US$ Millions						
Country/Bloc	2000	2001	2002	2003	2004	2005
NAFTA	4,067.5	4,316.0	4,655.1	4,801.9	6,653.4	8,883.8
MERCOSUR	1,717.2	1,527.2	991.8	1,225.4	1,951.4	2,467.9
Argentina	639.0	556.2	232.5	323.3	448.4	625.9
Brazil	969.4	862.2	694.1	839.0	1,402.6	1,728.9
Others	108.8	108.8	65.2	62.1	100.4	113.1
CAN	1,226.9	1,382.8	1,336.8	1,290.8	1,569.7	1,975.0
Bolivia	164.1	143.1	138.9	140.7	139.1	210.2
Peru	439.4	480.2	465.8	425.4	526.2	722.6
Others	623.4	759.5	732.1	724.7	904.3	1,042.2
European Union (25)	4,524.9	4,633.9	4,258.5	4,885.4	7,715.5	9,060.0
Asia	5,658.8	4,691.7	5,122.3	6,510.4	11,082.1	13,966.8
Africa	81.6	83.3	71.8	101.2	101.8	125.5
Others	874.6	924.0	908.1	1,142.3	1,700.5	1,931.0
Total	*18,216.0*	*17,616.3*	*17,420.0*	*20,085.6*	*30,894.5*	*38,539.7*

Notes: China includes Hong Kong. The European Union (25) includes the 10 countries that adhered to this Treaty on May 1st 2004.
Source: Data from *Aduana de Chile* [2006].

Table 2

Chilean Exports by Region CIF in US$ Millions						
Country/Bloc	2000	2001	2002	2003	2004	2005
NAFTA	4,401.8	3,799.2	3,314.0	3,319.3	4,344.7	5,879.3
MERCOSUR	4,327.2	4,692.1	4,810.9	5,912.2	7,095.9	8,802.3
Argentina	2,867.9	3,055.4	3,055.9	3,766.2	4,146.6	4,806.8
Brazil	1,333.6	1,490.9	1,612.7	2,021.4	2,778.1	3,777.4
Others	125.7	145.8	142.3	124.6	171.1	218.0
CAN	981.2	807.2	730.5	866.1	1,352.9	1,896.5
Bolivia	29.9	24.8	22.4	41.3	53.1	37.7
Peru	255.4	285.3	251.7	420.3	694.4	1,107.1
Others	695.9	497.1	456.4	404.6	605.4	751.8
European Union (25)	2,883.0	3,088.7	3,031.0	3,284.9	3,579.7	5,014.2
Asia	2,940.8	2,887.0	2,804.8	3,210.9	4,248.4	5,748.7
Africa	513.8	238.3	251.9	270.6	1,004.6	1,596.9
Australian Continent	151.5	113.7	115.0	104.8	164.4	205.6
Others	436.4	524.3	413.6	395.3	570.9	692.7
Total	*16,635.7*	*16,150.5*	*15,471.7*	*17,364.1*	*22,361.5*	*29,836.2*

Notes: China includes Hong Kong. EU25 includes the 10 countries that adhered to this Treaty on May 1st 2004.
Source: Data from *Aduana de Chile* [2006].

Table 3

Chilean Exports By Groups of Products
Percentage

Product Group	2000	2001	2002	2003	2004	2005
Farming - Forestry - Fishery	9.6	10.2	10.5	10.5	7.8	6.3
Mining excluding copper	4.2	4.2	4.7	4.8	6.7	11.0
Copper	41.2	38.5	37.0	38.5	47.0	47.1
Industry	45.0	47.1	47.8	46.2	38.5	35.6
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Source: Data from *Aduana de Chile* [2006].

Table 4

Chilean Imports By Groups of Products
Percentage

Product Group	2000	2001	2002	2003	2004	2005
Consumer Goods	18.1	17.7	17.7	16.7	16.2	15.3
Intermediate Goods	61.8	60.7	60.5	62.5	63.8	61.1
Capital Goods	20.1	21.6	21.8	20.7	20.1	23.6
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

Source: Data from *Banco Central de Chile* [2006].

Table 5

Chilean Trade by Mode, 2000

Mode	Exports		Imports	
	Millions of US$	% of Total	Millions of US$	% of Total
Sea and River	15,165	84.7	11,512	68.4
Rail	55	0.3	67	0.4
Road	1,020	5.7	1,720	10.2
Air	1,634	9.1	2,844	16.9
Others	28	0.2	687	4.1
Total	*17,902*	*100.0*	*16,831*	*100.0*

Source: Data from *Centro de Economía Internacional*.

Table 6

Chilean Trade by Mode, 2000

Mode	Exports		Imports	
	Tn	% of Total	Tn	% of Total
Sea and River	15,085,000	91.0	12,105,300	71.2
Rail	26,400	0.2	188,900	1.1
Road	1,077,500	6.5	2,685,100	15.8
Air	232,100	1.4	40,500	0.2
Others	156,000	0.9	1,974,300	11.6(*)
Total	*16,577,000*	*100.0*	*16,994,100*	*100.0*

Note: (*) Mainly by gas and oil pipelines.
Source: Data from *Centro de Economía Internacional*.

Table 7

Chilean Projects as Per the Aic 2005-2010

Nº	Project	Status	Hub	Countries	US$ (millions)
5	*Los Andes*-Mendoza Railway Project	Bidding/Concession	MERCOSUR-Chile	AR-CH	251
6	International Rout 60 CH (*Valparaiso-Los Andes* stretch)	In progress	MERCOSUR-Chile	CH (AR)	286
15	Recovery of *Iquique-Colchane* Route	In progress	Central Inter-oceanic	CH (BO)	19
30	Exports through postal services for SMEs	In preparation	ITCs	All	1
31	Implementation of a roaming agreement in South America	In preparation	ITCs	All	1
Total					*558*

Source: Data from *http://www.iirsa.org*.

Table 8

Private Investment Growth in Infrastructure 1993-2002

Year	Amount (US$ thousand)	Var % (YOY)
1993	1,996	-
1994	14,087	605.8
1995	73,145	419.2
1996	142,126	94.3
1997	233,683	64.4
1998	370,304	58.5
1999	590,379	59.4
2000	689,299	16.8
2001	647,322	-6.1
2002	493,428	-23.8

Source: Data from MOP.

Annex

Description of the Chile´s Infrastructure Projects in AIC 2005-2010

Project Nº 5: "*Los Andes*-Mendoza Railway Project"

- Hub: MERCOSUR - Chile
- Group: *Valparaiso* - Buenos Aires (Group 3)
- Countries: Chile - Argentina
- Status: Call for bids
- Objective: To enhance the transportation capacity of "*Cristo Redentor*" Border Crossing for the growing cargo flows between Argentina and Chile.
- Proposed Solution: Reactivation, operation, exploitation and maintenance of the railway cargo transport service that links the cities of Mendoza (Argentina) and *Los Andes* (Chile), recovering the railway connection through the building and rebuilding of the necessary infrastructure and through the supply of the rolling stock which is suitable to provide the service.
- In Chile: Reconditioning of *Los Andes* - *Rio Blanco* stretch. Rebuilding of *Rio Blanco* - *Portillo* stretch. Reconditioning of *Portillo* - *Frontera* stretch. Signaling and communication. Reconditioning of the stations. Building of the multimodal station in *Los Andes*.
- In Argentina: Building of a narrow gage track (23 km) and rebuilding of the pre-existing railway line, in Mendoza - International Tunnel stretch. Recovery of train sheds. Rebuilding and/or recovery and start-up of the stations, detours and shunting yards. Building, operation and maintenance of the multimodal cargo station in *Luján de Cuyo* and its connection to the A-12 branch line of the ex *FC Belgrano*.
- Investment: Total: US$251 million. (US$81 million in infrastructure in Chile; US$100 million in infrastructure in Argentina, and US$60 million in railway material/Argentina).
- Financing Sources: Private Sector.
- Executing Agencies (Concession Grantor): Chile: General Office for Concession Coordination, Ministry of Public Works (*Coordinación General de Concesiones - Ministerio de Obras Públicas*). Argentina: Undersecretariat of Railway Transport, Transport Secretariat (*Subsecretaría de Transporte Ferroviario - Secretaría de Transporte*) and Ministry of Federal Planning (*Ministerio de Planificación Federal*).

Project Nº 6: "International Route 60 CH (*Valparaiso*-*Los Andes* Stretch)"

- Hub: MERCOSUR - Chile
- Group: *Valparaiso* - Buenos Aires (Group 3)
- Countries: Chile (Argentina, influenced by the project)
- Status: In progress
- Objective: To increase the capacity and upgrade the standard of the International Route 60 CH so as to absorb the growth in traffic demand. The route starts at the Chilean - Argentinean border (*Cristo Redentor* tunnel) and crosses Chile towards *Valparaiso* Port.
- Proposed Solution: Improvement of 90.5km of the International Route 60 CH (with most stretches designed for a 100km/h speed). In hill areas, third tracks are being considered as well as the enlargement to second Routeways and road junctions at different

levels. The project is divided into two sectors: (1) The first one starts 6.5km from *Las Vizcachas* bridge and ends at Route 5 North, length: 52km; and (2) the second sector is located between *El Olivo* junction, Route 5 North (commune of *La Calera*), and ends in the South Trunk junction, length: 38.5km, and access to *Valparaiso* Port. In the sectors where the project crosses populated areas, some detours from the current route are considered.

• Investment: Total: US$286 million (offer awarded).

• Financing Sources: Private concession.

• Executing Agencies (Concession Grantor): *Sociedad Concesionaria Autopista de Los Andes* S.A.

Project Nº 15: "Recovery of *Iquique*-*Colchane* Route"

• Hub: Central Inter-oceanic

• Group: Connection Chile-Bolivia: *Arica-La Paz* + *Iquique-Oruro-Cochabamba* (Group 5)

• Countries: Chile (Bolivia, influenced by the project)

• Status: In progress

• Objective: To enhance the capacity and upgrade the standard of Route A-55. This project could help connect *Iquique* Port with areas in the South and Center of Bolivia, such as *Oruro* and *Cochabamba*, as well as allowing connectivity through these routes with the Eastern areas of Santa Cruz and *Puerto Suárez*.

• Proposed Solution: Recovery of 173km in a stretch of Route A-55, between *Huara* and *Colchane*. The project is included in the "Programa de Obras Bicentenario y Convenio de Programación Regional". It will be carried out in different stages and relies on regional support.

• Investment: Total: US$19.2 million. Km 50 - Km 102 (until December 2006): US$10.2 million. Km 102 - Km 173 (draft, without a basic project): US$9 million.

• Financing Sources: Public investment.

• Executing Agencies (Concession Grantor): Ministry of Public Works.

Source: *http://www.iirsa.org.*

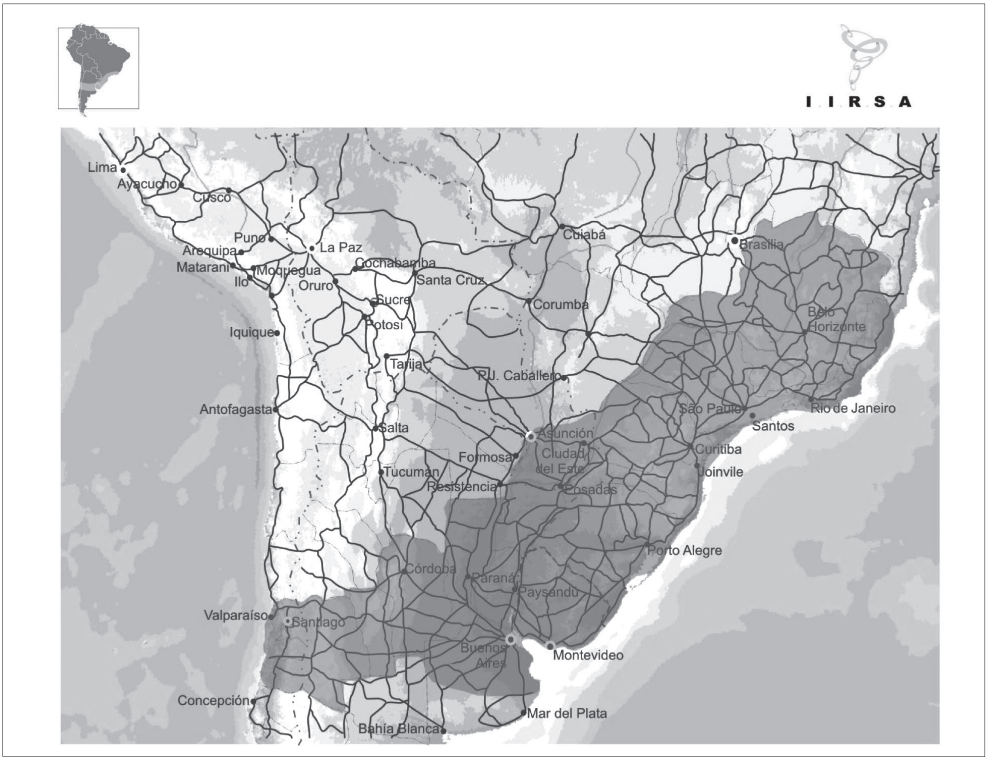
Main International Corridors

• *Chile-MERCOSUR Hub. Valparaiso-Buenos Aires-Porto Alegre-Rio de Janeiro*

This corridor stretches over 2,791km, out of which 211km belong to Chile. It has high traffic and cargo levels, estimated at 320 thousand vehicles/year and 2.5 thousand tons/year. The layout links the central coast ports (*San Antonio*, *Valparaiso* and *Ventanas*) with *Los Andes*; then, through *Cristo Redentor* border crossing up to Mendoza, it goes down to Buenos Aires, and from there to the ports of *Porto Alegre* and *Santos*. Combined, the capacity of these ports amounts to 6 million tons/year. In Chile, connections towards both the ports and *Santiago* are granted in concession to private partners through the public-private partnership system. It should be noted that the *Valparaiso-San Antonio-Ventanas* System concentrates more than 75% of the volume traded throughout the country with all South America.

Figure 1

MERCOSUR-Chile Hub
Valparaiso-Buenos Aires-Porto Alegre-Rio de Janeiro



Source: IIRSA website: *http://www.iirsa.org*.

• *Central Inter-oceanic Hub. Arica-Santa Cruz de la Sierra-Santos*

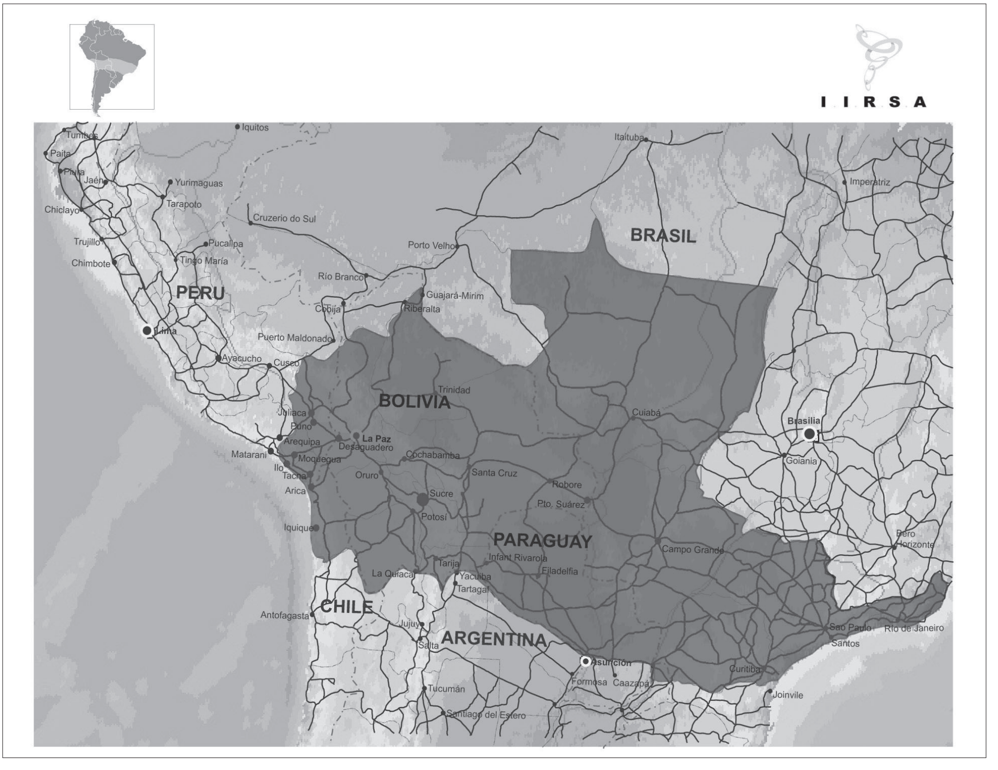
This corridor stretches over 3,822km, out of which 182km belong to Chile. The traffic and cargo levels are estimated at 15 thousand vehicles/year and 90 thousand tons/year. In Chile, the development of road infrastructure that links *Arica* with *Chungara - Tambo Quemado* border crossing to Bolivia has been favored. Therefore, the road is passable and links the City of *Arica* and its port through a broad-access avenue. The overall investment between 2000 and 2006 is estimated at US$40 million, mainly in routes 11 CH and 55 A. Moreover, the estimated investment for the *Iquique*-*Colchane* corridor amounts to US$20 million, approximately, while the opening of the second access to *Iquique* amounts to US$28 million.

In connection to ports, *Arica* is one of the cargo storage points and intermediate port of call seeking extra-regional markets. The port is being granted in concession to a single operator. An enlargement and improvement of the port facilities, as well as an increase in its current 2.4 million-ton capacity, with an investment estimated at US$50

million, is expected. Moreover, one of the wharves of *Iquique* Port is already granted in concession. The public-private partnership proved to be positive, gradually completing the Master Plan which will allow for a 1.7 million capacity at wharf number two since 2005, with an estimated private investment of over US$25 million.

Figure 2

CENTRAL INTEROCEANIC HUB
Arica-Santa Cruz de la Sierra-Santos



Source: IIRSA website: *http://www.iirsa.org*.

• *CAPRICORN INTER-OCEANIC HUB. ANTOFAGASTA-PASO DE JAMA-JUJUY-RESISTENCIA-FORMOSA-CURITIBA-PARANAGUA*

This corridor stretches over 2,712km, out of which 452km belong to Chile. The traffic and cargo levels are estimated at 17 thousand vehicles/year and 66 thousand tons/year. This hub has a great growth potential for cargo in transit, mainly from the Northwest of Argentina. As regards Chile, the stretch from *Antofagasta* to Jama international border crossing is being paved. The overall investment in hub-related routes amounts to US$32 million. The estimated cost of the Southern access to *Antofagasta* amounts to US$9.7 million, while the seaside road improvement and reinforcement amounts to US$12 million.

In connection with the hub ports, *Antofagasta* -currently engaged mainly in mining- will be reoriented due to the commissioning of Port *Mejillones*. This new port is under construction, being Terminal 1 already finished (with a minimum capacity of 2 million annual loading tonnage), accounting for an investment of US$120 million.

Figure 3

Capricorn Interoceanic Hub
Antofagasta-Paso de Jama-Jujuy-Resistencia-Formosa-Curitiba-Paranagua

Source: IIRSA website: *http://www.iirsa.org*.

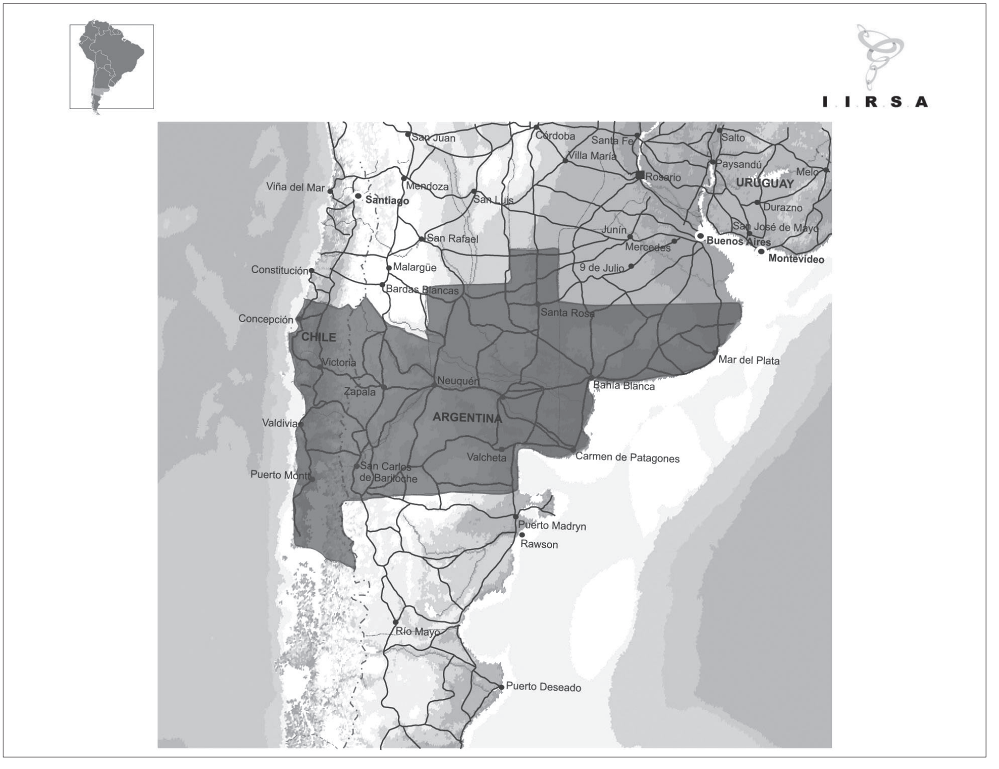
• *Southern Hub. Concepción-Bahía Blanca-Puerto de San Antonio Este*

The *Concepción-Bahía Blanca-Puerto de San Antonio Este* Hub provides an inter-oceanic connection which plays an important bilateral integrating role between Chile and Argentina. The proposed solution is to streamline the infrastructure in order to create opportunities for both economic and social development. Among the planned projects, we can mention the modernization of *Talcahuano* Port, the improvement of *Pino Hachado* border control infrastructure, and repair works in *Las Raices* Tunnel. Advances within the hub will provide a distinctive territorial dynamism element in both the South of Chile and Argentina, integrating the Lake Region.

Figure 4

Southern Hub

Concepcion-Bahia Blanca-Puerto de San Antonio Este



Source: IIRSA website: *http://www.iirsa.org*.

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Contents

Political Economy, Infrastructure and Integration: The Peruvian Case

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Summary

This paper focuses on how a series of drivers could modify substantially major decisions concerning resource allocation for the main physical infrastructure projects in Peru, within the context of integration processes.

The impetus for integration projects under the Initiative for the Integration of Regional Infrastructure in South America (IIRSA), the huge vested interests within the construction industry, the pressure from decentralization processes, and the little political support from the government account for the fact that road-related expenditure was given a new priority whereby lower density and low-impact eastern-western corridors were privileged over higher density, northern-southern corridors that had a greater potential for integration. This paper also describes how eastern-western corridors requiring higher investment amounts took precedence even when they were socially and financially less profitable.

An analysis of future scenarios enables us to conclude that the effects on trade and development in low density areas where investments will concentrate (eastern-western corridors) will be limited unless a trade integration agenda is implemented parallel to the development of physical infrastructure. A closer northern-southern integration through the Andean corridors, in turn, will be contingent upon the availability of adequate resources to complete the works on unpaved stretches of the longitudinal northern forest and southern highlands roads in Peru.

This paper is a short-version of the document prepared for FLACSO.

I. Introduction

This paper aims at examining the drivers of public policy decisions that account for the reallocation of resources and redistribution of priorities in the Peruvian transport industry. Since decision-making has not resulted from a structured planning process, the variables analyzed in this paper are the following: (i) the interests of pressure groups, (ii) international players; (iii) factors conditioning the integration process; and (iv) factors conditioning the decentralization process.

II. Peru and the Economic Infrastructure Integration Process

The Integration and Development Hubs under the Initiative for the Integration of Regional Infrastructure in South America (IIRSA) were agreed upon at a summit of South American transport, telecommunications and energy ministers held in December 2002. On that occasion, eight priority integration and development hubs were defined, to which two additional hubs were later added.

The Andean Hub, the Central Interoceanic Hub, the Amazon Hub, and the Peru-Brazil-Bolivia Hub are directly linked with Peru. These hubs have been structured on the basis of groups of projects or economic corridors, which constitute true integration spaces.

The economic corridors have been classified by the author of this paper into first-generation or second-generation corridors (see Tables A1, A2, and B in the Annex) according to the degree of preparation of the projects involved.

The first-generation projects include the three longitudinal corridors that are being executed or have already been given to concession or are part of a public works contract. These corridors have strong political support and are being implemented under different innovative financial mechanisms (public-private partnerships) and concession contracts. They comprise five projects: Northern Amazon, Central Amazon, Southern Amazon, Northern Pan-American, and Southern Pan-American highways. The first three are paving projects intended to provide the missing links between the highlands and the forest districts. The other two projects are designed to improve the quality and reliability of paved roads, including enlargements, second carriageways and bypass roads in some main cities of the Peruvian coast.

There are two main second-generation corridors. The Southern Highlands project intended to complete the *Huancayo-Huancavelica-Ayacucho-Abancay* connection, and the Marginal Northern Forest (*Marginal de la Selva Norte*) roads or the *Tingo María-Tarapoto-San Ignacio-Puente Integración* corridor. If both were improved, the resulting longitudinal road would act as an alternative to the Pan-American Highway connected to the Marginal Northern Forest Road with the Longitudinal Southern Highlands (*Longitudinal de la Sierra Sur*) Road. Studies on both roads have to be conducted before any project can be defined.

Peru has a large infrastructure deficit associated to domestic and international integration problems. However, investment resources allocated to the Ministry of Transport and Communications (MTC - *Ministerio de Transporte y Comunicaciones*) as a percentage of the Gross Domestic Product (GDP) and of the central government budget have decreased since the mid-1990s. In 1996, the MTC accounted for 17% of the whole central government investment budget, while in 2005 this indicator only reached 14%. This situation changed substantially as from mid-2006, but, by that time, the main decisions concerning the *Iñapari-Puerto Marítimo* project had already been made.

III. Political Economy of the Peruvian Economic Infrastructure

National, International and Local Players: Interest Groups and Pressure Groups

National Players

Presidential Palace

The IIRSA initiative has been on the agenda of public decisions at top government level in Peru since 2004. Between 2001 and 2003, IIRSA was managed within the purview of the Ministries of Transport and Communications, Energy and Mining, and Foreign Affairs. During this period, investment resources were scarce and the Government would not make any decision involving the use of innovative financial mechanisms.

Since 2004, there have been several reasons why the major projects came to occupy prime positions on the presidential agenda of Peru.

One of the main reasons or drivers was the closer relationship or *rapprochement* established between the Peruvian and Brazilian presidents and, consequently, the strengthening of the countries' bilateral relations, reinforced even further with the completion of the Brazilian highway and the international bridge joining the cities of *Rio Branco* and *Porto Velho* with the *Iñapari* border town in the southern Peruvian forest.

A second major driver was tied to the Government's need to appear as a leader of high-impact projects. President Alejandro Toledo sought to improve his image before the public opinion after years (2002-2004) of having been supported by only 8% to 15% of the population. These low percentages of presidential support were even lower inland. Therefore, President Toledo was particularly interested in initiating the works for both the Northern Amazon project (with an impact on the entire macro-region in the north) and the Southern Interoceanic project (with an impact on the entire macro-region in the south).

Another decisive driver was the formal and informal persuasion methods used by Brazilian and Peruvian construction companies that were highly keen on reactivating the construction industry by resorting to innovative financial mechanisms that would "release" them from the strict limitations imposed by the Ministry of Economy and Finance (MEF). In a context where public investment was subject to tight fiscal restrictions, any financial solution that would open up room for maneuvering to invest in transport projects without affecting fiscal accounts or country risk measurements were eagerly sought. A key role was also played by the Peruvian-Brazilian Chamber of Commerce, since its power of persuasion and influence in Peru are stronger than those of the Peruvian-Ecuadorian or Peruvian-Bolivian Chambers of Commerce. This contributed to tipping the scales in favor of eastern-western rather than northern-southern integration projects.

Circumstantial factors have also been present. The Cusco Summit offered the opportunity to create the South American Community of Nations. Similarly, southern local and regional authorities pushed the process, as they considered the Interoceanic project to be emblematic of their own development.

Finally, Norberto Odebrecht International Company was also a significant player. This company included several mega development projects among its business plans to integrate Peru and Brazil, among which the southern Interoceanic highway was one of the biggest.

Based on the drivers listed above, both the sums to be invested and the project completion terms were thoroughly revised. As a result, IIRSA projects were given priority over local impact projects, eastern-western connections (Peru-Brazil) were prioritized over northern-southern Andean connections (Peru-Ecuador and Peru-Bolivia), and the barriers

erected by the MEF preventing the creation of public-private partnerships encouraged by IIRSA National Coordination and the Development Finance Corporation (COFIDE) were removed. Eastern-western corridor projects requiring the highest investment amounts were first advanced, even though they were less profitable from a social and financial perspective. Thus, the Central Amazon corridor -the most densely populated and the one with the highest level of preparation- was displaced by the Northern Amazon (*Paita Yurimaguas*) and the Southern Interoceanic (*Iñapari-Puerto Marítimo*) corridors. At the same time, the agenda involving Northern and Southern Pan-American project concessions shifted towards transversal integration projects, which had not been considered eligible for a public-private partnership on account of their low traffic of vehicles and the fact that they may not become financially self-sustainable, not even for maintenance tasks. The Government assumed a leading role in this process and committed different public players (Ministry of Economy and Finance, Ministry of Transport and Communications and the Private Investment Promotion Agency - ProInversión) to the directives issued at the highest-ranking political level.

The Peruvian Ministers and their Technical Teams

The IIRSA initiative was coordinated by the Ministry of Transport and Communications between 2001 and 2002 and the projects on the transport industry agenda were governed pursuant to the Transport Industry Development Plan: 1995-2006. This scheme was based on the establishment of three basic road circuits prioritized according to traffic density, investment costs by km and their potential for fostering regional economic growth. Against this background, the concession plan prioritized the Pan-American project and completion of the transverse roads *Arequipa-Juliaca, Rioja-Moyobamba-Tarapoto, Abancay-Cusco* and *Tingo María Pucallpa*. Concessions were concentrated on the Northern Pan-American and the Southern Pan-American highways.

In 2003, the coordination of the IIRSA Initiative was formally taken over by the Ministry of Foreign Affairs (MRE - *Ministerio de Relaciones Exteriores*); its rules of procedure were laid down and both IIRSA Coordination and COFIDE started to work on setting up non-conventional concession mechanisms that should enable the Northern and Southern Amazon projects to be implemented, since given their investment requirements, they could hardly be developed with public investment funds.

These efforts, combined with all the drivers above described, led the Peruvian government to entrust ProInversión with the commencement of operations for the Northern Amazon and Southern Interoceanic projects.

Therefore, the MEF -mainly the Vice-Ministry of Finance and the Public Sector Multiannual Programming Board- attempted to gain control over this process in order to avoid the emergence of unsustainable fiscal pressures. The problem was that the financing scheme for the Southern Interoceanic project would give rise to deferred payments in excess of 50% of the current investment in the transport sector in a 15-year horizon.

In spite of the MEF's bureaucratic efforts to restrain, delay or reduce investments in integration projects with Brazil, these were carried out with the support of the President of the Republic.

National Construction Companies

Peruvian trade unions related with the construction sector were badly struck during the 1980s due to a substantial drop in public investments over the 1985-1990 period. Therefore, in the 1990s, when the Pan-American highway and its transverse roads

were to be reconstructed and rehabilitated, national trade unions could not show that they had a recent record of completed projects in the construction industry, a factor that undoubtedly weakened their possibilities to compete with international firms.

In addition, procurement rules imposed by international agencies favored a tender structure that would avoid the splitting up of projects, thus encouraging the participation of international firms on account of their larger economies of scale. Thus, international construction companies, mainly from Brazil, started to take the lead in the construction market. National construction companies adopted a defensive strategy throughout this process, seeking to make the Peruvian government set out rules and directives that would impose a minimum participation of national construction firms in the construction phase of the main interoceanic projects.

Professional and Academic Communities

The Southern Interoceanic project, IIRSA's emblematic project, gave rise to a disagreement between the community of engineers (mainly represented by the Professional Association of Engineers in Lima and the Peruvian Road Association) and the community of economists. While the former supported the project, the latter questioned the violation of the rules set forth by the National System of Public Investments (SNIP - *Sistema Nacional de Inversión Pública*).

The Environmental Community

The environmental community fiercely criticized the processes of the Camisea Gas project as well as the main coastal and highland mining projects. However, they did not voice much protest against IIRSA projects in spite of the environmental risks at stake. It was not until June 2006, i.e. 10 months after the agreement entered into between the State and the concessionaires, that a group of environmental non-governmental organizations (NGOs) hired the Peruvian expert Marc Dourojeani to assess the process that was being followed in the implementation of the Southern Interoceanic project. His conclusions were strongly critical of the Peruvian governmental sectors involved and the Andean Development Corporation (CAF - *Corporación Andina de Fomento*).

International Players

Brazil

The idea of creating a South American Community of Nations was launched in 2000 by President Fernando Enrique Cardoso at a South American presidential summit due to several reasons. First of all, as Rita Giacalone [2006] and Manuel Mindreau [2002] have suggested, to generate leadership in the region, while excluding Mexico. Second, to develop the Amazonian states in Brazil far from the Atlantic ports (*Amazonas, Acre, Rondônia*) that required an outlet to the sea through the Pacific ports located in third party countries. Additionally, the *Avança Brasil* (Advance Brazil) spatial planning system raised awareness about the benefits of being commercially integrated and of its direct relationship with improvements in economic infrastructure (Silveira [2002]). Third, the Brazilian Government felt the need to counterbalance the negative effects of the North American Free Trade Agreement (NAFTA) on the exports of Brazilian manufactured products.

During the summit, the proposal made by President Cardoso to launch an economic infrastructure program (comprising energy, transport and telecommunications),

to be later called IIRSA, was approved. At the time of the creation of IIRSA, the South American presidents also defined two main bodies: the Executive Steering Committee (CDE - *Comité de Dirección Ejecutiva*), composed by the infrastructure ministers of the 12 South American countries, and the Technical Coordination Committee (CCT - *Comité de Coordinación Técnica*), made up of the Inter-American Development Bank (IDB), the CAF and the Financial Fund for the Development of the Río de la Plata Basin (FONPLATA - *Fondo Financiero para el Desarrollo de la Cuenca del Plata*).

CAN and MERCOSUR Member Countries within the Context of the South American Community of Nations

The South American Community of Nations was created one year after the negotiations between the Andean Community (CAN - *Comunidad Andina de Naciones*) and the Southern Cone Common Market (MERCOSUR - *Mercado Común del Sur*) had concluded. The major issues discussed during CAN and MERCOSUR negotiations were: (i) the extremely low trade volume between both regions as a result of the extra-regional export bias evidenced in all the countries (the Andean countries prioritized the US market, while the southern countries prioritized European destinations) and (ii) the fact that the main products exported by Brazilian partners were agricultural, which are highly protected in the Andean countries. This means that, despite its protectionist policy, Brazil seems to have an economy more complementary to the Andean Community rather than to the other MERCOSUR member countries.

IIRSA Infrastructure Ministers

The CDE, made up of the infrastructure ministers from the South American countries that form part of IIRSA, acts as the linking body or liaison, working closely with the CCT, which was empowered as the Technical Secretariat of the whole process. Most ministers have a common interest -the need to increase their fiscal maneuvering capacity to finance physical integration projects either fully or partially. With the support of the CCT, ministries' authorities and their teams have identified and agreed on 10 integration and development hubs and are on the way to group the projects in each hub. Moreover, they have also started to discuss, under the coordination of the CCT, a strategic view of the physical integration in the region.

IIRSA Technical Coordination Committee

The CCT is composed of the IDB, CAF and FONPLATA. It has played a major role in attempting to provide consistency and technical capacity to IIRSA processes concerning both investment projects (Integration and Development Hubs, Groups of Projects) and the sectoral processes, which involve institutional and regulatory issues intended to tackle and solve the bottlenecks that hamper trade and regulatory convergence among South American nations.

IIRSA Businessmen and Coalitions of Interests

Agreements within the context of IIRSA and the South American Community of Nations were in line with the interests of multinational construction companies, mainly Brazilian firms operating in the Andean region.

According to international trade experts, regional agreements are required when the national scale is small but the global scale is too large for companies to compete

successfully. In these cases, businesses exert pressure on their governments to reach regional agreements. This conceptual premise has been met and integration interests match those of construction businessmen. Furthermore, international businessmen have succeeded in setting up comprehensive alliances with their Peruvian and Brazilian suppliers and with financial entities, consulting and engineering firms, public opinion leaders, bureaucrats, and high-ranking politicians. They have thus achieved irreversible contracting processes, regardless of any criticisms of oversized or overvalued projects.

Local Players

Regional Fronts

From the very first days since Alejandro Toledo took office, different regional fronts, made up of civil organizations, social movements and political parties with anti-market and anti-globalization ideas, got ready to demonstrate against some emblematic projects in these regions.

Regional fronts became organized in the south to compete for the future design of the Southern Interoceanic Highway. There were two alternatives for this route: one through Cusco and another one through Puno. Pressure was very strong. In an attempt to ensure social peace and governance, the national administration offered to implement a US$240 million investment plan, of which US$110 million would be allocated to the Cusco route and US$130 million to the Puno route. Subsequently, a tripartite commission was set up including members of the Government and representatives of civil societies from Cusco and Puno to draw up the terms of reference for a pre-feasibility study.

A violent demonstration was staged by the Ucayali Defense Front to protest delays in the paving of the *Tingo-María Pucallpa* highway and the construction of the *Pucallpa* port, among other topics on the regional agenda.

Demonstrations were also organized at Loreto by the Patriotic Front, which negotiated a series of works and projects for the Northern Amazon, including the paving of the *Tarapoto-Yurimaguas* highway, a significant portion of the Northern Amazon corridor.

In the Amazonas department, an alliance of native *Aguaruna* and *Huambisa* communities joined a group of native Colonos to demand the paving of one of the routes of the Northern Amazon corridor, located between *Bagua* and *Sarameriza* by the *Marañón* riverside.

It was paradoxical that in the 2001-2002 term, while social protests were emphatically demanding highways, the transport budget was reduced to its lowest levels since 1997. The improvement of transport budgets, decentralization policies and new public-private partnerships were factors that contributed to lowering the degree of conflictivity.

Regional and Local Governments

The regionalization process started in January 2003 and the transfer of temporary councils (national governmental agencies) to the new regional governments gave way to a more relaxed atmosphere.

As from the 2003-2004 period, the main IIRSA transversal projects were promoted by the Government and implemented through ProInversión. Both the national Government and ProInversión created the necessary coordination and negotiation instances to encourage IIRSA projects and gained the support of regional and local governments. Evidence of this were the public statements by mayors from southern regions backing the Southern Interoceanic project precisely when the academic community and some of the mass media criticized the fact that the procedures under the National System of Public Investment had not been followed.

Factors Conditioning the Integration Process

Geopolitical Views

For decades, one of the main obstacles hindering integration had been associated to the geopolitical views of elites from institutions related to the armed forces and the Peruvian Foreign Office. The territories that Peru had lost in wars or otherwise to neighboring countries, such as Colombia, Brazil and Chile, are painful scars that have had an impact on the national defense and foreign affairs officials' views.

These geopolitical ideas led to defensive positions regarding integration, in particular, *vis-à-vis* Brazil. In this regard, it is important to note that as a result of different international negotiations Peru lost more territory to Brazil -measured in square kilometers- than to any other neighboring country. Other factors, such as the relatively unequal development and the acculturation process, were also considered and met with resistance. These views coupled with the meagre fiscal resources available resulted in not giving priority for many years to the eastern-western connections linking the highlands and the forests.

During the late 1990s until the 2000-2003 period, many efforts were made to bring closer and promote the exchange of: (i) the Brazilian business sector linked to the construction industry, (ii) the Brazilian states interested in gaining access to Pacific ports (*Acre, Rondonia* and *Amazonas*), (iii) the Chambers of Commerce from southern Peru and (iv) *Cusco, Puno* and *Arequipa* regional governments. Supported by outstanding NGOs at different times -the Peruvian Center for International Studies (CEPEI - *Centro Peruano de Estudios Internacionales*)-, the Chamber of Commerce between Peru and Brazil, the Peruvian Foreign Office and other institutions, these initiatives gradually earned a favorable opinion among Peruvian elites based on the possibilities of achieving integration with Brazil by a land connection through Iñapari and bimodal connections reaching Manaus. All these efforts contributed to a shift from a geopolitical to a geoeconomic idea of development. The IIRSA initiative and the concept of decentralized development based on international integration corridors helped to consolidate all these efforts and were crucial to the implementation of integration projects.

An Aggressive Trade Agenda is Missing

Since 1969, CAN has unsuccessfully attempted to emerge as a customs union. In spite of the many years since its inception, CAN has remained an imperfect customs union, still unable to unify policies and be authoritative on its Andean-related decisions (i.e. rules binding the countries concerned).

Additionally, the Andean countries' tendency to export to extra-regional markets has made the USA, Europe and Asia their main trade partners. Intra-community exports account for less than 12% of total trade exports. Therefore, the integration agenda of the Andean countries is dependent on the leading international negotiations with its main trade partners.

Likewise, difficulties have also arisen regarding the conclusion of integration agreements between the Andean countries and MERCOSUR members. Nonetheless, an agreement between MERCOSUR and Peru was reached in August 2003, and the Economic Complementation Agreement N° 59 between MERCOSUR, as one party, and Colombia and Ecuador, as the other party, was entered into in December 2003.

These agreements have laid the commercial foundations for the creation of the South American Community of Nations. However, trade integration has made little progress so far. This new community focuses then on IIRSA's Implementation Agenda Based on

Consensus (AIC - *Agenda de Implementación Consensuada*), an agreed upon investment program that includes the Southern Interoceanic highway among its emblematic projects.

A Government Against the Ropes

President Alejandro Toledo found no romance with his constituency. Political analysts and experts claim that the transition government consumed the honeymoon period and that expectations created by the political campaign and the return of democracy gave rise to a large number of demonstrations and protests which, in turn, forced the government to make new promises, thus creating a vicious circle. At the same time, decisions such as substantially raising the salaries of the President and the Ministers, the fact that the President refused to recognize Zaraí Toledo as his daughter, the legal proceedings for corruption filed against some of the President's direct relatives, and the poor management by officials appointed to the Temporary Regional Administration Councils had a very serious impact on the image of the President and his Executive Power. Another negative component that accounts for the rejection of the President's administration was his decision to cut down on investments in general and social and on rural investment programs in particular. According to the Food and Agriculture Organization of the United Nations (FAO), rural expenditure went down by 22% in real terms during President Toledo's administration. Therefore, increases in investment, GDP and exports did not result in a significant reduction of inequalities or poverty.

Achievements by the Toledo administration were eclipsed by the above problems. The Government could not enjoy the political benefits arising from most positive aspects of its management -the macroeconomic stability and some successful, large investment projects (*Las Bambas* mining project, *Antamina* mining project, *Olmos* hydroelectric power plant, *Camisea Gas* development project, and Bayóvar phosphate deposit development project) and the rise in job creation in dynamic economic activities, such as agricultural exports and urban manufacturing, which thrived as a result of the trade agreement entered into between the USA and Andean countries (Andean Trade Promotion and Drug Eradication Act - ATPDEA).

In sum, President Toledo's administration between 2001 and 2004 was cornered by its own fiscal policy, according to which total and rural investment expenditure could not be raised, and by its unfulfilled promises, giving rise to demonstrations making demands which were very hard to meet.

This situation, together with the Government's need to overcome its political difficulties, encouraged the search for innovative financial mechanisms under which high-impact investment projects could be implemented for the benefit of specific regions of the country. Some of the projects actually carried out as public-private partnerships and favored by these processes were the Olmos project, the Northern Amazon road corridor project (*Paita-Yurimaguas*) and the Southern Amazon project (*Iñapari-Puerto Marítimo*).

Inland Views in a Decentralizing Context

In November 2002, new regional authorities were elected for the first time since 1992, when former regional governments had been dissolved. The new authorities took over on January 1, 2003.

The new regional authorities, jointly with the regional fronts and the new Parliament elected in 2001 through a multiple electoral districts system favored a significant decentralizing consensus, in line with the opinion of most Peruvian citizens.

In addition, from the point of view of international cooperation, boards fighting against poverty (government and civil society) and civil society networks watched and supported the decentralizing trend.

All this was fertile ground for projects deemed favorable for a decentralized development and for gaining support of public opinion, a decisive factor to win presidential approval. Encouraged by the possibility of coming closer to a large portion of the population, sectors from the Executive Power supporting these novel financial mechanisms under which two of the three main eastern-western integration IIRSA projects became feasible could finally isolate and defeat the mid-ranking managers of the Ministry of Economy and Finance who were reluctant to accept these projects on the grounds that they could impair the fiscal balance of the future and break the limits of indebtedness of the present.

Budgetary Constraints, the National System for Public Investment and Other Institutional Restrictions

During the 2001-2004 period, the implementation of large scale public projects was hindered by many restrictions, mainly of a fiscal nature. The Government had planned to reduce the fiscal deficit from 3.5% to less than 1% of the GDP. At the same time, debt servicing costs and the pressure for pensions increased dramatically while a large share of the newly generated public revenues had to be allocated to raise the salaries of teachers, policemen and physicians, who had not received any real salary increase since the beginning of the 1990s. Little room was left then for investment expansion.

By the end of 2002, public investment had reached one of its lowest levels since 1997. Public investment in transport barely amounted to 0.4% of the GDP in 2004, equivalent to half its share in 1999 (0.8% of the GDP). This figure rose to 0.5% of the GDP in 2005, which was however insufficient to overcome the country's transport infrastructure deficit. Such huge fiscal constraints impelled the use of novel financial mechanisms. Therefore, projects that were not profitable were placed under Public-Private Partnerships so that the Government was able to materialize road investment projects worth US$1,300 million without causing any impact on the fiscal deficit account or the country risk. Public payments would take the form of deferred subsidies for both investments and maintenance, but the bill was not to be paid until after 2008.

In addition to fiscal constraints, large investment projects had to meet the requirements set forth by the SNIP to ensure that projects be socially profitable and have an internal rate of return of at least 14%. Large projects in low density areas were unlikely to meet the minimum profitability required in pre-investment studies. The Southern Amazon project (*Iñapari-Puerto Marítimo*) fell into this category, but the consulting firm in charge of the feasibility study explained that more benefits would presumably be derived from a disputable rural expansion at the forest district *Madre de Dios*, in an area of 185,000 hectares, as a sequel of the investment in the highway project. Profit estimates, however, were challenged by SNIP audits. Therefore, with the support of the President of the Republic, the Minister of Economy and Finance, and the Minister of Transport and Communications, it was decided to apply section 10.4 of the Public Investment System Law, pursuant to which the largest road project in the Peruvian history was exempted from the technical review required by the MTC's General Planning Office and the MEF's Public Sector Multiannual Programming Board, the two bodies empowered to analyze and assess transport projects.

The rules of the game changed and the institutional framework was altered to facilitate the eastern-western integration projects (Northern and Southern Amazon corridors). In addition to having these projects elude the Public Investment System, other significant changes were introduced: (i) the limits of the Indebtedness Law were changed, which forced the resignation of the Deputy Minister of Finance, (ii) procurement rules were changed and iii) the rules establishing the impediments to contract with the State were also revised, since one of the bidders had a pending lawsuit against the State.

Integration and Decentralization Dynamics in Peru

Decentralization was the only institutional reform which developed significantly under President Alejandro Toledo's administration. As a response to an excessive degree of political centralization and economic concentration during the 1990s, the Government initiated a regional and local decentralization process supported by the Parliament and large sectors of the public opinion in all regions of Peru.

It should be stated that the 2001-2006 Parliament was committed to decentralization because its members had been elected as a result of a new multiple district electoral system which replaced the single district system in force in the 1990s. Thus, under this new political dynamics, the legislative body was now encouraged to discuss both regional and national topics. This process began with the electoral campaign in 2000, when most political forces put forward significant proposals in this regard.[1]

The above legal reforms had a great impact on the Executive Power as well as on regional and local governments. The decentralization process is expected to continue and grow. Indeed, the regional decentralization has been the most important institutional reform of the 2001-2004 term.

This general process was perceived as being highly consistent with the implementation of economic corridors interconnecting the coastal ports with the cities in the highlands and with isolated towns and urban centers in the Peruvian forest. Decentralization has been a major driver of the so-called interoceanic corridors; for this reason, they were enthusiastically supported by public opinion in inland states.

The Andean (Northern-Southern) Rationale against the Peru-Brazil (Eastern-Western) Rationale

During the 2003-2006 term, northern-southern economic corridor projects -*Tarapoto-Tingo María*, Northern Pan-American highway and Longitudinal Southern Highland Road- were displaced by the prioritized eastern-western corridors.

Furthermore, in the specific case of the Southern Interoceanic highway, the tender was opened in record time and supported by only one feasibility study. This means that, contrary to the tradition of public and private projects in Peru and to the recommendations from international experts, the largest road investment project in Peru was tendered almost under "turnkey" conditions and without the investment costs having been examined thoroughly enough.

The resources committed to deferred payments to Public-Private Partnerships for the Southern Interoceanic project (US$800 million) and the Northern Amazon project (US$250 million) were enormous. The structure of the Annual Works Payments (PAO - *Pago Anual por Obras*) and Annual Maintenance Payments (PAMO - *Pago Anual por Mantenimiento*)

-corresponding to the Northern Amazon corridor and the Southern Interoceanic highway (Stretches 2, 3, and 4)- is about to reach 54% of the MTC's investment budget, which amounted to US$348.6 million in 2005. If we also consider all road concessions already tendered and about to be awarded under the same award criterion (i.e. the bidder requesting the lowest PAO and PAMO subsidies), the payment obligations to be annually met by the Peruvian State could reach 80% of the MTC's total budget in a single year.[2]

Nevertheless, if we take the 2005 MTC investment budget, the payment obligations already assumed by the State exceed 84% and may even surpass this in 25% when all concessions are completed. This means not only that IIRSA projects have displaced all the other corridors on the implementation agenda, but also that little budgetary room is left for new projects in the coming 15 years given the annual payments already committed.

Peru and IIRSA Implementation Agenda Based on Consensus

IIRSA's Implementation Agenda Based on Consensus has also reflected the priority given to eastern-western connections to the detriment of northern-southern ones. The Northern, Southern and Central Amazon corridors joining Peru and Brazil will require a total investment of US$1600 million. All these investments are on the agenda.

Instead, the Andean Integration and Development Hub's prioritized investments amount to only US$19 million for all the countries in the Andean Community of Nations, even though the northern-southern trade seems more promising than that between the Andean countries and the cities of *Manaus, Cuiaba, Rio Branco*, and *Porto Velho*.

It is worth noting that eastern-western corridors are sub-regional, because due to freight cost differences it is far cheaper to export to Brazil by sea (a port-to-port freight costs between US$25 and US$50) than by land (US$90 on a paved highway from a Pacific maritime port to the Brazilian border). Trade with Brazilian cities becomes more complicated when it involves transshipment on the *Ucayali, Huallaga, Marañón, Putumayo, Napo* or Amazon rivers.

Huge expectations by many regional and local (government and private sector) leaders regarding the evolution of land or bimodal (river-highway) trade with Brazil may not be met in the medium term and Andean countries may turn their attention once again to improving their northern-southern routes and solving their serious problems at border crossings.

Future Integration Scenarios

This section delves into two integration process scenarios: (i) an optimistic one and (ii) a pessimistic one.

Optimistic Scenario

Under an optimistic scenario, it is assumed that the three eastern-western corridors will be successfully completed by 2009 and that, at the same time, Peru and Brazil will start negotiations on a trade agenda intended to enhance the possibilities and opportunities arising from their improved physical integration.

Throughout this process, the new trade border crossings with Brazil at *Iñapari* and the Amazon River will gradually achieve an activity comparable to land border crossings with Ecuador (*Huaquillas-Aguas Verdes, Desaguadero* and *Tacna-Arica*). These transactions will exceed 1200 MT (metric tons) of new trade in areas where there was no significant bilateral trade before. Coastal, highland and forest districts in Peru and

border states in Brazil (*Acre, Rondônia* and *Amazonas*) will become integrated and adopt an inside-out approach with a new development paradigm in the forest to replace the environmentally unsustainable timber and oil development scheme. Environmental agencies in Peru will be strengthened with resources from international cooperation agreements and a strong political will from the Peruvian Executive Power.

In addition, public revenues as well as the public investment budget will continue growing in Peru. Thus, national public investments under the purview of the Ministry of Transport and Communications will also rise. Moreover, based on a favorable international context, mineral prices will keep on the rise improving regional governments' revenues related to mining royalties (equivalent to 50% of the mining income tax). Therefore, national and regional governments' resources will be able to fund second-generation corridors -i.e. the Longitudinal Northern Highlands corridor (*Cajamarca*), the corridor of the Longitudinal Northern Forest road (*Cajamarca, Amazonas*, and *San Martín*) as well as the corridor of the Longitudinal Southern Highland road (*Huancayo-Huancavelica-Ayacucho-Abancay-Cusco-Puno*). These undertakings will enable the cities of *Cajamarca* (highlands), *Bagua* (forest), and *Tarapoto* (forest) to integrate with the southern Andean area of Ecuador, thus opening up new routes for commercial exchange.

Similarly, the integration of southern highland cities will connect the Peruvian Andean south with the Andean region in Ecuador from *La Paz* up to *Tarija*, towards the Argentine northwestern area. This Andean space will enhance the potential for partnership between Andean Peruvian and Bolivian producers (whose problems to reach international markets lie in the absence of an economy of scale) and will favor a closer economic relationship that should promote Inka cultural tourism in the Cusco and Puno districts together with *Tiahuanaco* cultural tourism in *La Paz*, Bolivia. Both Bolivians and Peruvians will be able to work together to place their potentially tradable products in the international marketplace.

Border crossings will become modernized both in the south and in the north and waiting times for cargo trucks will be thus reduced. In addition, road concessions will raise tolls to secure resources for the maintenance of the trade road network.

Pessimistic Scenario

Under a pessimistic scenario, it is assumed that the three eastern-western corridors will be completed by 2009 but the trade integration between Peru and Brazil will not be strengthened. Brazilian non-tariff regulations will hinder the exportation of Peruvian products, and the small yet strategic investments in Amazon water flows and river ports will not be made. Therefore, trade and new economic activities will have a minor impact since Brazilian exports to Peru will not carry sufficient return cargo.

At the same time, Brazilian forest states and Peruvian forest districts will not fully integrate with cold (highlands) and temperate (coast) climate districts, and their forest development paradigm will continue to be based on oil and timber. Expectations created by road investments will not boost international trade, but will certainly promote a disorderly migration causing serious environmental impacts which cannot be mitigated due to the huge environmental weakness of the districts located in the Peruvian forest.

Throughout this process, border crossings from Peru to Brazil will replicate the problems originating in the absence of inter-institutional coordination, administrative fragmentation, and poor business practices as are currently found at Andean border crossings, where trucks take longer to cross the border than to complete their entire journey.

Even though public revenues in Peru will increase, the pressure from public sector unions will push current expenditures upwards -as it actually happened in the 2001-2005 term- at a rate higher than the overall public expenditure.

In addition, conflicts and disputes will arise at different government levels, preventing any cooperation agreement from being institutionalized between the central and local governments in order to finance international integration corridors. China's growth will slow down and metal prices will become stagnant, while an escalation of mining and environmental conflicts will weaken the Peruvian mining sector. As a result, regional governments' investments will shrink, so that the funds required for the second-generation corridors are not secured.

Thus, northern highland and forest districts will not become integrated with the Andean south in Ecuador and the Peruvian south, and the deterioration of the *Juliaca-Desaguadero* highway will raise trade costs for Peru and Bolivia. As a consequence, Bolivian export cargo will abandon the road through the *Matarani* Port in southern Peru and choose instead *Arica* and *Iquique* ports. In addition, stretches between Huancayo and *Cusco* will not be paved, thus excluding several districts from the positive though limited benefits brought by the southern Amazon project.

Finally, tolls will not be adjusted and the trade network will face serious sustainability problems. Furthermore, Andean land border crossings will not be modernized and trade expenditure will grow at a rate lower than the GDP rate.

IV. Conclusions and Recommendations

The main elements conditioning the integration process were the following: the shift from geo-political views to neo-economic ideas, the lack of an aggressive trade agenda between the Andean and MERCOSUR countries, the difficult political situation faced by the Peruvian Government, the views of inland states in the decentralization context, which strongly supported projects that should have a high impact on areas far from Lima, and the budgetary and institutional constraints.

Several drivers have pushed the major projects to prime positions on the presidential agenda of Peru since 2004. One of such drivers was the closer relationship or rapprochement established between the Peruvian and Brazilian presidents and, consequently, the strengthening of the countries' bilateral relations, reinforced even further with the completion of the Brazilian highway and the international bridge joining the cities of *Rio Branco* and *Porto Velho* with the Iñapari border town in the Peruvian southern forests.

A second major driver was tied to the Government's need to appear as a leader of high-impact projects. As inland states were more reluctant to accept President Toledo, he was particularly interested in initiating the works related to the Northern Amazon project (with an impact on the entire macro-region in the north) and the Southern Interoceanic project (with an impact on the entire macro-region in the south).

Another decisive factor was the formal and informal pressure exerted by Brazilian and Peruvian construction companies that were highly keen on reactivating the construction industry by resorting to innovative financial mechanisms that would enable them to escape from the strict limitations imposed by the Ministry of Economy and Finance.

In a context where public investment was subject to tight fiscal restrictions, any financial mechanism that could broaden the chances to invest in transport projects without affecting fiscal accounts or country risk measurements was welcomed. The Peruvian-Brazilian

Chamber of Commerce played a key role, since its power of persuasion and influence in Peru are stronger than that of the Peruvian-Ecuadorian or Peruvian-Bolivian Chambers of Commerce. This contributed to tipping the scale in favor of eastern-western rather than northern-southern integration projects.

Finally, Norberto Odebrecht International Company was also a significant player. This company included several mega development projects among its business plans to integrate Peru and Brazil, among which the southern Interoceanic highway was one of the biggest.

Due to the drivers explained above, both the amounts to be invested and the project completion terms were thoroughly revised. As a result, priority was given to IIRSA projects over local impact projects, eastern-western connections (Peru-Brazil) over northern-southern Andean connections (Peru-Ecuador and Peru-Bolivia) and the barriers erected by the Ministry of Economy and Finance preventing the creation of public-private partnerships encouraged by IIRSA National Coordination and the Development Finance Corporation (COFIDE - *Corporación Financiera de Desarrollo*) were removed.

Eastern-western corridor projects requiring the highest investment amounts were first advanced, even though they were less profitable from a social and financial perspective. Thus, the central corridor -the most densely populated corridor and the one with the highest level of preparation- was displaced by the Northern Amazon (*Paita-Yurimaguas*) and the Southern Interoceanic (*Iñapari-Puerto Marítimo*) corridors.

At the same time, the agenda involving the Northern and Southern Pan-American projects concessions shifted towards transversal integration projects, which had not been considered eligible for a public-private partnership on account of their low traffic of vehicles and the fact that they may not become financially self-sustainable, not even for maintenance. The Government assumed a leading role in this process and committed different public players (MEF, MTC and ProInversión) to the directives issued at the highest-ranking political level.

If put into perspective, a closer eastern-western integration through corridors between Peru and Brazil will be contingent upon the implementation of a trade integration agenda that should run parallel to the development of physical infrastructure. In turn, a closer integration between the north and the south through Andean corridors will depend on the availability of adequate resources to complete the missing stretches on the Northern Forest and Southern Highland roads.

Notes

[1] This process was first launched by the 2001 Parliament with the discussion of chapter XIV of the Constitution, which deals with decentralization issues. Reform has then been continual and progressive. In July 2002, the Decentralization Bases Law and the Territorial Demarcation Law were passed. Later, in September 2002, a National Decentralization Committee was set up, governing and coordinating the competence transfer process. In November 2002, the Organic Law of Regions was passed and on January 1st new regional governments elected by direct vote took over. Thus, quite hastily, the legal basis for the regional decentralization process was established. On a local level, the Organic Law of Municipalities was passed in March 2003. Then, the Law for the Promotion of Decentralized Investments, the Fiscal Decentralization Law, the Municipal Tax Amendment Law, the Accreditation System Law and the Law of Incentives for the Integration and Establishment of Regions (Macro-Regions) were passed to ensure the legal continuity of the reform.

[2] This analysis should be further refined as payment terms for PAO and PAMO are not the same for all concessions.

Annex

Table A1

First-generation Corridors I Estimated Investment (US$)	
Central Amazon	
Tingo María-Pucallpa Road and *Pucallpa Port*	175,000
Pucallpa-Cruzeiro do Sul Energy Interconnection	40,000
Pucallpa-Cruzeiro do Sul Route Interconnection	247,000
Pucallpa Airport	6,100
Pucallpa Intermodal Logistics Center	2,000
Modernization of *El Callao* Port	215,000
Canta Unish Paving	70,000
Churín-Sayán-Oyón Improvement	70,000
Lunahuaná –Huancayo Improvement	150,000
Trunk Road Tunnel	400,000
Lima-Ricardo Palma Highway	30,000
Subtotal	*1,405,100*
Northern Amazon	
Tarapoto-Yurimaguas Highway and *Yurimaguas* Port	53,400
Rehabilitation of the *Piura* Airport	10,000
Yurimaguas Airport	5,000
Building and improvement of *El Reposo - Sarameriza* Road. National Route 4	189,000
Paita Logistics Center	3,000
Yurimaguas Logistics Center	2,000
Bayóvar Port	100,000
Sarameriza Port	6,000
Paita Port	80,000
Subtotal	*448,400*
Southern Amazon	
Paving of *Iñapari Puerto Maldonado-Inambari. Inambari-Juliaca/ Inambari-Cusco*	746,000
Border crossing and building of the CEBAF	5,000
Bridge over the *Acre* River	10,000
Puerto Maldonado Airport	6,000
Subtotal	*767,000*

Source: *http://www.iirsa.org.*

Table A2

First-generation Corridors II Estimated Investment (US$)	
Northern Pan-American Highway Corridor	
CEBAF at *Huaquillas-Aguas Verdes*	5,000
CEBAF at *Mataje* River	3,110
La Espriella-Río Mataje Project including bridge over *Mataje* River (Colombia)	15,700
Espriella-Mataje (Ecuador) / *Borbón-San Lorenzo* stretch	7,000
Santa Rosa regional border integration airport and international freight transfer site	65,000
Inca-Huaquillas Port and international bridge at *Huaquillas-Aguas Verdes*. Lateral Crossing at *Huaquillas*	28,500
Road Network N° 5 (under concession)	61,400
Road Networks N° 1 (including bypass road at *Piura*)	103,600
Road Networks N° 4 (including bypass road *Chimbote*)	99,700
Road Networks N° 2 and 3 (including bypass road *Chiclayo* and *Trujillo*)	203,000
Subtotal	*592,010*
Southern Pan-American Highway Corridor	
Puno-El Alto Rail Connection	198,000
Construction of second carriageway at *Cerro Azul-Ica* stretch. National Road 1S	155,200
Improvement of airport at city of *Tacna*	10,000
Improvement of airport at city of *Juliaca*	12,000
Improvement of airport at city of *Arequipa*	18,000
Rehabilitation of Southern Pan-American Highway (earthquake)	17,300
Bypass Road at city of *Ica*. National Road R1-S	15,000
Subtotal	*425,500*
Total	*3,638,010*

Source: *http://www.iirsa.org.*

Table B

Second-generation Corridors Estimated Investment (US$)	
Longitudinal Southern Highlands Road (Longitudinal de la Sierra Sur)	
CEBAF at *Desaguadero*	1,500
Improvement of *Ayacucho-Abancay* Highway	212,794
Completion of *Huancayo-Ayacucho* Paving	126,170
Rehabilitation of *Juliaca-Desaguadero* Highway	33,000
Construction of bypass road at *Urcos*	7,000
Subtotal	*380,464*
Longitudinal Northern Forest Road (Longitudinal de la Selva Norte)	
Vilcabamba-Puente de Integración-Jaén Paving	112,420
Improvement of *Tarapoto-Tingo María* Highway. National Road 5N	255,950
Improvement of *Chamaya-Puente Integración* Highway. National Road 5N	72,870
CEBAF at *Puente de Integración*	2,500
Improvement of airport at *Tarapoto*	7,000
Improvement of airport at *Huanuco*	14,000
Subtotal	*464,740*
Total	*845,204*

Source: *http://www.iirsa.org.*

Table C

Road Concession Obligations Assumed by the Government
Relative to the Full MTC Budget

Highways	Investment	PAO(*)	PAMO(**)	PAO	PAMO	PAO+PAMO
	US$	US$		% of Full MTC 2005 Budget		
Under Concession or Contract						
Northern Amazon IIRSA Hub	219,000,000	35,046,646	18,195,735	10.10%	5.20%	15.30%
Southern Interoceanic	692,900,125	116,606,910	18,331,950	33.40%	5.30%	38.70%
Stretch 2	204,665,152	37,911,020	5,667,970	10.90%	1.60%	12.50%
Stretch 3	316,573,637	48,411,580	7,091,210	13.90%	2.00%	15.90%
Stretch 4	171,661,336	30,284,310	5,572,770	8.70%	1.60%	10.30%
Subtotal	*911,900,125*	*151,653,556*	*36,527,685*	*43.50%*	*10.50%*	*54.00%*
To Be Awarded						
Southern Interoceanic	199,028,418	31,844,547	4,975,710	9.10%	1.40%	10.60%
Stretch 1 [1/]	63,980,125	10,236,820	1,599,503	2.90%	0.50%	3.40%
Stretch 5 [1/]	135,048,293	21,607,727	3,376,207	6.20%	1.00%	7.20%
Costa Sierra [1/ 2/]	292,000,000	46,720,000	7,300,000	13.40%	2.10%	15.50%
Subtotal	*491,028,418*	*78,564,547*	*12,275,710*	*22.50%*	*3.50%*	*26.10%*
Total	*1,402,928,543*	*230,218,103*	*48,803,396*	*66.00%*	*14.00%*	*80.00%*

Notes: (*) Annual Works Payments. (**) Annual Maintenance Payments.
1/ PAO and PAMO for these stretches are just estimates. 2/ Including stretches in progress only.
Source: ProInversión, SIAF.

Table D

Road Concession Obligations Taken On by the Government Relative to the MTC Investment Budget						
Highways	Investment	PAO(*)	PAMO(**)	PAO	PAMO	PAO+PAMO
	US$	US$		% of MTC 2005 Investment Budget		
Under Concession or Contract						
Northern Amazon IIRSA Hub	219,000,000	35,046,646	18,195,735	15.7%	8.2%	23.9%
Southern Interoceanic	692,900,125	116,606,910	18,331,950	52.3%	8.2%	60.5%
Stretch 2	204,665,152	37,911,020	5,667,970	17.0%	2.5%	19.5%
Stretch 3	316,573,637	48,411,580	7,091,210	21.7%	3.2%	24.9%
Stretch 4	171,661,336	30,284,310	5,572,770	13.6%	2.5%	16.1%
Subtotal	*911,900,125*	*151,653,556*	*36,527,685*	*68.0%*	*16.4%*	*84.4%*
To Be Awarded						
Southern Interoceanic	199,028,418	31,844,547	4,975,710	14.3%	2.2%	16.5%
Stretch 1 1/	63,980,125	10,236,820	1,599,503	4.6%	0.7%	5.3%
Stretch 5 1/	135,048,293	21,607,727	3,376,207	9.7%	1.5%	11.2%
Costa Sierra 1/ 2/	292,000,000	46,720,000	7,300,000	20.9%	3.3%	24.2%
Subtotal	*491,028,418*	*78,564,547*	*12,275,710*	*35.2%*	*5.5%*	*40.7%*
Total	*1,402,928,543*	*230,218,103*	*48,803,396*	*103.2%*	*21.9%*	*125.1%*

Notes: (*) Annual Works Payments. (**) Annual Maintenance Payments.
1/ PAO and PAMO for these stretches are just estimates. 2/ Including stretches in progress only.
Source: ProInversión, SIAF.

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Summary

Trade costs include all costs incurred in getting a good to a final user other than the marginal cost of producing the good itself, such as transportation costs (both freight costs and time costs), policy barriers (tariffs and non-tariff barriers), information costs, contract enforcement costs, costs associated with the use of different currencies, legal and regulatory costs, and local distribution costs (wholesale and retail). Higher trade costs are an obstacle to trade and it impedes the realization of gains from trade liberalization. How are the Asian countries doing in reducing trade costs? To answer this, this study has made advancement over earlier studies carried out on this subject in terms of methodology and application. In this study, by estimating an augmented gravity model at 4-digit HS level for the year 2004, the author finds that a number of trade costs components, namely, infrastructure quality, tariffs, and international transport costs affect international trade patterns significantly. This paper shows, inter alia, that a reduction in tariffs and transport costs by 10%, each would increase bilateral trade by about 2% and 6%, respectively. Therefore, propensity to increase the trade is likely to be higher with reduction of transport costs, rather than tariff reduction at the present context. The estimated coefficients of this paper also indicate that the trade in Asia has been benefited from FTAs, and countries that speak the same language also trade more among themselves. Findings of this paper have important policy implications for Asian countries seeking to expand trade.

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I. Introduction

Higher trade costs are an obstacle to trade and it impedes the realization of gains from trade liberalization. Gains from trade depend not only on the tariff liberalization but also on the quality of infrastructure and related services. Improved infrastructural and logistics services play an important role in the flow of international trade. In one hand, it generates enormous wealth by reducing costs of trade because of its non-discriminatory and non-rivalry characteristics, and, on the other, it integrates production and trade across countries.

The effective rate of protection provided by the transport costs in many cases is higher than that provided by tariffs (World Bank [2001]). For the majority of Sub-Saharan Africa, Latin America and Caribbean countries, and a large part of Asia, transport cost incidence for exports is five times higher than tariff cost incidence (World Bank [2001]).[1] Therefore, supply constraints are the primary factors that have limited the ability of many countries to exploit trade opportunities. As a result, complimentary trade policies focusing trade costs have gained immense importance in enhancing international trade.

Trade costs are often cited as an important determinant of the volume of trade. A growing literature in this regard has documented the impact of trade costs on the volume of trade.[2] Most of these studies show that integration is the result of reduced costs of transportation in particular and other infrastructure services in general. The shared objective of economic integration, in general, is to reduce trade barriers - visible and invisible. Direct evidence on border costs shows that tariff barriers are now low in most countries, on average (trade-weighted or arithmetic) less than 5% for rich countries, and with a few exceptions are on average between 10% to 20% for developing countries (Anderson and van Wincoop [2004]). While the world has witnessed drastic fall in tariffs over last two decades, a whole lot of barriers remain and do penalize trade, among which are some "soft" and "hard" barriers. One set of such 'soft' barriers is dealt with through trade and business facilitation measures. The 'hard' set of barriers, which are often cited as physical or infrastructure barriers, are dealt with through transport facilitation measures. In a different vein, the costs appearing from these barriers can be clubbed together, and, for the sake of understanding, can be termed as "trade costs", which is measured as a mark-up between export and import prices, where this mark-up roughly indicates the relative costs of transfer of goods from one country to another (see, for example, Khan and Weiss [2006]).

In recent years, Asia has witnessed a spread of regional and bilateral integration and cooperation initiatives.[3] On the one hand, trade volume in Asia has been rising at a very rapid pace, and, on the other, the composition of trade within Asia is taking a new shape. Countries in Asia are gradually specializing in trade in intermediate and finished products, where effectiveness of transport infrastructure plays an important role in trade and international integration. With the rise of bilateralism in Asia, any attempt towards deeper integration of the economies of the region thus holds high promise if accompanied by initiatives that help improve trade efficiency and reduce trade costs (ADB [2006]).

Reduction of trade costs help traders get their goods to market more quickly and cheaply. Considering the increase in trade interdependency in Asia, the need for better enabling environment to trade in Asia has gained high momentum. On the demand side, the noticeable development is that tariff barriers in Asia have become low as a result of trade liberalization. However, on the supply side, rising trade costs are having an adverse impact on trade. Freight costs are one of the major components of trade costs. While freight costs for imports in developed countries continue to be lower than those of developing countries,

the same in the case of developing Asia is hovering around 6.5% thereby affecting the comparative advantage of Asian countries. Table 1 shows that freight costs in developing Asia are on an average 116% higher than developed countries. According to the United Nations Conference on Trade and Development (UNCTAD), this difference is mainly attributable to global trade structures, regional infrastructure facilities, logistics systems, and the more influential distribution strategies of shippers of developed countries (see UNCTAD [2006]).

Freight costs vary across Asia. Inefficient transport services are reflected in higher freight costs and longer time for delivery. Table 2 indicates that while ocean freight has fallen over time (here, between 2003 and 2005) for movement of vessels among some selected Asian countries, auxiliary (other) charges have gone up, thereby off-setting the gains arising from (i) technological advancement (e.g., bigger vessel) and (ii) trade liberalization (e.g., lower tariff). Therefore, differences across countries in transport costs are a source of absolute and comparative advantage and affect the volume and composition of trade (WTO [2004]).[4]

How are the Asian countries doing in reducing trade costs? A clear understanding of the role of trade costs in enhancing trade will help to promote deeper integration of the region. This study, therefore, seeks to enhance understanding in this area in the context of selected Asian countries. Section II defines trade costs and review studies done so far on the subject. Data and methodology used to evaluate the importance of various trade cost components are presented in Section III. Econometric results are presented and discussed in Section IV, followed by conclusions in Section V.

II. Trade Costs and Their Relevance

In broad terms, trade costs include all costs incurred in getting a good to a final user other than the marginal cost of producing the good itself, such as transportation costs (both freight costs and time costs), policy barriers (tariffs and non-tariff barriers), information costs, contract enforcement costs, costs associated with the use of different currencies, legal and regulatory costs, and local distribution costs (wholesale and retail). Trade costs are reported in terms of their *ad-valorem* tax equivalent. In Anderson and van Wincoop's [2004] term: the 170% of "representative" trade costs in industrialized countries breaks down into 21% transportation costs, 44% border related trade barriers and 55% retail and wholesale distribution costs (Figure 1).

In general, an exporter or importer incurs trade costs in all the phases of the export or import process starting from obtaining information about market conditions in any given foreign market and ending with the receipt of final payment. One part of the trade costs is trader specific and depends upon his/her operational efficiency. The magnitude of these trade costs diminish with an increase in the efficiency level of the trader, under the prevailing framework of any economy.

The other part of trade costs is specific to the trading environment and is incurred by the traders due to in-built inefficiencies in the trading environment. It includes institutional bottlenecks (transport, regulatory and other logistics infrastructure), information asymmetry and administrative power that give rise to rent seeking activities by government officials at various stages of transaction. This may cost traders (or country) time and money including demurrage charges, making transactions more expensive.

Trade costs are large, even aside from trade policy barriers and even between apparently highly integrated economies. In explaining trade costs, Anderson and van Wincoop [2004] referred the example of Mattel's Barbie doll, discussed in Feenstra [1998], indicated

that the production costs for the doll were US$1, while it sold for about US$10 in the United States. The cost of transportation, marketing, wholesaling and retailing represent an *ad-valorem* tax equivalent of 900%. Anderson and van Wincoop [2004] commented: "Tax equivalent of representative trade costs for rich countries is 170%. This includes all transport, border-related and local distribution costs from foreign producer to final user in the domestic country. Trade costs are richly linked to economic policy. Direct policy instruments (tariffs, the tariff equivalents of quotas and trade barriers associated with the exchange rate system) are less important than other policies (transport infrastructure investment, law enforcement and related property rights institutions, informational institutions, regulation, language)."

Direct transport costs include freight charges and insurance, which is customarily added to the freight charge. Indirect transport user costs include holding costs for the goods in transit, inventory costs due to buffering the variability of delivery dates, preparation costs associated with shipment size (full container load vs. partial loads) and the like. Indirect costs must be inferred. Alongside tariffs and nontariff barriers's (NTB), transport costs appear to be comparable in average magnitude and in variability across countries, commodities and time.

Trade costs have large welfare implications. Current policy related costs are often worth more than 10% of national income (Anderson and van Wincoop [2002]). Obstfeld and Rogoff [2000] commented that all the major puzzles of international macroeconomics hang on trade costs. Some of the studies, for example, Asian Pacific Economic Cooperation (APEC) [2002], Organisation for Economic Cooperation and Development (OECD) [2003], and Francois *et al*. [2005] estimate that for each 1% reduction of trade transaction costs, world income could increase by US$30 to 40 billion.

Many commentators have indicated that the success of trade liberalization will always be suboptimal if transport costs are not controlled. World Trade Organization (WTO [2004]) comments: "the effective rate of protection provided by transport costs in many cases higher than that provided by tariffs." According to the World Bank [2001], for 168 out of 216 trading partners of the United States, transport costs barriers outweighed tariff barriers. It is estimated that doubling distance increases overall freight rates between 20% and 30% (Hummels [1999b]). Time delays affect international trade. It is estimated that, on an average, each additional day that a product is delayed prior to being shipped reduces trade by at least 1% (Djankov *et al*. [2006]).[5] Therefore, what follows is that gains from trade will be more if trade frictions are minimized.

Details of trade costs also matter to economic geography. For example, the home market effect hypothesis (big countries produce more of goods with scale economies) hangs on differentiated goods with scale economies having greater trade costs than homogeneous goods (Davis [1998]). The cross-commodity structure of policy barriers is important to welfare (e.g., Anderson [1994]).

In dealing with cross-country trade, influenced by *new trade theory*, several studies have explicitly considered transport costs (interchangeably transaction costs) such as Bergstrand [1985, 1989]; Davis [1998]; Deardorff [1998]; Limao and Venables [2001]; Fink *et al*.; [2002]; Clark; Dollar and Miucco [2004]; Redding and Venables [2004]; Hummels [1999a, 2000]; Wilson *et al.*; [2003]; De [2006a, 2007a], among others.

Poor institutions and poor infrastructure act as impediments to trade, differentially across countries. While dealing with barriers to trade, there are some studies, which have explicitly emphasized on the quality of infrastructure (as a proxy of trade costs), associated with cross-country trade. Country's infrastructure plays a vital role in carrying trade. For example, by incorporating transport infrastructure in a two-country Ricardian framework,

Bougheas *et al.* [1999] have shown the circumstances under which it affects trade volumes. According to Francois and Manchin [2006], transport and communication infrastructure and institutional quality are significant determinant not only for a country's export levels but also for the likelihood of exports. Nordås and Piermartini [2004] have shown that quality of infrastructure is an important determinant of trade performance wherein port efficiency alone has the largest impact on trade among all indicators of infrastructure. De [2005, 2006b] provided evidence that transaction costs is statistically significant and important in explaining variations in trade in Asia. In addition, De [2005, 2006b] also found that port efficiency and infrastructure quality are two important determinants of trade costs. Higher the transaction costs, lower is the volume of trade. This is exemplified in Figure 2, which shows a negative non-linear relationship between transaction costs and imports in the context of 15 Asian economies for the year 2004. This relationship clearly points to the fact that trade transaction costs do influence trade.

The infrastructure variables have explanatory power in predicting trade volume. Limao and Venables [2001] emphasized the dependence of trade costs on infrastructure, where infrastructure is measured as an average of the density of the road network, the paved road network, the rail network and the number of telephone main lines per person. A deterioration of infrastructure from the median to the 75th percentile of destinations raises transport costs by 12%. The median landlocked country has transport costs, which are 55% higher than the median coastal economy.[6] Country's comparative advantage also depends upon quality of infrastructure. Yeaple and Golub [2002] found that differences in the quality of public infrastructure between countries can explain differences in total factor productivity.

Some studies have indicated that the cost of trade facilitation, specifically trade documentation and procedures, is high, between 4% to 7% of the value of goods shipped. In 1996, APEC conducted a study that highlighted the gain from effective trade facilitation. For example, the gains from streamlining customs procedures exceeded those resulting from trade liberalization, such as tariff reduction. Gains from effective trade facilitation accounted for about 0.26% of real gross domestic product (GDP) of APEC members (about US$45 billion), while the gains from trade liberalization would be 0.14% of real GDP (about US$23 billion).[7] According to the World Bank, raising performance across the region to halfway up to the level of the APEC average could result in a 10% increase in intra-APEC exports, worth roughly US$280 billion (World Bank [2002]).

Therefore, what follows is that understanding trade costs and their role in determining international trade volumes must incorporate the internal geography of countries and the associated interior trade costs. This paper builds upon the literature carried out on this subject earlier and in particular De [2006a, 2007b], and it has two distinct methodological improvements over De [2006a]. First, we have estimated the modified gravity model controlling for remoteness and endogeneity. Second, the model is tested at a large cross-section data, taken at 4-digit HS level for 10 Asian countries.[8]

III. Data and Methodology

The main objective of this study is to assess the trade costs (barriers to trade) in context of selected Asian countries. As an extension, the study also analyzes the impact of trade liberalization and regulatory reforms on trade. To attain this objective, this study is undertaken in two stages. First, we stress that the specification of the gravity equation, together with the choice of the distance measure, is crucial for evaluating the size of the

barriers. Second, we estimate the impact of trade costs on regional trade, controlling for endogeneity and remoteness, following which, policy conclusions are drawn.

In this study, we deal with only those components of trade costs, which are imposed by both policy (such as tariff) as well as environment (such as transport and others). Shaded boxes in Figure 3 are the trade costs components considered in this study. Due to lack of compatible quantitative information, NTBs, quotas, and transit and pre-shipment costs were not considered in this study.

To estimate bilateral transport costs, two methods have been used interchangeably: (i) the difference of *ad-valorem* trade-weighted freight rate,[9] and (ii) the differences in inter-country costs of transportation using shipping rate, collected from shipping agents.[10]

Importing countries report the value of imports from partner countries inclusive of transportation charges, and exporting countries report their value exclusive of transportation charges, which measures the costs of the imports and all charges incurred in placing the merchandise aboard a carrier in the exporting port. Alternatively, using the freight rate, we arrive at variation in transport costs across countries. The ratio of import and export costs provides the measure of transport costs on trade between each pair of countries.

In this paper, t_{ij}, denotes the *ad-valorem* transport cost factor, or alternatively, it represents costs of transportation (international transport costs) between country i and j. We use two separate methods to estimate t_{ij}. *Method I* is trade-weighted transport costs, derived from differences of export and import prices, whereas the *Method II* represents weighted costs of transportation, estimated using cross-country shipping rates.[11] While both the methods have been widely used to estimate transport costs, there is a methodological difference between them. The trade-weighted transport cost in *Method I* for commodity k is as follows.

$$t_{ij}^{k} = \left(\frac{IM_{ij}^{\;k}}{EX_{ji}^{k}} - 1 \right) S_i^{k} \tag{1}$$

where IM^{k}_{ij} stands for import price of country i from country j for the commodity k, EX^{k}_{ji} denotes export price of country j to country i for the commodity k, and S_i^{k} is the value-share of commodity k in country i in the bilateral trade (here, at the 4-digit HS). In terms of the data, we use *cost, insurance and freight* (CIF) values to represent IM^{k}_{ij}, and *free on board* (FOB) values for EX^{k}_{ji}. As indicated by Limao and Venables [2001], CIF/FOB data does contain information about the cross sectional variation in transport costs, and that results from using this data are quite consistent with those obtained from the shipping costs data.[12]

The trade-weighted transport cost at the 4-digit HS in *Method II* is derived using

$$t_{ij}^{k} = \frac{Q_{ij}^{k}\, f_{ji}^{k}}{Q_{ij}} \tag{2}$$

where, Q^{k}_{ij} stands for import in quantity of country i from country j for the commodity k, f_{ji}^{k} stands for shipping costs of per unit of import of commodity k by country i from country j, and Q_{ij} is country i's total import from country j.

For country characteristics and domestic (inland) transport costs, we focus on infrastructure measures -the country's ability to enhance the merchandise trade. Here, we treat infrastructure as a proxy to those costs, which are equally responsible for movement of goods across and within countries. Infrastructure facilities, arising from differential factor endowments within a country, are responsible for movement of goods. To assess impact of infrastructure facilities on bilateral trade, we have constructed an Infrastructure Index (II), comprising nine infrastructure variables for each individual country. II is designed to measure the costs of travel across a country. In theory, the export and import prices are border prices and thus, it would seem that own and trading partner infrastructures as defined here should not affect these rates. It is possible that there are interactions between the variables. The simplest example is that an increase in land distance should increase the cost of going through a given infrastructure. The II was constructed based on Principal Component Analysis (PCA) (see Fruchter [1967]), and it measures the relative position of a country considering a set of observables. Briefly, the II is a linear combination of the unit free values of the individual facilities such that

$$II_{ij} = \sum W_{kj} X_{kij} \tag{3}$$

where II_{ij} is infrastructure index of the i-th country in j-th time, W_{kj} is weight of the k-th facility in j-th time, and X_{kij} = unit free value of the k-th facility for the i-th country in j-th time point.

While indexing the infrastructure stocks of the countries, we have considered following nine variables which are directly involved in moving the merchandise between countries: (i) railway length density (km per 1000 sq. km of surface area), (ii) road length density (km per 1000 sq. km of surface area), (iii) air transport freight (million tons per km), (iv) air transport, passengers carried (percentage of population), (v) aircraft departures (percentage of population), (vi) country's percentage share in world fleet (percent), (vii) container port traffic (TEUs per terminal), (viii) fixed line and mobile phone subscribers (per 1,000 people), and (ix) electric power consumption (kwh *per capita*). The weights of these variables, and the index, derived from the PCA, are given in Appendix 1.

The Augmented Gravity Model

In order to explore the impact of trade costs on trade flows, our empirical analysis has considered an augmented gravity model, since it is one of the most popular partial equilibrium models known in explaining the variation of trade flows. The gravity model provides the main link between trade barriers and trade flows. The gravity equation proposed here is a sort of reduced form of an intra-industry trade model. Following Anderson and van Wincoop [2003], the baseline equation is as follows.

$$X_{ij} = \frac{Y_i Y_j}{Y_w} \left({T_{ij}} \middle/ {P_i P_j} \right)^{1-\sigma} \tag{4}$$

where, Y_i Y_j and Y_w denote the aggregate size of countries i, j and the world, respectively; T_{ij} accounts for trade costs and other trade barriers; P_i and P_j reflect the

implicit aggregate equilibrium prices; and σ is the constant elasticity of substitution (CES) between all goods in the consumption utility function.[13]

We assume from equation (4) that T_{ij} may be divided into several components, namely, infrastructure quality, tariff barriers, transport costs, distance, difference in language, and other border effects. Assuming monopolistically competitive market, the term (1- σ) should be negatively related to volume of trade.

In order to carry out the estimations, following Head [2003], and Anderson and van Wincoop [2003], we assume the implicit aggregate equilibrium prices P_i and P_j are basically resistance term or remoteness (trade weighted average distances from rest of the world).[14] Here, we derive remoteness (R_i), as a proxy of implicit aggregate equilibrium prices, through following equation.

$$R_i = \sum_{m \neq j} \left(d_{im} / Y_m \right) \tag{5}$$

where R_i reflects the average distance of country i from all trading partners other than j, d_{im} is the distance between countries i and m, Y_m is the GDP of country m.

Therefore, final estimable gravity equation takes following shape.

$$\ln IM_{ij} = \alpha_0 + \alpha_i + \beta_1 \ln Y_i Y_j + \beta_2 \ln II_i + \beta_3 \ln II_j + \beta_4 \ln TC_{ij} + \beta_5 \ln T_{ij} + \beta_6 \ln R_i + \beta_7 \ln R_j + \beta_8 \ln D_{ij} + \beta_9 d_1 + \beta_{10} d_2 + \beta_{11} d_3 + \varepsilon_{ij} \tag{6}$$

where i and j are importing and exporting country respectively, IM_{ij} represents import by country i from country j, taken at constant US$, Y_i and Y_j denote gross domestic products, taken at constant US$, of countries i and j, respectively, II represents country's infrastructure quality, measured through an index, TC_{ij} stands for transport costs for bilateral trade between countries i and j, T_{ij} stands for bilateral tariff (weighted average) between country i and j, R_i and R_j denote average remoteness of countries i and j, D_{ij} is the distance between countries i and j. Dummies 1, 2 and 3 refer to PTA/FTA in force, adjacency, and language, respectively. To capture country effects, we use country specific dummy, α_i. The parameters to be estimated are denoted by β, and ε_{ij} is the error term.

The gravity model explains bilateral trade flows as a function of the trading partners' market sizes and their bilateral barriers to trade. There are few important reasons for considering the equation (6). First, we estimate a modified gravity equation, controlling for endogeneity and remoteness. Second, an alternative method to obtain unbiased estimates of the impact of distance and other bilateral variables on bilateral trade flows is to replace the multilateral resistance indexes with importer and exporter dummies (Anderson and van Wincoop [2003]). We therefore estimate a gravity equation including country specific effects. Third, the variables are identified keeping in mind their importance in influencing bilateral trade. Fourth, we can estimate elasticity of trade flows with respect to exogenous variables. Fifth, a country's trade with any given partner is dependent upon its average remoteness to the rest of the world (Anderson and van Wincoop [2003]). Studies that do not control for remoteness produce biased estimates of the impact of transaction costs on trade. Finally, in an attempt to minimize the possibility of endogeneity bias we also estimate equation (6)

instrumenting country's import. We use the number of ports in bilateral pairs as instrument mainly for two reasons: (i) countries in Asia rely more on seaports for merchandise trade, rather than overland, and (ii) due to spatial distribution, number of seaports are unlikely to be affected by the total volume of import in a given pair.

The augmented gravity model considered here uses data for the year 2004 at 4-digit HS for 10 Asian countries, namely, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Singapore, Taiwan and Thailand. By taking tariffs, transport costs and infrastructure quality, we cover a major portion of trade costs. Bilateral trade, transport costs, and tariffs are taken at 4-digit HS for the year 2004.[15] Since the gravity equation is the standard analytical framework for the prediction of bilateral trade flows, we use it as a policy simulation technique rather than extending it for forecasting purposes.

The major sources of secondary data are collected from the International Monetary Fund (IMF), the United Nations Statistical Division (UNSD), UNCTAD, and the World Bank. Appendix 3 provides the data specific sources.

IV. Effects of Trade Impediments: Estimation Results

Tables 3 shows the estimation results of equation (6) for two scenarios of transport costs: one using equation (1) and another using equation (2). The explanatory variables of interest are II, TC and T in equation (6). We expect that the TC, T and II are negatively correlated with the volume of imports, respectively.[16] The gravity model performs well and most of the variables do have expected signs. The results show that the volume of import is inversely proportional to the II, TC, and T. Variables being in natural logarithms, estimated coefficients capture their elasticity. Given large cross-section nature of the data at 4-digit HS for the year 2004, estimated gravity model explains 13% of the variation in direction of trade flows, when equation (1) is considered to measure transport costs, and about 55% of the variation in direction of trade flows, when we use equation (2).

The volume of imports is increasing in GDP and decreasing in the distance. But this is a rather common phenomenon as we are dealing with aggregate behavior. The most interesting result is the strong influence of components of trade costs on trade. The higher the transport costs, and tariffs between each pair of countries, the less they trade. Significance of transport costs using equation (2) always found to be higher than that estimated by equation (1). Coefficient of transport costs is statistically significant at 1% level in Model 2 and they are also negative. It also indicates that trade-weighted transport costs using ocean freight through equation (2) seems to be a better method compared to conventional way to estimate transport costs using equation (1) in our case.

With 12,051 observations at 4-digit HS (Model 2 in Table 3), we found variables representing trade costs such as tariff, infrastructure, and transport costs are significant, and carry usual sign thereby showing appropriate relationship between trade and trade costs components. Estimated coefficients indicate that a reduction in tariff and transport costs by 10%, each would increase bilateral trade by about 1.6% and 5.7%, respectively. Therefore, propensity to increase the trade will be higher with reduction of transport costs, rather than tariff reduction.

Infrastructure quality is also an important determinant of trade flows. We found that the quality of infrastructure has a strong impact on trade. In our case, we found infrastructure qualities of both importing and exporting countries are statistically significant. Further deterioration of infrastructure quality will hamper trade flows. In other

words, an improvement of current state of infrastructure by 10% in both exporting and importing countries will lead to rise in imports by 5.9% in importing countries and exports by 1.5% in exporting countries.

What is interesting is that preferential and/or free trade arrangement among the Asian countries has positively influenced the trade. The significant coefficient of FTA dummy tells that trade in Asia has benefited from the PTA/FTA environment. The estimated coefficient also indicates that trade in the present context is not much influenced by geographical contiguity as adjacency dummy appears with positive sign but statistically insignificant, whereas language similarity does influence trade as reflected in estimated positive and statistically significant coefficient. Therefore, countries that speak the same language would trade more, does hold in this case.

Models 1 and 2 in Table 3 report the results including remoteness of both exporting and importing countries. Coefficients of remoteness and distance are significant with unchanged negative signs, thereby indicating a country's distance from its trading partner and relative remoteness from rest of the world, which have clear negative effect on imports. Therefore, the importance of distance is not diminished, even if we include quality of infrastructure. Since distance is a proxy for trade costs where trade costs, according to several studies quoted in this paper, are largely determined by the quality of infrastructure, this is somewhat surprising. It is likely that better infrastructure and lower transport costs first and foremost increase the trade volume, while the distance is as important as before for the distribution of trade on individual trading partners.

The sign of country effects is a reflection of current trade situation. Country effects have also appeared significantly in the cases of China, Indonesia, Korea and Thailand. China and Thailand show positive and significant country effects, while the same in the cases of Indonesia and Korea are negative and significant. The reason is large or medium sized countries like China and Thailand, which are major producers and exporters, have much to influence the trade in Asia, thus showing positive and significant country effects. On the other hand, countries like Indonesia and Korea are still not able to get adequate benefits due to the presence of comparatively higher trade barriers such as higher tariffs and transport costs. It may also be inferred that countries with negative and significant country effect (for example, Indonesia and Korea) indicate low exploitation of trade potentiality and high presence of trade barriers.[17]

Next, we deal with the 2-stage least square estimates (2SLS) which addresses more precisely the potential problem of omitted variable bias and endogeneity. The results are reported in Table 4. In fact robustness of trade costs components has gone up, even though marginally, as can be observed in Table 4. The results differ from those presented in Table 3, and the explanatory power of the model has also improved, though marginally. This result holds when we deal with the potential endogeneity of the variable transport costs by using a number of ports engaged in trade in bilateral pair as instrument.

The 2SLS estimates indicate that trade costs components, namely, infrastructure quality, transport costs, and tariffs, have statistically significant negative impact on the volume of imports. The coefficients of these trade costs components increase marginally, compared with the OLS results. Therefore, 2SLS estimates imply that 10% saving in transport costs and 10% reduction in tariffs will likely to increase imports by about 6 and 2%, respectively. At the same time, 10% improvement in infrastructure quality will increase exports by 2% (in exporting countries) and imports by 3% (in importing countries). Number of ports being the instrument variable has appeared with significant

and positive sign. This leads to conclude that the problems of omitted variable bias and the endogeneity are taken care, to some extent, in the model.

Therefore, a country's domestic (inland) transport costs (represented by infrastructure quality) and international transport costs are the two main determinants of cross-country variations of trade flows in the present context. Interestingly, these two barriers are explicitly related with environment, where the rise in transport costs is an outcome of the environment and policy constraints on the regional trade and infrastructure system. Nevertheless, these findings provide sufficient indications of presence of trade costs in Asia.

To summarize, there is strong empirical evidence that trade costs components, namely, infrastructure quality, tariffs, and transport costs are important for international trade patterns. Indeed, as product differentiation, vertical specialization and international outsourcing have become more prominent in world trade, the relative importance of these costs as a determinant of international trade has thus increased in Asia.

V. Conclusions

Considering earlier studies, the findings of this paper provide sufficient indications of the presence of trade costs particularly in the context of Asian trade. This paper has provided additional measures of bilateral trade restrictions and empirical estimates using the gravity model. First, we introduce infrastructure quality of the trading partners that we believe have an impact on trade. Second, we introduce bilateral tariffs, which are largely ignored in the empirical gravity literature in the context of Asia. Third, in order to ensure unbiased estimates, we used resistance parameters. Fourth, in order to find out the relative robustness of the transport costs, we used trade-weighted transport costs considering cross-country shipping rates, which is also a new entry in the gravity literature. Fifth, in order to check the potential problem of omitted variable bias and endogeneity, we use simultaneous equation modeling.

The analysis carried out in this paper provides sufficient evidences to ascertain that variations in transport costs along with infrastructure facilities have significant influence on regional trade flows in Asia. A 10% saving in transport costs is likely to increase trade by about 6%. Further, we found that tariffs have a relatively large and negative impact on trade. We also found that the importance of distance is not diminished, even if we include quality of infrastructure and transport costs. The findings of this paper indicate that the trade in Asia has been benefited from FTAs, whereas the trade in present context is not much influenced by geographical contiguity. Further, countries that speak the same language would trade more, holding our case in this study. Countries like China, Indonesia, Korea and Thailand being major regional producers and exporters, influence the Asian trade more than others in recent years. However, countries such as Indonesia and Korea are yet to reap much benefit from freer trade environment due to low exploitation of trade potentiality and high presence of trade barriers. We also highlighted that a country's infrastructure quality and transport costs are the two main determinants of cross-country variations of trade flows in the present context. Interestingly, these two barriers are explicitly related to environment where the rise in transport costs is an outcome of the environment and policy constraints on the regional trade and infrastructure system.

Tariffs tend to be lower not only in Asia but also across most of the economies in the world. Attention is being paid towards trade and transport facilitation, to a varied extent, across the world. Asia is moving progressively into more complex and higher-value manufacturing, and greater integration into global production chains, logistics requirement

have to be more sophisticated. The challenge for Asian countries is thus to identify improvements in logistics services and related infrastructure that can be achieved in the short-to-medium term and that would have a significant impact on competitiveness of these countries. Our results have important policy implications for Asian countries seeking to expand trade. These findings also have important policy implications for least developed countries too. If improvements in the quality of infrastructure in LDCs continue to lag behind the more developed countries, their share of world trade is likely to continue to decline.

In order to better inform policy-making process, future studies should attempt to establish the technological relationship between transportation costs and distance as we now have bigger vessels plying across Asian ports, and the region is witnessing more liberal trade environment. This study has considered some direct and indirect trade costs components but omitted infrastructure costs and also wholesale and distribution costs. Impact of infrastructure costs along with the wholesale and distribution costs thus need to be captured more accurately in the model. One of the supposed objectives of technological development and improved trade facilitation measures at ports and borders is to reduce costs of movement of goods across countries. In this paper, a plausible explanation has been given why ocean freight costs are penalizing merchandise trade. However, due to limitation, individual components of ocean freight costs were not considered in the model. Therefore, future studies should be attempted to understand how the components of ocean freight costs (such as base ocean freight and auxiliary shipping charges) along with other trade barriers are affecting trade.

Notes

[1] According to the World Bank [2001], 168 out of 216 US trading partner, transport costs barriers outweighed tariff barriers.

[2] See Anderson and van Wincoop [2004], which have elaborately covered the major seminal studies carried out on this subject. Also see, De [2006a, 2007a, 2007b].

[3] Regionalism enters into Asia with establishment of ASEAN in 1960s. Since then, several regional and subregional initiatives appeared in Asia, such as Bangkok Agreement, SAARC, etc. However, the East Asia Summit in 2005 involving ASEAN+6 countries indicates the rise of constructive regionalism in Asia. Slow progress in WTO Doha Round and also the pan-Asian integration have encouraged proliferation of bilateral agreements in Asia. In 2005, about 36 bilateral agreements from Asia were notified to WTO, which was only 3 involving developing Asia before 1995, whereas 46 agreements are yet to be notified to WTO, and further 42 agreements are being negotiated (ADB [2006]). Also see, UNESCAP [2005].

[4] In another context, while describing East Asia's outward-oriented growth, ADB-JBIC-WB team commented that the efficiency of East Asia's logistics is falling behind, with costs of transportation representing a high proportion of the final price of goods thereby affecting competitiveness of the region (ADB-JBIC-WB [2005] pp. 61-64).

[5] This was estimated by the authors through a structured gravity model using newly constructed *Doing Business* Database of the World Bank on shipment of cargo from the factory gate to the ship (vessel) in 126 countries.

[6] Bougheas *et al.* [1999] estimated gravity equations for a sample limited to nine European countries. They included the product of partner's kilometres of motorway in one specification and that of public capital stock in another and found that these have a positive partial correlation with bilateral exports.

[7] Similar indications were obtained for countries in APEC (Cernat [2001]; World Bank [2002]; Wilson *et al.* [2003]).

[8] These two are the new additions to the earlier studies done by the author on similar subject.

[9] Many measures have been constructed to measure transport cost. The most straightforward measure in international trade is the difference between the CIF and FOB quotations of trade. The difference between these two values is a measure of the cost of getting an item from the exporting country to the importing country. There is another source to obtain data for transport costs from industry or shipping firms. Limao and Venables [2001] obtained quotes from shipping firms for a standard container shipped from Baltimore to various destinations. Hummels [1999a] obtained indices of ocean shipping and air freight rates from trade journals which presumably are averages of such quotes. The most widely available (many countries and years are covered) is average *ad-valorem* transport costs are the aggregate bilateral CIF/FOB ratios from UN's COMTRADE database, supplemented in some cases with national data sources. Nevertheless, because of their availability and the difficulty of obtaining better estimates for a wide range of countries and

years, apparently careful work such as Harrigan [1993] and Baier and Bergstrand [2001] used the IMF database (UN's COMTRADE).

10 We use ocean freight rates, collected from Maersk Sealand [2006].

11 Here, methodology follows Limao and Venables [2001], which were adopted from Hummels [1999a].

12 However, CIF/FOB ratio has several drawbacks. The first is measurement error; the CIF/FOB factor is calculated for those countries that report the total value of imports at CIF and FOB values, both of which involve some measurement error. The second concern is that the measure aggregates over all commodities imported, so it is biased if high transport cost countries systematically import lower transport cost goods. This would be particularly important if we were using exports, which tend to be concentrated in a few specific goods. It is less so for imports which are generally more diversified and vary less in composition across countries (Limao and Venables [2001].

13 See Anderson and van Wincoop [2003] for compete derivation of the model. We assume, as shown in Anderson [1979] and Anderson and van Wincoop [2003], all goods are differentiated by place of origin and each country is specialized in the production of only one good. Therefore, supply of each good is fixed ($n_i = 1$), but it allows preferences to vary across countries subject to the constraint of market clearing (CES).

14 In fact, some authors tentatively estimated model with price index variables (Baier and Bergstrand [2001]).

15 The model also suffers from data limitation when we consider equation (1) to estimate transport costs. On average 56% of total observations for all sectors are found to be either zero or negative or missing. Theoretically, t_{ij} cannot be negative or zero. Due to poor quality of data compilation, we face discrepancy in transport costs estimation. However, we get better results when we consider equation (2) and use freight rates. Appendix 2 shows the country-wise observations collected and those with errors.

16 The usual caveat is that in our particular case, we took an inverse measure of II in the regression so that an increase in II is expected to be associated with an increase in the TC, and vice versa.

17 However, one cannot refute the problems of multicollinearity associated with the results.

Table 1

ESTIMATES OF TOTAL FREIGHT COSTS FOR IMPORTS (*)			
Year	Developed countries	Developing Countries	Developing Asia
		(%)	
1990	2.9	6.7	6.9
2000	2.9	5.9	6.5
2003	2.9	6.1	6.7
2004	3.0	5.9	6.5

Note: (*) As a percentage of import value (taken at CIF).
Source: UNCTAD (2006).

Table 2

TRENDS IN FREIGHT COSTS IN SELECTED ASIAN COUNTRIES (*)							
Origin Country	Destination Country	Base Ocean freight		Other charges [1]		Total	
		2003	2005	2003	2005	2003	2005
				(US$ per 20' container)			
Japan	China	250	275	178	223	428	498
Japan	Korea	300	275	238	289	538	564
Japan	Hong Kong	196	200	419	425	615	625
Japan	Malaysia	366	375	244	296	610	671
Japan	Singapore	312	325	307	321	619	646
Japan	India	1,546	1,600	489	523	2,035	2,123
Japan	Thailand	312	275	232	258	544	533
China	Japan	900	800	162	366	1,062	1,166
China	Korea	300	500	190	240	490	740
China	Hong Kong	412	400	331	345	743	745
China	Malaysia	620	600	213	217	833	817
China	Singapore	410	400	240	241	650	641
China	India	2,109	2,000	288	302	2,397	2,302
China	Thailand	608	600	166	180	774	780
Korea	Japan	300	400	218	262	518	662
Korea	China	250	350	203	220	453	570
Korea	Hong Kong	444	450	419	422	863	872
Korea	Malaysia	388	400	267	282	655	682
Korea	Singapore	398	400	309	318	707	718
Korea	India	2,010	1,950	517	528	2,527	2,478
Korea	Thailand	395	400	251	255	646	655

Notes: (*) Rates are collected for shipment of a 20' container (Twenty-feet Equivalent Unit - TEU) among country's major ports. Rates are averaged for the years 2003 and 2005.
[1] Including container handling charges, documentation fees, government taxes and levies, etc. of both the trading partners.
Source: Calculation based on freight rates provided by Maersk Sealand [2006].

Table 3

OLS Results at 4-digit HS for the Year 2004

	Model 1[1]		Model 2[2]	
	Coefficient	t-value	Coefficient	t-value
GDP of importing countries	0.107***	3.720	0.059**	2.350
GDP of exporting countries	0.488***	20.440	0.394***	21.230
Infrastructure of importing countries	-0.421***	-7.500	-0.586***	-12.090
Infrastructure of exporting countries	-0.054*	-1.990	-0.148***	-5.930
Weighted tariff	-0.276***	-13.830	-0.161***	-9.450
Trade-weighted transport costs [2]			-0.571***	-11.620
Trade-weighted transport costs [1]	-0.021*	-1.940		
Remoteness of importing countries	-0.001	-0.010	-0.680***	-8.260
Remoteness of exporting countries	-0.638***	-8.720	-0.929***	-15.150
Distance	-0.420***	-9.970	-0.573***	-15.570
FTA Dummy	0.323***	5.900	0.179***	3.970
Adjacency Dummy	0.163**	2.260	0.072	1.290
Language Dummy	0.114	1.570	0.117*	2.000
Country effect				
China	0.693***	4.940	0.579***	9.580
Hong Kong	Insignificant		Insignificant	
India	Insignificant		Insignificant	
Indonesia	0.087	1.080	-0.212**	-2.810
Japan	Insignificant		Insignificant	
Korea	-0.488***	-6.340	-0.964***	-13.750
Malaysia	Insignificant		Insignificant	
Singapore	Insignificant		Insignificant	
Thailand	0.119*	1.940	0.241***	4.570
No of observations	20,533		12,051	
Adjusted R^2	0.130		0.555	

Notes: [1] Estimated using equation (1). [2] Estimated using equation (2).
* Significant at 10% level. ** Significant at 5% level. *** Significant at 1% level.
Source: Authors' elaboration.

Table 4

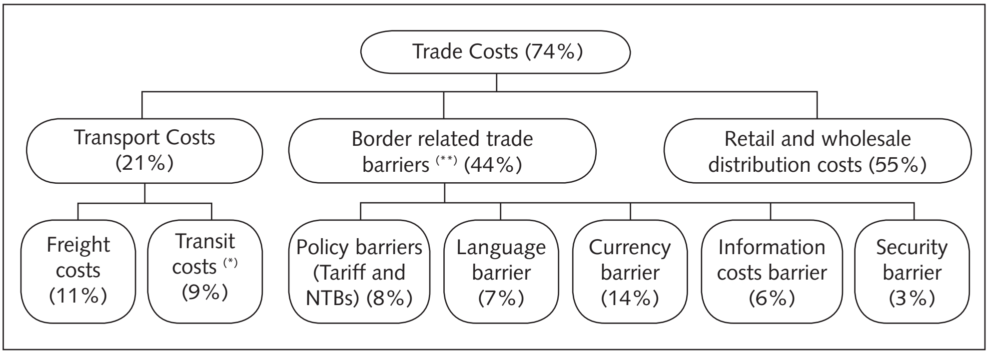
2SLS Results at 4-digit HS for the Year 2004

	Model 1[1]		Model 2[2]	
	Coefficient	t-value	Coefficient	t-value
GDP of importing countries	0.014	0.410	0.150***	4.950
GDP of exporting countries	0.325***	9.390	0.112***	3.800
Infrastructure of importing countries	-0.279***	-4.640	-0.341***	-6.550
Infrastructure of exporting countries	-0.008	-0.290	-0.170***	-6.830
Weighted tariff	-0.276***	-13.830	-0.159***	-9.360
Trade-weighted transport costs [2]			-0.574***	-7.700
Trade-weighted transport costs [1]	-0.024**	-2.210		
Remoteness of importing countries	-0.056	-0.600	-0.727***	-8.880
Remoteness of exporting countries	-0.504***	-6.640	-0.726***	-11.500
Distance	-0.530***	-11.680	-0.786***	-19.460
FTA Dummy	0.292***	5.310	0.014	0.300
Adjacency Dummy	-0.006	-0.080	-0.036	-0.640
Language Dummy	0.171**	2.330	0.066	1.130
Country effect				
China	0.738***	5.260	0.470***	7.750
Hong Kong	Insignificant		Insignificant	
India	Insignificant		Insignificant	
Indonesia	-0.015	-0.190	-0.378***	-4.970
Japan	Insignificant		Insignificant	
Korea	-0.555***	-7.160	-1.029***	-14.720
Malaysia	Insignificant		Insignificant	
Singapore	Insignificant		Insignificant	
Thailand	0.300***	4.450	0.548***	9.460
Instrument: No of seaports for exports and imports in bilateral pair	0.572***	6.460	1.063***	12.410
No of observations	20,533		12,051	
Adjusted R^2	0.132		0.560	

Notes: [1] Estimated using equation (1). [2] Estimated using equation (2).
* Significant at 10% level. ** Significant at 5% level. *** Significant at 1% level.
Source: Authors' elaboration.

Figure 1

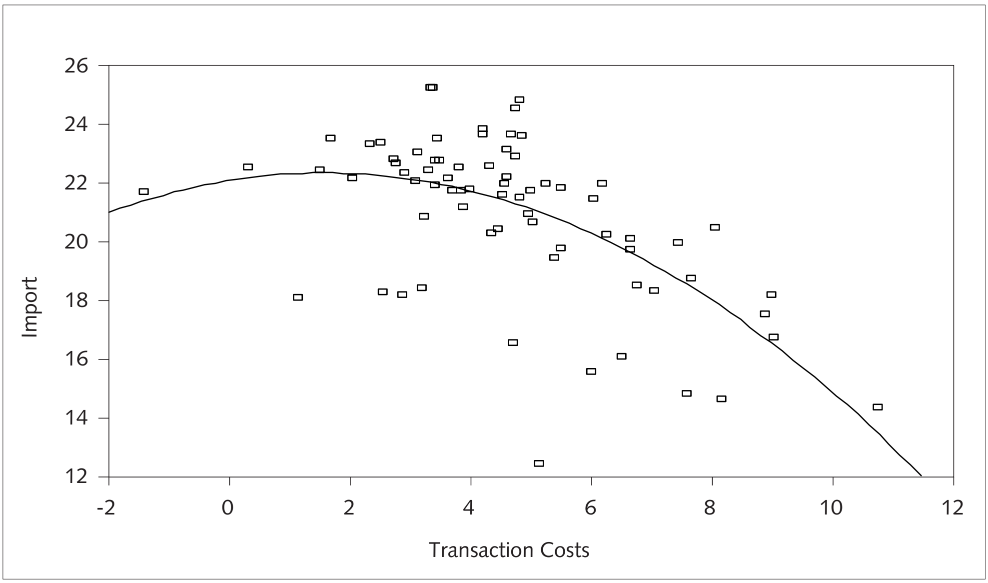
Estimated Trade Costs in Industrialized Countries



Notes: (*) Tax equivalent to the time value of goods in transit. Both are based on estimates for US data.
(**) The combination of direct observation and inferred costs, which, according to the author, is an extremely rough breakdown.
Source: Anderson and van Wincoop [2004].

Figure 2

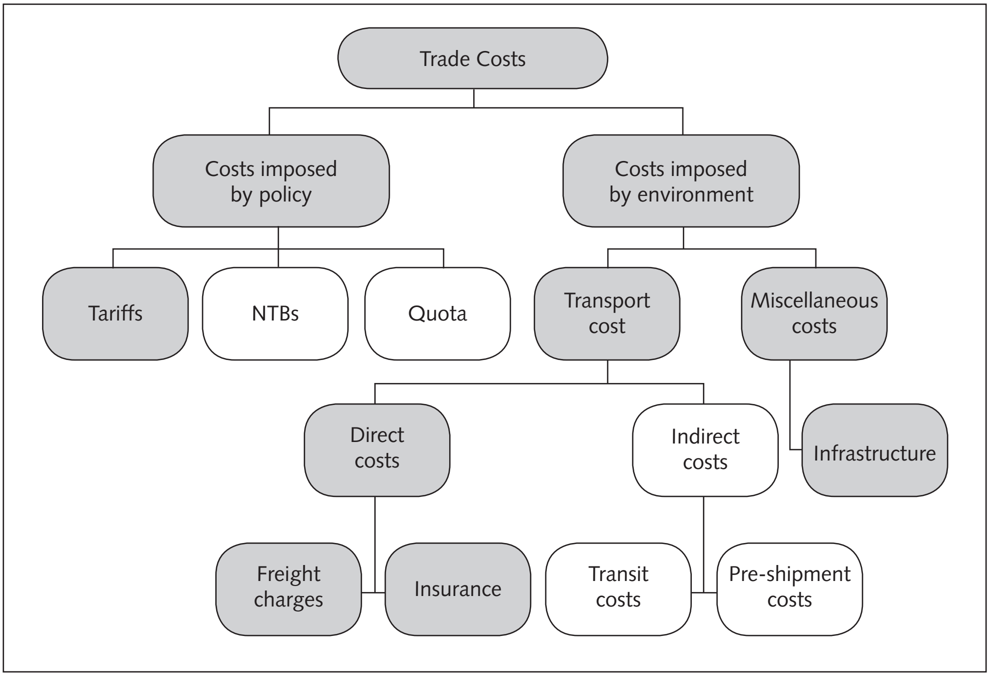
Relative Importance of Trade Transaction Costs in Asia



Note: Import and transaction costs are based on pooled bilateral trading pairs for 15 Asian economies (those listed in the paper) for the year 2004.
Source: De [2006b].

Figure 3

SELECTED TRADE COSTS COMPONENTS



Source: Authors' elaboration.

Appendix 1

Estimated Weights		
Infrastructure Indicator	Factor Loadings 1	Factor Loadings 2
Air transport freight (million tons per km)	0.81	0.57
Air transport, passengers carried (percentage of population)	0.88	-0.38
Aircraft departures (percentage of population)	0.91	-0.36
Country's percentage share in world fleet (percent)	0.36	0.69
Container port traffic (TEUs per terminal)	0.53	0.69
Electric power consumption (kwh per capita)	0.90	0.10
Fixed line and mobile phone subscribers (per 1,000 people)	0.93	0.02
Railway length density (km per 1000 sq. km of surface area)	0.92	-0.31
Road length density (km per 1000 sq. km of surface area)	0.90	-0.26
Expl. Var (% of total)	0.67	0.19

Note: Factor Loadings (unrotated).
Source: Authors' elaboration.

Infrastructure Index and Ranks in 2004					
Country	Score	Rank	Country	Score	Rank
Singapore	6.01	1	Thailand	0.99	7
Hong Kong	5.60	2	India	0.59	8
Japan	4.23	3	Philippines	0.59	9
Korea	3.22	4	Indonesia	0.46	10
China	1.92	5	Vietnam	0.40	11
Malaysia	1.74	6			

Source: Authors' elaboration.

Appendix 2

Discrepancy in Transport Costs Estimation at 4-digit HS			
Importer	Total number of observations at HS 4	Total number of observations with positive transport costs at HS 4	Total number of observations with zero/negative/missing transport costs at HS4
China	6,380	2,847	3,533
Hong Kong	5,734	2,626	3,108
India	5,652	2,566	3,086
Indonesia	6,213	2,916	3,297
Japan	5,582	2,548	3,034
Korea	5,705	2,599	3,106
Malaysia	6,736	2,924	3,812
Singapore	6,937	2,755	4,182
Taiwan	5,517	2,266	3,251
Thailand	6,463	2,584	3,879
Grand Total	*60,919*	*26,631*	*34,288*

Source: Authors' elaboration.

Data Classification		
Sector	Corresponding 2-digit HS	Remarks
Food	16 - 23	
Chemical	28 - 40	Taken all at HS 4
Textile and clothing	41 - 67	
Machinery	84	Excluding HS 8415, 8418, 8471, 8473
Electronics	85, 90, 91, 92, 95	Including HS 8415, 8418, 8471, 8473
Auto components	87	
Steel and metal	72 - 83	Taken all at HS 4
Transport equipment	86, 88, 89	

Source: Authors' elaboration.

Appendix 3

Sources of Data	
Particular	Source
Bilateral trade	UN COMTRADE, UNSD
Bilateral tariff	WB WITS, UNCTAD TRAINS
GDP, GDP *per capita*, surface area, population, openness, exchange rate, etc.	WB WDI 2006
Distance	Great circle distance, *http://www.wcrl.ars.usda.gov/cec/java/lat-long.htm*
Infrastructure variables: (i) railway length, (ii) road length, (iii) air transport freight, (iv) air transport passengers carried, (v) aircraft departures, (vi) container traffic, (vii) fixed line and mobile phone subscribers, (viii) internet users, and (ix) electric power consumption	WB WDI 2006
Shipping rates	Maersk Sealand, Denmark, *http://www.maerskline.com*

Source: Authors' elaboration.

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Contents

Impact of Cross-border Road Infrastructure on Trade and Investment in the Greater Mekong Subregion

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Summary

This paper investigates the impact of cross-border road infrastructure on trade and foreign direct investment in the Greater Mekong Subregion using panel data from 1981 to 2003. Empirical analysis based on a gravity-model approach suggests that the development of cross-border road infrastructure has had a positive effect on intra-regional trade in major commodities with its elasticity in the range of 0.6 to 2.3. When the impact of domestic road infrastructure is assessed separately, it has been associated with increased trade. When cross-border and domestic road infrastructures are considered together, the former has had a positive and the latter has had a negative association, respectively, with trade. Results regarding the impact of road infrastructure on foreign direct investment (FDI) flows are ambiguous, although data limitations appear to have been contributed to the poor performance of these estimates.

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I. Introduction

This paper investigates the impact of cross-border road infrastructure on the economies of the Greater Mekong Sub-region (GMS).[1] Cross-border and domestic road infrastructure together can reduce transport costs and lead directly to increased trade. Reduced transport costs can also raise indirectly foreign direct investment (FDI) by reducing transaction costs involved in intra-firm vertical integration structured to exploit varied comparative

advantages across countries. Increases in FDI, in turn, can further increase regional trade, and add to the direct effect of reduced transport costs achieved through improvements in the road infrastructure in border areas. If true, this would define a virtuous cycle of cross-border infrastructure development, trade, and investment that fosters increased trade and economic growth. Despite the many initiatives of economic integration in practice in the GMS, there has been only limited empirical research (e.g., Poncet [2006]), and to our knowledge, none on the role of cross-border road infrastructure. This paper helps fill this gap.[2]

We estimate trade creation and investment facilitation effects of cross-border road infrastructure in the GMS though econometric examination of historical data. In particular, following the approach of Limao and Venables [2001], we estimate gravity model equations for trade and FDI flows between each pair of the six (pre-2005) GMS economies. The gravity approach has been widely applied in empirical studies of bilateral trade since its introduction by Tinbergen [1962] and Poyhonen [1963]. "In most cases, the basic gravity model has been employed to capture statistically the bulk of trade variation to discern the marginal explanatory power of free trade pacts and/or exchange rate variability with an aim to test one theory or another" (Bergstrand [1998] pp. 27-28). Our principal interest in applying the gravity model in this paper is to use it to establish expected levels of trade between GMS economies from which we can quantify the marginal or incremental effect of cross-border (border-area) road infrastructure on trade in GMS relative to the effect of general domestic (non-border area) road infrastructure.

Despite data limitations associated with the relatively small number of economies included in our analysis and shortcomings in reliable reporting of FDI and other key data in some of the GMS economies, our estimates are able to explain much of the variation in trade flows. Estimates are less successful in explaining FDI flows. Our results show that the quality of road infrastructure in the border area between economies has a positive and statistically significant relationship with trade flows between them, and that this relationship is particularly strong when both cross-border and general domestic road infrastructure are included in the estimates. This result is important to policy as governments and international development organizations seek effective mechanisms for promoting regional trade and broader economic growth in the GMS.

Section II of the paper discusses the relevant literature we reviewed and Section III sets out the research questions we consider. Section IV presents the analytical approach and estimation models we applied. Section V discusses characteristics of the data we used in our analysis. Section VI presents our estimation procedures and Section VII discusses our results and implications. Finally, Section VIII provides concluding remarks.

II. Relevant Literature

This paper draws from two broad strands of recent economic literature. First, the economic geography literature that has flourished since the 1990s and makes increasingly clear the importance of geography in explaining patterns of trade and economic development. For example, access to sea and distance to major markets have been shown to have strong effects on shipping costs, which in turn, strongly influence trade flows in manufactured goods (e.g., Limao and Venables [2001]). Economies suffering multiple geographical handicaps such as landlocked status, an absence of navigable rivers and lakes, or tropical or desert ecology, tend to be among the poorest in the world (e.g., Radelet and Sachs [1998]; Redding and Venables [2004]). These papers have documented a strong negative empirical

relationship between transport costs and economic growth controlling for the other variables expected to influence growth. In the context of the GMS, the relative poverty of Lao PDR has long been understood as at least a partial result of the country's landlocked status and geographic characteristics. Empirical evidence in this literature suggests there is much potential for cross-border road infrastructure and associated institutional arrangements to benefit economies that are not endowed with favorable geographic characteristics.

Second, one branch of the recent trade literature has focused on trade and FDI linkages (the so-called "trade-FDI nexus") in explaining patterns of trade and, ultimately, patterns of economic development. Empirical analyses in the area have found that multinational firms can gain from intra-firm trade by integrating production processes across economies with different areas of comparative advantage. When such gains are present, this reduces tendencies towards production agglomeration, and if the advantages of production integration across economies outweigh those from agglomeration, then reductions in transport costs would make FDI complementary to trade. The literature on the trade-FDI nexus shares an understanding that one of the common threads in the economic successes of the "East Asian Miracle" has been the openness of these economies to FDI and their time-limited and targeted use of protectionist measures, which enabled their economies to overcome late-comer disadvantage and to reap the benefits of leaning by doing and network presence in their manufactured exports. Researchers have asserted that in the case of some East Asian economies, this led to a virtuous cycle of increased trade, economic growth, and FDI, and fueled their emergence as export-oriented manufacturing-based economies.[3] The experience of East Asian economies and the potential gains from trade (and capital transfers) between economies in the GMS suggest the latter has the potential to benefit from a similar trade-FDI nexus and greater regional economic integration enabled by improved cross-border road infrastructure.

III. Research Questions

Our interest extends to a few empirical questions considered to be of importance in the context of ongoing road infrastructure development in the GMS.

- What is the empirical relationship between the level of development of cross-border road infrastructure, and trade and FDI flows between GMS economies, historically?
- Can positive marginal effects of cross-border road infrastructure development on trade flows be found empirically, and if found, what is the magnitude of such effects?
- Has the development of cross-border road infrastructure been associated with increased FDI flows, and if so, to what extent can trade creation be attributed to increased FDI?

IV. Analytical Approach and Estimation Models

Our analytical approach is adapted from Limao and Venables [2001] and applies a gravity model to predict bilateral trade and FDI flows for each pair of GMS economies. However, departing from Limao and Venables, we omit estimation of an explicit transport cost equation due to data limitations. The lack of reliable measures of transport costs within the GMS and their proxies is discussed in Section V. Instead, we proceed by using an instrument for transport costs (distance) and include this directly in our trade and FDI equations. Also, departing from the existing empirical literature on the trade-FDI nexus, data limitations prevented us from estimating indirect impacts that come through trade and

FDI.[4] Estimation parameters of our particular interest are the responses of trade and FDI to various transport cost factors including cross-border road infrastructure.[5] Accordingly, our empirical analysis centers on the following two functional relationships:

1. *Trade equation*: $X_{ij} = X(E_i, E_j, R_{ij}, R_{ji}, D_{ij}, F_{ij}, \omega_{ij})$

- X_{ij} : exports of economy i to economy j,
- E_i , E_j : vector of characteristics of economy i (j) related to trade such as economy size (GDP), population, land area, trade barriers, and other variables typically used in gravity model estimates,
- R_{ij} , R_{ji} : vector of variables measuring road infrastructure in border areas and non-border (domestic) areas in economy i (j) with respect to economy j (i),
- D_{ij} : distance between economies i and j,
- F_{ij} : economy i's foreign direct investment from economy j, and
- ω_{ij} : other factors not accounted for (model error).

The trade equation incorporates standard variables used in gravity models plus variables of our particular interest in this research (i.e., measures of cross-border and domestic road infrastructure, and FDI from the trading partners). Economy's GDP is considered a key variable in the base gravity model because larger economies are expected to engage in greater trade (*ceteris paribus*). Trade is expected to be positively influenced by the economic mass of the trading partners and negatively affected by the distance between them. Our focus in this paper is on how road infrastructure is related to bilateral trade in the GMS. Specifically, we envision that bilateral trade between GMS economies is a function of the quality of road infrastructure generally in each economy and particularly the quality of road infrastructure in border areas. Other factors seen as important in driving levels of bilateral trade are differences in price levels between economies, tariff rates, and a broad characterization of the export/import environment in the economies.

Gravity models are often estimated with a few other variables to characterize the geographic characteristics and proximity of economies besides distance (e.g., sharing land border, landlocked status, small island status) or cultural-historical ties (e.g., shared language, dominance by common colonial power), however, these variables are not included in our estimates because there is insufficient heterogeneity in these variables and insufficient degrees of freedom in our small sample of GMS economies.

2. *FDI equation*: $F_{ij} = F(E_i, E_j, R_{ij}, R_{ji}, D_{ij}, X_{ij}, z_i, \varepsilon_{ij})$

- F_{ij} : economy i's foreign direct investment received from economy j,
- E_i , E_j , R_{ij} , R_{ji}, D_{ij}, X_{ij} : same as in the trade equation,
- z_i : vector of other characteristics related to economy i's investment climate, and
- ε_{ij} : other factors not accounted for (model error).

The FDI equation specifies that FDI flows are determined by several factors common to the trade equation (e.g., economy size and resources, inflation rate, tariff rates). Of our particular interest, again, is in the relative marginal contributions of cross-border and domestic road infrastructure to FDI flows between the GMS economies. In addition, FDI is viewed as being influenced by various other factors related to the investment climate of the recipient economy.

Following the empirical approach common to gravity models of trade, our base models use two parametric specifications for the above functional relationships:

$$X_{ijt} = A\,Y_{it}^{\alpha_E}\,Y_{jt}^{\alpha_M}\,H_i^{\beta_E}\,H_j^{\beta_M}\,N_{it}^{\gamma_E}\,N_{jt}^{\gamma_M}\,D_{ij}^{\theta}\,(\varepsilon_{ijt}u_{ij})$$

or $$X_{ijt} = A\,(Y_{it}\,Y_{jt})^{\alpha}\,(H_i\,H_j)^{\beta}\,(N_{it}\,N_{jt})^{\gamma}\,D_{ij}^{\theta}\,(\varepsilon_{ijt}\,u_{ij})$$

where X_{ijt} : are exports from economy i to economy j in time t,
Y_{it}, Y_{jt} : are the gross domestic products of economies i and j in year t,
H_i, H_j : are the geographic sizes of economies i and j,
N_{it}, N_{jt} : are the populations of economies i and j in year t,
D_{ij} : is the distance between (the capitals of) economies i and j,
ε_{ijt} : is the regular error term,
u_{ij} : is an error component specific to economy-pair i-j,
A : is a constant,
with the following signs generally expected for the estimation parameters:

$\alpha_E, \alpha_M, \alpha, \beta_E, \beta_M, \beta > 0;$ and $\gamma_E, \gamma_M, \gamma, \theta < 0.$

In logarithmic form, we have:

$$ln\, X_{ijt} = ln\, A + \alpha_E\, ln\, Y_{it} + \alpha_M\, ln\, Y_{jt} + \beta_E\, ln\, H_i + \beta_M\, ln\, H_j + \gamma_E\, lnN_{it} + \gamma_M\, N_{jt} + \theta lnD_{ij} + ln\,\varepsilon_{ijt} + ln\, u_{ij}$$

or $$ln\, X_{ijt} = lnA + \alpha\,(lnY_{it} + lnY_{jt}) + \beta(\,lnH_i + lnH_j) + \gamma\,(\,lnN_{it}, + lnN_{jt}) + \theta lnD_{ij} + ln\,\varepsilon_{ijt} + ln\, u_{ij}$$

(The FDI equation takes the same form and is not presented here to save space).

The first specification takes a Cobb-Douglas form in which the influences of each trading partner's economic size, population, and geographic area enter the equation separately. The second specification enters the characteristics of economies i and j as products, following more closely the Newtonian form of the gravity equation. The advantage of the first specification is that it allows examination of the effects of variables between exporting and importing economies separately.[6] The second specification offers a more straightforward interpretation and has the additional advantage of reducing the number of estimation parameters, which is helpful when sample size is relatively limited as in our dataset. Using these specifications as our base models, we add variables for road infrastructure and obtain estimates that control for other standard variables treated in the gravity model.

Before discussing the dataset used in our analysis, some comments regarding potential problems with endogeneity between trade flows and the other variables in the model seem warranted. Endogeneity between trade flows and GDP, and between overland trade flows and the quality of road infrastructure in the border areas -in particular- are of concern in this regard. With respect to the former, we note that the widespread use of GDP as a regressor in the vast gravity model literature. Moreover, we use a measure of major goods traded over land (to be explained later) in addition to total bilateral trade as our dependent variable, which would have only a limited endogeneity problem since major goods traded over land represents a smaller share of GDP. Were it the case that cross-border road infrastructure is developed in response to increased demand by traders, then endogeneity between trade and cross border road infrastructure would be a problem. However, the significant lead time required before a planned road is constructed and is available for transporting goods supports treating the extent of road infrastructure as an exogenous variable.

V. Data

Our dataset tracks trade and other variables for each pair of GMS economies over the period of 1981 to 2003. In all, 30 economy pairs can be formed across the 6 GMS economies (i.e., Cambodia-Laos, Cambodia-Myanmar, (…), Yunnan-Thailand and Yunnan-Vietnam). Table 1 summarizes descriptive statistics from the dataset along with details on the data sources and definitions of variables. In the table, "between n" reports the number of reporting economy pairs (maximum 30), "within T(-bar)" the number of data years (maximum 23 years), and "overall N" the total number of observations (maximum 30×23=690).

Due to the relatively small number of GMS economies and limited number of years for which most data are available, missing data problems were widespread and created challenges in estimating our models. This is particularly true for data during the initial years of our panel, when many of the GMS economies were suffering prolonged periods of conflict or social unrest and did not have well-established national statistical services. In the remainder of this section we discuss details on data collection and the measures we used for key variables.

Transport Cost

This study required information on overland transport costs because of our focus on road infrastructure. However, gathering reliable measures for these proved difficult. Past studies, including Limao and Venables [2001], used directly observed transport costs data collected from shipping and logistics companies and they mainly capture the costs of transport by sea. We were not able to find reasonable data directly representing observed transport costs overland in the GMS. Then we considered using a commonly employed proxy for transport costs: the ratio of Cost, Insurance, and Freight (CIF) and Free on Board (FOB) prices. The CIF/FOB ratio between two economies provides a proxy for average costs of transporting goods between them weighted by the value of the goods being traded.[7] In the case of the GMS, however, collecting panel data for CIF/FOB proved impractical because: (i) the trade authorities for most GMS economies record export values in FOB only and import values in CIF only; and (ii) FOB import values reported in balance of payment statistics are available only at the economy-aggregate level, but not by individual trading partner. An alternative to finding FOB import values would be to assume the FOB export values equal the FOB import values for corresponding trade partners; however, analysis of these data revealed large discrepancies between the recorded values for exporters and those for corresponding importers. Problems of missing or unreliable trade data reported in GMS economies with weak statistical capacity such as Cambodia, Lao PDR, and Myanmar lead international trade databases including the International Monetary Fund's (IMF) *Direction of Trade Statistics* (DOTS) to adjust the data for these economies based on data of their trading partners such as China and Thailand (for example, in a number of cases, it appeared that an assumed CIF/FOB ratio of 1.08 was used). Other data sources and adjustments to derive transport cost measures were tried, but none proved reliable ultimately. Due to these data problems with transport costs, we had to forgo the estimation of the effects of road infrastructure in two steps -first on transport costs, and then second on trade flows- and instead estimate the determinants of trade (and FDI) flows in one step as described in Section IV.

Following common practice in gravity model estimation, the distance between capitals (approximate direct point-to-point distances) is used as proxy variables for transport costs.[8] Estimation results presented in Section VII are based on these data. However, in order to check the robustness of our results, changes in this proxy are tested

using information on air freight charges collected from GMS shipping firms, which was the only measure of transport costs we could identify that was generally available for international transport costs between the GMS countries. Efforts to gather information on the cost of shipping goods between the countries' capitals via roads or waterways were unsuccessful, which may be a reflection of difficulty of transporting goods between cities in the GMS. Table 2 summarizes these data.

Trade Flows

We employ two measures of trade flows: one based on total bilateral trade reported in the IMF-DOTS database (except for Yunnan Province for which data are taken from Yunnan Statistical Yearbook), and the other based on "major exports" transported via land or river. For the latter measure, the selection of the representative commodities relied on customs data available at selected international crossing points (including river ports) in the GMS. Up to five commodities defined at the four digit level in the UN Harmonized System of Product Categories that are considered largely transported via land (or ferry, where river transport dominates) are identified and their export values reported in the UNCOMTRADE database are summed to form the measure of major exports via land.[9] Use of this measure is preferred to the use of total bilateral trade because cross-border road infrastructure is expected to be more important in determining the volume of overland trade flows than total trade, which includes ocean-bound trade and is influenced by a greater variety of factors. However, the use of the preferred measure comes at the cost of data scarcity and there is some unavoidable subjectivity in the selection of major goods due to sketchiness of customs data at overland points of entry. Therefore, the use of the total bilateral trade serves as a check on the sensitivity of estimates depending on the choice of the trade measures, and it can also gauge the effect of more limited sample size on estimates despite the presumably weaker relationship between total trade and cross-border road infrastructure.

One last issue concerning the data used in this study concerns the problem of undocumented trade/smuggling between GMS economies. The limited evidence available regarding the magnitude of smuggling suggests that a significant portion of intra-GMS trade goes unrecorded by government officials. Estimates of the value of smuggled goods generally fall in the broad range of 30 to 50 percent of the value of the recorded trade (ADB [2004] p.14). However, for the purpose of this paper, we maintain that omission of the value of unrecorded trade is unlikely to significantly influence estimates due to our focus on international crossing points-as opposed to local border crossing points-in deriving the measure of cross-border road infrastructure.[10]

Road Infrastructure

We construct two separate measures for road infrastructure based on road density in GMS economies: one characterizing road density in border areas and the other characterizing road density in non-border areas.[11] In this paper "cross-border road infrastructure" is represented by the density of paved roads in the provinces (for Cambodia, Lao PDR, Thailand, and Vietnam), states (for Myanmar) or districts (for Yunnan Province) containing international crossing point(s) to the corresponding GMS pair. "Domestic road infrastructure" is represented by the density of paved roads in the provinces, states or districts that do not border any economy. Figure 1 displays the GMS road network and border crossing points referenced in our dataset while Table 3 gives the names of these

locations. For example, cross-border road infrastructure for Cambodia as an exporter and Lao PDR as an importer is represented by the road density in Stung Treng Province of Cambodia and Champassack Province of Lao PDR, respectively. In Tables 3 and Figure 1, these variables are represented by "cross-border roads exporter" and "cross-border roads importer," respectively. Similarly the domestic road infrastructure in this case is represented by road density of all the other provinces in these economies and they are represented by "domestic roads exporter" and "domestic roads importer," respectively. Road density is calculated by dividing the total road length in border (non-border) provinces by the total area of the corresponding provinces, states, or districts, with adjustments in a few cases where disaggregated road inventory data are unavailable.[12]

VI. Estimation Procedures

Estimates are carried out using estimators suitable to the panel structure of our data. By panel, we refer to the fact that data consists of variables covering the cross-section of GMS economies over time, which raises concerns of serial correlation in estimation residuals.[13] Depending upon the results of Hausman and Breusch-Pagan Lagrange Multiplier tests, either the random effects estimator or the robust ordinary least squares (OLS) estimator is applied. Robust OLS is the regular OLS estimator with a Huber-White correction, which takes into account the panel-nature of the data in recalculating standard errors. The fixed effects estimator cannot be applied since key variables of concern (e.g., distances, land areas) are fixed over time. The Hausman test indicates whether the fixed or random effects approach is appropriate by testing for omitted variables. A significant result from the Hausman test indicates that strong parametric assumptions of the random effects estimators are not met so this estimator is not suitable. In such cases, we use the robust OLS estimator despite its reduced efficiency. The Breusch-Pagan test evaluates the significance of random effects versus a regular OLS estimator by examining the statistical significance of economy-pair-specific error terms included in the random effects estimator. A significant result from the Breusch-Pagan test implies that the random effects estimator should be used.

Coefficient estimates in random effects estimation reflect a weighted average of the cross-sectional and time-series association between the dependent and independent variables included, with the weighting indicated by the estimation parameter Rho. The statistical significance of coefficient estimates is tested using a z-test that is functionally equivalent to a standard t-test applied in OLS regression. The overall statistical significance of the estimation models is tested using the Wald Chi-square test, which indicates the probability of a false rejection of the null hypotheses that the model has no explanatory power over the dependent variable.

Finally, coefficient estimates in all estimation models can be interpreted as elasticities because they are estimated in logarithmic form.

VII. Estimation Results

Table 4 presents estimation results on total exports between GMS economies. Seven variant specifications of the model are reported. As explained above, we used two sets of data for the "distance" variable: actual distance (in kilometers) between capital cities, and air freight fees between the corresponding cities. The results using the air freight cost data are reported in Appendix Table 1. All models yield coefficient estimates that

are largely consistent with expectations (e.g., a negative association with distance and a positive association with economic size), and conform to gravity model results in several recent papers.[14] All the models except Model 7 show overall goodness of fit with R-squared coefficients in the range of 44 to 63 percent (24 to 60 percent, when shipping cost used in place of distance). They are all highly statistically significant according to results of F-test (robust OLS) or Wald Chi-square test (random effects). The results of Hausman test indicate that the robust OLS estimator should be used for all models except Model 3.

The overall results suggest that the gravity model approach provides a sound basis upon which we can judge the marginal effect of additional variables on the level of trade. In particular, Model 1 includes only the gravity model base variables with exporting and importing economies separated. The coefficient estimates have the expected signs and significance, so endorse application of the gravity model to analyze trade flows in the GMS.

In Model 2, cross-border road infrastructure is found to have a positive and statistically significant association with total exports on both the exporter's and importer's sides of the border. According to this estimate, a one percent increase in the stock of roads on each side of the border area are associated with 1.2 to 1.3 and 1.7 to 1.8 percent increases in total trade between the importing and exporting economies, respectively. Model 3 adds measures of domestic road infrastructure, alone, to the base gravity model, and finds a positive but statistically insignificant association between total trade and domestic roads.

Models 4, 5, and 6 add both cross-border and domestic road infrastructure to the base gravity model estimates of total trade. While coefficient estimates based on the distance data for transport proxy are positive and statistically significant only on exporter's side, those based on the freight costs are positive and statistically significant on both exporter's and importer's sides. This suggests cross-border road infrastructure in the GMS has a positive association with the volume of intra-GMS trade. In contrast, domestic roads are estimated to have a negative and statistically significant association with total trade in many model estimates. Compared with models in which only cross-border road infrastructure is included in the explanatory variables, models in which both cross-border and domestic road infrastructure variables are included obtained larger coefficient estimates for the cross-border road infrastructure. A likely explanation for this is that these are artifacts of high covariance between our measures of cross border and domestic road infrastructure measures.[15] The magnitudes of the trade effects estimated for importer's cross-border and domestic road infrastructure appear unreasonably large given the presumably smaller influence they would have on aggregate trade relative to their influence on major overland trades. But the results could also be explained if our road measures were capturing broader policies determining trade orientation/openness. This would occur if economies more oriented towards foreign trade tended to make greater investments in cross-border infrastructure.

If, as indicated by the results in Models 4 through 6, cross-border and domestic road infrastructure play non-complementary roles in promoting regional trade in the GMS, regional integration would require strategic shifts in road investments toward border areas.

Model 6 includes the average weighted tariff rate of the importer as an explanatory variable. However, this is found not to have a statistically significant effect on trade. Possible explanations for this are that tariff rates averaged across all goods and trading partners poorly reflect the tariff rates between particular GMS economies or that non-tariff barriers are of greater importance than tariff levels in determining trade. Lastly, Model 7 estimates the relationship between FDI on trade by adding measures of bilateral FDI flows to the base gravity model, and finds no statistically significant relation between the two.[16]

Comparing results from estimates using distance and those using air freight costs, the former yields more consistent results in line with past gravity model estimations, but both series indicate there is a positive association between cross-border road infrastructure and trade flows that is robust to the specification used for the transport cost proxy.

Table 5 (and Appendix Table 2) present results for the determinants of the major exports over land between GMS economies. Models 8 to 15 report estimated R^2 measures ranging between 47 percent (Model 8) and 74 percent (Model 12), and all models are highly statistically significant as indicated by the results of F-test or Wald Chi-square test.[17] Based on the results of Hausman test, all models except models 9 and 10 use the robust OLS estimator.

Gravity model estimates carried out using the major export measures are less successful in explaining past trade than the estimates using the total export measures. The coefficient estimates on the base variables of the gravity model, except for GDP, failed to yield expected signs and statistical significance consistently. The contrast between the results from estimates using total and major export measures could be due to the limited explanatory power of the gravity model for the latter (i.e., major goods transported over land in the GMS) or to the much reduced sample available in the latter estimates. The distance variable shows either an insignificant or a positive influence on major exports, which is counter to the expectation from gravity model. Perhaps, distance between capitals is a poor indicator for the relevant distance in determining overland trade flows between GMS economies, which would be the case if overland trade tended to focus on markets besides the capital city (e.g., regional markets closer to border areas).

When the cross-border road infrastructure variable is added separately to base variables of the gravity model (as in models 9 through 12), we find a positive and statistically significant association with trade levels for both exporter's and importer's sides of cross-border roads. Estimated trade elasticities with respect to cross-border roads range between 0.635 and 2.256 (Model 9, under specification using distance and freight costs, respectively). The estimated elasticities are generally larger for exporter's side except in the case of model 10, and are relatively stable across the various model specifications estimated. As noted above for the case of the total exports estimates, using distance or air freight costs as proxies for transport costs do not significantly change results in terms of the positive and statistically significant association obtained between cross-border road infrastructure and trade flows.

The trade elasticities with respect to cross-border road infrastructure appear more reasonable in the major export estimates than in the estimate of total exports, which would follow from the expected closer relation between cross-border transport infrastructure and trade in goods selected based on their importance to overland trade as opposed to total trade (which relies more heavily on sea shipment).

Model 13 shows that when our measure of domestic road infrastructure is added separately to the base gravity model, it alone has a significant positive association with the level of major exports -with a elasticity of about 1 for both the exporter and importer. Paralleling our finding from the estimates of total trade (Model 14), when both cross-border and domestic road infrastructure measures are included in the model, we find that cross border roads and domestic roads have non-complementary contributions to intra-GMS major exports. This could imply that domestic road infrastructure -when separated from roads in frontier areas- mainly promotes the integration of domestic markets and diverts economic activities away from trade in major goods across GMS economies.

Another relationship of our interest is how FDI flows between GMS economies influence trade levels. Model 15 adds a measured bilateral FDI to the base gravity model and suggests that importer-to-exporter FDI flow has a small (0.095 to 0.098) but statistically significant association with major exports, but that exporter-to-importer FDI flow has no significant effect. This provides some evidence of a positive trade-FDI nexus in which FDI contributes to export growth from the FDI-recipient economies, and would be consistent with the movement of export-oriented assembly and resource extraction activities. Lastly, the result from Model 12 indicates that tariff barriers have no discernible influence on major exports, which was also the case in total exports estimates.

Finally, we are also interested in examining the determinants of FDI flows between GMS economies -particularly the relationship between FDI, trade flows, and development of road infrastructure. Table 6 summarizes FDI inflow estimation results. In general, the gravity model performed poorly in explaining regional FDI flows, although, admittedly, our dataset on FDI flows was small. Calculated R^2 statistics for the models were fairly low, ranging between 0.37 and 0.41, but all models were statistically significant according to F-tests. Few variables except GDP were found to have significant associations with FDI flows. Cross-border road infrastructure was estimated to have a positive but not statistically significant association with FDI in most models, while domestic road infrastructure was found to have a negative but again statistically insignificant association.

VIII. Conclusions

This paper investigates the impact of cross-border and domestic road infrastructure on trade and FDI flows in the GMS during the past two decades. The theoretical underpinnings of the research draw from the recent economic geography and trade literatures, while the paper's empirical approach is based on a gravity model estimation framework. Our main interest is in the marginal effect of cross-border road infrastructure on trade and FDI when domestic road infrastructure and other controls are taken into account. The most notable findings were:

(i) Economy size appears to be a dominant driver of both trade and FDI, and other base variables of the gravity model generally perform as expected (except for the estimates of FDI flows);

(ii) the elasticity of trade in major exports likely to be transported over land between GMS economies with respect to developments in cross-border road infrastructure is estimated to be in the range of 0.6 to 2.3;

(iii) when the gravity model of total trade is estimated with domestic road infrastructure separately, we find a positive association between the two with an estimated elasticity of about 1.0;

(iv) estimates including measures of both cross-border and domestic road infrastructure show that cross-border roads have a positive association and domestic roads have a negative association with trade flows (both major exports and total trade); and

(v) barriers to trade captured by weighted average tariff rates and a trade environment dummy variable failed to yield significant associations with trade flows, which may suggest a relatively greater impact of unmeasured non-tariff barriers or poor measurement of these proxies for trade policy.

From this analysis, we conclude that the development of cross-border road infrastructure in the GMS has had a positive effect on the regional trade. The result

that cross-border roads have distinct effects from domestic road infrastructure suggests promotion of regional trade may require deliberate policy shifts toward investments in roads in border areas. In this light, cross-border road infrastructure becomes an important part of a broader effort to encourage regional integration to benefit GMS economies that are less endowed with natural seaports such as Lao PDR.

Nonetheless, sample size constraints associated both with the relatively small number of GMS economies and with missing data problems represent serious challenges in carrying out otherwise more comprehensive regression exercises. Our estimates provide little insight into the determinants of FDI flows between GMS economies, although FDI flows are associated at a statistically significant level with slightly higher trade in major exports.

The modeling framework and empirical estimates in this paper provide a useful beginning in efforts to estimate some of the key empirical relationships between road infrastructure development, trade, and FDI in the context of the GMS. While application of the gravity model to intra-GMS FDI flows appears premature, such application could gain relevance in the future as the flow of investments particularly from Thailand and China toward the other GMS economies increase and the data situation in Cambodia, Lao PDR, Myanmar, and Vietnam improves.

Notes

[1] Current members of GMS are Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, Yunnan Province of China, and Guanxgxi Zhuang Autonomous Region of China. Guangxi Region joined GMS in 2005. Analysis in this paper excluded data for Guangxi Region due to scarcity of detailed data documented (e.g., in Guanxi Statistical Yearbooks), particularly on transport infrastructure. Throughout this paper, we use "economy(ies)" in referring to the members of the GMS.

[2] The motivation and detailed background of this research are discussed in Fujimura [2004].

[3] Trade-FDI nexus in line with the argument here has been well researched in the context of East Asia's economic integration: e.g., Fukao, Ishido and Ito [2003] and Urata [2001].

[4] The dataset used in this study features too few observations to permit simultaneous estimation of equations (trade and FDI) with a panel structure.

[5] De [2005] applied a gravity model to Asian countries with transport infrastructure variables and transaction costs among the explanatory variables, but does not distinguish cross-border and domestic transport infrastructure as such.

[6] However, caution is warranted in interpreting results when asymmetric coefficients for exporting and importing economies are obtained, since these may to a considerable extent be driven by imbalance in the panel.

[7] CIF = FOB + freight forwarding charge + insurance premium. To the extent that insurance premiums are similar for goods transported between various GMS markets, the CIF/FOB ratio would provide a good measure of transport costs.

[8] Capital cities are used except in the case of Cambodia-Vietnam and Thailand-Vietnam trade, where Ho Chi Minh City is used in preference to Hanoi due to that city's prominence as a trade center.

[9] For example, for major exports from Lao PDR to Thailand the commodities selected (based on goods transit reported at selected border crossing customs stations in 2004) were: HS2483 (wood of non-coniferous species), HS2472 (sawn logs and veneer logs of non-coniferous species), HS0011 (animals of bovine species), HS2876 (tin ores and concentrates), and HS2842 (wood of coniferous species).

[10] A number of other points can be offered with respect to the issue of unmeasured trade within the GMS and its impact on our findings. Improvement in the availability and quality of roads at borders may reduce incentives for smuggling by increasing relative cost of transport via undocumented channels (by making transport via primary roads through international crossing relatively more cost-efficient *vis-à-vis* smuggler routes) and by capacitating customs enforcement. Also, to the extent that major international roads are used by smugglers, estimates of trade effects of cross-border road improvement

will underestimate true positive effect of the road on trade, so examining official trade figures would offer a conservative test of road improvement's influence on trade flows. Lastly, it is reasonable to assume that the economic incentives for smuggling of some goods between GMS economies have fallen over time as they have lowered tariff rates on many imports from their neighbors, which would be expected to reduce smuggling over time (other things being equal).

[11] Data sources (and data years available) were: Committee for Development of Cambodia (CDC) for Cambodia (1995-2002), Department of Roads, Ministry of Communication, Transport, Post and Construction (MCTPC) for Lao PDR (1992-2003); Department of Highways, Ministry of Transport for Thailand (1994-2003); and transport section of statistical yearbooks for Myanmar (1984-1996), Vietnam (1993-2002) and Yunnan Province (1990-2002), respectively.

[12] For Cambodia, road data by province were available only for 1995. This data was extrapolated to recent years based on the available data on total road length. For Thailand, road inventory data are not recorded by province but by the route of national highways that run through multiple provinces. Therefore, adjustment was made by the estimated provincial shares of road length of each highway based on the GIS-based "Road Inventory of ASEAN Highways" developed by UNESCAP. For Vietnam, road inventory data was available for only 1994. This data was extrapolated based on the available administrative data on freight tonnage and distance carried. Justification for this treatment is that freight carriages reflect to some extent "revealed" quality of roads that are used.

[13] See Greene [2003] or other graduate econometric texts treating panel estimation procedures for further discussion of the estimators and specification tests reviewed briefly here.

[14] For example, our estimation results are generally comparable to those reported in Frankel and Romer [1999], Soloaga and Winters [2001], Clarete *et al.* [2003], Rose [2004] and Yamarik and Ghosh [2005].

[15] Given high covariance between available measures of domestic and cross-border road infrastructure, coefficient estimates that include both these variables must be interpreted with caution (i.e., multicolinearity problem), which is why we present models that include the cross-border and domestic road variables separately. Unfortunately, no usable instruments for either of our road measures could be identified and other approaches to solving potential problems of mutlicolinearity between these two variables of interest were considered impractical.

[16] In addition to the explanatory variables discussed here, models estimates examined a number variables (e.g., dummy variables characterizing the export, import, and foreign investment environment), but these were not found to have statistically significant effects on trade and FDI under various specification, and are not reported in light of space constraints. Full results are available upon request from the authors.

[17] In the estimates using shipping costs, estimated R^2 coefficients were in the range 48 and 70 percent and all F-tests/Wald Chi-square tests were statistically significant at the 0.01 level.

Table 1

Descriptive Statistics from the Dataset used in Estimates									
Variable	Units	Number observations			Mean	Std. Dev.	Minimum	Maximum	Sources and notes
Economy-pair identification code	n.a.	overall	N	690	353.5	170.6	102	605	1
		between	n	30					
		within	T	23					
Year	n.a.	overall	N	690	1992	6.6	1981	2003	
		between	n	30					
		within	T	23					
Trade and trade environment									
Economy i's exports to economy j	mil. current US$	overall	N	475	112.75	288.84	0.00	2853.60	2,3,4
		between	n	29					
		within	T-bar	16,4					
Major exports from economy i to j	mil. current US$	overall	N	171	74.71	125.43	0.04	845.01	5,6
		between	n	11					
		within	T	15,5					
Weighted average tariff rate	expressed in fraction	overall	N	525	0.158	0.174	0.023	1.050	7,8
		between	n	30					
		within	T-bar	17,5					
FDI flows									
Economy i's FDI inflow from economy j	mil. current US$	overall	N	231	7.0569	13.677	-9.020	97.39	9
		between	n	21					
		within	T-bar	11					
Distance and roads									
Distance between economy i and j	kilometer	overall	N	690	802.4	344.4	217.0	1519.0	10,11
		between	n	30					
		within	T	23					
Freight cost between economy i and j	US$ per box	overall	N	644	185	51.95	115	290	12
		between	n	28					
		within	T	23					
Economy i's road infrastructure in regions bordering economy j	km/km^2	overall	N	219	0.079	0.072	0.008	0.283	13
		between	n	19					
		within	T-bar	11,5					
Economy i's road infrastructure in interior regions	km/km^2	overall	N	345	0.078	0.073	0.009	0.299	13
		between	n	30					
		within	T-bar	11,5					

Table 1 (continued)

Descriptive Statistics from the Dataset used in Estimates									
Variable	Units	Number observations			Mean	Std. Dev.	Minimum	Maximum	Sources and notes
Economic characteristics									
GDP	bil. current US$	overall	N	570	26.05	42.11	0.60	181.50	7
		between	n	30					
		within	T-bar	19					
PPP ratio	relative real	overall	N	292	1.140	0.619	0.235	4.254	14
	price level	between	n	20					
	between economies	within	T-bar	14.6					
Other economy characteristics									
Total population	number (mil.)	overall	N	570	229.00	429.00	3.62	1290.00	7
		between	n	30					
		within	T	19					
Land area	square km (thou.)	overall	N	570	1,871	3,341	177	9,327	14
		between	n	30					
		within	T	19					

Notes and sources:

1) Numbers 1 through 6 are assigned to Cambodia, Laos, Myanmar, Thailand, Vietnam and Yunnan Province in that order. Code number 102 indicates "Cambodia-to-Laos", 103 "Cambodia-to-Myanmar" and so on, and finally 605 "Yunnan-to-Vietnam".
2) IMF Direction of Trade Statistics [2005].
3) Yunnan statistical yearbooks (various years).
4) Approximate adjustments were made to exclude river- and sea-born trade and gas trade. Yunnan exports are specific to Yunnan Province.
5) UNCOMTRADE data from Statistics Canada's Trade Analyzer database [2005].
6) Up to 5 commodities (HS 4 digits) were selected relying on available information on border trades in the subregion.
7) ADB Key Indicators and statistical yearbooks of GMS members (various years).
8) WATR is calculated by dividing customs revenue by imports. Weighting of trade items by value is done automatically by this procedure.
9) Data for Cambodia, Laos, Myanmar, and Vietnam are approved amounts by investment approving authorities, adjusted by estimated average implementation ratios and smoothed by 5-year moving average. Data for Thailand are "net FDI inflows" recorded by the Bank of Thailand. Data for Yunnan Province are the "actually utilized" amount recorded in the provincial statistical yearbooks. Investments in energy are excluded.
10) Distance based on approximate direct distance between cities, Oldfield [2004].
11) Distance between capital cities was chosen, except for cases of Cambodia-Vietnam and Thailand-Vietnam where Ho Chi Minh City is used in preference to Hanoi since it represents largest Vietnamese city near the other two countries' capitals. See also Table 2.
12) Interviews by Mr. Magnus Andersson. See Table 2 for more detail.
13) Separate sources were used for the countries. See the text and Table 2 for details.
14) World Bank, *World Development Indicators* [2005].

Table 2

Distance and Shipping Cost between Major Markets in GMS

		Country	Cambodia	Lao PDR	Myanmar	Thailand	Vietnam	Vietnam	Yunnan
		City	Phnom Penh	Vientiane	Yangon	Bangkok	Hanoi	HCMC	Kunming
Country	City		Distances (kilometers)						
Cambodia	Phnom Penh	Freight cost /1	--	753	1101	530	1057	217	1519
Lao PDR	Vientiane		150	--	695	521	482	913	789
Myanmar	Yangon		265	-	--	575	1123	1316	1142
Thailand	Bangkok		150	115	179	--	981	754	1280
Vietnam	Hanoi		-	145	215	-	--	1141	555
	Ho Chi Minh City		150	-	-	141	-	--	1636
Yunnan	Kunming		250	218	290	141	181	-	--

Notes: Distances and freight costs are considered symmetric between indicated cities (i.e., same cost to ship, for example, from Bangkok to Kunming as Kunming to Bangkok).

/1 Shipping costs are defined as the cost in US$ for transporting by air a 25 kg box with the dimensions (56 cm x 44 cm x 35 cm) between the cities indicated.

Source: Oldfield [2004] for distances, and interviews with shipping firms by Magnus Andersson [2007].

Table 3

Major International Crossing Points in the Greater Mekong Subregion

Bordering Countries	Border city/ Town	Province/State	Border city/Town	Province/State
Cambodia-Lao PDR	Trapeangkreal	Stung Treng Province	Khinak	Champassack Province
Cambodia-Thailand	Poipet	Bantreay Meanchey Province	Arayaprathet	Sa Kaeo Province
	Cham Yeam	Koh Kong Province	Hat Lek	Trat Province
Cambodia-Vietnam	Bavet	Xvay Rieng Province	Moc bai	Tay Ninh Province
Lao PDR-Thailand	Huoayxay	Bokeo Province	Chiang Khong	Chiang Rai Province
	Thanaleng	Vientiane Municipality	Nong Khai	Nong Khai Province
	Thakhek	Khammouan Province	Nakhon Phanom	Nakohn Panom Province
	Savannakhet	Savannakhet Province	Mukdahan	Mukdahan Province
Lao PDR-Vietnam	Nam Phao	Borikhamxay Province	Cau Treo	Ha Tinh Province
	Densavanh	Savannakhet Province	Lao Bao	Quang Tri Province
Lao PDR-Yunnan	Boten	Luangnamtha Province	Mengla	Xishuanbanna Region
Myanmar-Thailand	Myawadi	Kayin State	Mae Sot	Tak Province
	Tachilek	Shan State	Mae Sai	Chiang Rai Province
Myanmar-Yunnan	Mongla	Shan State	Daluo	Xishuanbanna Region
	Muse	Shan State	Ruili	Baoshan Region
Vietnam-Yunnan	Lao Cai	Lao Cai Province	Hekou	Wenshan Region

Sources: UNESCAP Asian Highway database [2004], and regional maps and atlases.

Table 4

Estimates of Total Exports between GMS Countries

Estimated Coefficient Standard error of estimate		Total Exports	Total Exports	Total Exports	Total Exports	Total Exports	Total Exports	Total Exports
Coefficients		Model 1 (Robust OLS)	Model 2 (Robust OLS)	Model 3 (Rand. Eff.)	Model 4 (Robust OLS)	Model 5 (Robust OLS)	Model 6 (Robust OLS)	Model 7 (Robust OLS)
Intercept		6.778	13.488	16.663	7.311	-9.707	8.533	3.558
		5.665	8.229	12.363	10.200	7.679	13.260	6.368
Distance between countries		-5.205***	-1.052	-5.912***	-2.471*		-2.465	-1.745**
		0.644	1.108	1.382	1.333		1.504	0.667
GDP exporter	GDP exp.* GDP imp.	1.620***	0.839***	1.097***	2.145***	1.081***	1.204***	0.328*
		0.179	0.247	0.302	0.626	0.259	0.255	0.184
GDP importer	--	1.332***			0.248			
		0.230			0.498			
Population exporter	Pop.exp.* Pop.imp.	-1.327**	-0.684	-1.910**	-2.200*	-0.081	-0.896	-0.726
		0.546	0.635	0.797	1.189	0.284	0.563	0.517
Population importer	--	-2.001***			0.505			
		0.555			1.364			
Area exporter	Area imp.* Area exp.	2.465***	0.976	3.381***	2.759**	0.574*	1.543**	1.367**
		0.688	0.818	0.983	1.263	0.301	0.681	0.611
Area importer	--	3.663***			0.260			
		0.701			1.269			
Cross-boarder roads exporter			1.705***		0.150	0.698	0.131	
			0.344		0.844	0.539	0.630	
Cross-boarder roads importer			1.196***		2.560***	3.151***	2.538***	
			0.383		0.902	0.821	0.789	
Domestic Roads exporter				0.552	0.542	0.029	0.634	
				0.419	0.956	0.482	0.615	
Domestic Roads importer				0.440	-1.921	-2.483***	-1.879***	
				0.418	1.361	0.795	0.708	

Table 4 (continued)

Estimates of Total Exports between GMS Countries							
Estimated Coefficient							
Standard error of estimate	Total Exports	Total Exports	Total Exports	Total Exports	Total Exports	Total Exports	Total Exports
Coefficients	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	(Robust OLS)	(Robust OLS)	(Rand. Eff.)	(Robust OLS)	(Robust OLS)	(Robust OLS)	(Robust OLS)
Weighted average tariff rate importer						0.071	
						0.561	
Value of FDI from exporter to importer							0.068
							0.340
Value of FDI from importer to exporter							-0.029
							0.035
Sigma_u			2.643				
Sigma_e			1.723				
Rho			0.702				
Number Observations	392	156	222	131	131	128	146
Groups	29	18	26	14	14	14	16
Average years per group	13.5	8.7	8.5	9.4	9.4	9.1	9.1
R^2	0.509	0.541	0.444	0.632	0.596	0.617	0.282
F-Test or Wald Chi-square	20.39***	14.32***	51.10***	2954.57***	38.84***	26.80***	4.36***
degrees of freedom	[7,28]	[6,17]	[6]	[12,13]	[8,13]	[10,13]	[6,15]
Hausman test	22.74***	28.34***	0.95	3.98/1	2.70***/1	9.51/1	4.70/1
degrees of freedom	[4]	[4]	[4]	[9]	[7]	[8]	[4]
Breusch-Pagan Lagrange Multiplier test	77.62***	24.98***	184.25***	4.23**	5.15**	3.95**	204.63***

Notes: Statistical singificance of the parameter estimates: ***99%, **95%, and *90% confidence level, respectively. Continuous variables in the models are estimated in natural logarithms.

/1 Matrix of differences between fixed and random effects variance estimates is not positive definite.

Table 5

Estimates of Major Exports between GMS Countries

Estimated Coefficient Standard Error of estimate		Major Exports	Major Exports	Major Exports	Major Exports	Major Exports	Major Exports	Major Exports	Major Exports
Coefficients		Model 8 (Robust OLS)	Model 9 (Rand. Eff.)	Model 10 (Rand. Eff.)	Model 11 (Robust OLS)	Model 12 (Robust OLS)	Model 13 (Robust OLS)	Model 14 (Robust OLS)	Model 15 (Robust OLS)
Intercept		-7.724	2.378	1.273	11.006	1.483	22.255**	10.848	-3.718
		5.648	8.940	10.521	9.276	7.869	8.271	11.649	3.065
Distance between countries		3.410***	0.571	0.723	3.573**	5.210***	4.529***		-2.156
		1.078	1.241	1.504	1.403	1.304	1.006		2.994
GDP exporter	GDP exp.* GDP imp.	0.231	0.323*	0.519***	0.170	0.236	-0.310	0.217	0.685***
		0.219	0.195	0.136	0.206	0.212	0.285	0.301	0.142
GDP importer	--	0.639	0.715***						
		0.638	0.191						
Population exporter	Pop.exp.* Pop.imp.	1.055			0.818	1.186**	1.240*	0.869*	-0.937
		0.609			0.572	0.371	0.601	0.434	0.587
Population importer	--	-0.143							
		1.669							
Area exporter	Area imp.* Area exp.	-1.889*			-1.948*	-2.591***	-3.121**	-1.141	1.906
		0.964			0.894	0.608	1.057	0.690	1.346
Area importer	--	-0.316							
		2.193							
Cross-border roads exporter			1.087**	0.803***	1.357**	1.066**		3.402***	
			0.314	0.285	0.523	0.385		0.635	
Cross-border roads importer			0.635**	0.903***	1.210*	0.800**		1.253	
			0.303	0.281	0.551	0.339		0.905	
Domestic roads exporter							1.006***	-1.744**	
							0.247	0.634	
Domestic roads importer							1.015***	-0.170	
							0.203	0.957	

Table 5 (continued)

ESTIMATES OF MAJOR EXPORTS BETWEEN GMS COUNTRIES								
ESTIMATED COEFFICIENT								
STANDARD ERROR OF ESTIMATE	Major Exports	Major Exports	Major Exports	Major Exports	Major Exports	Major Exports	Major Exports	Major Exports
Coefficients	Model 8 (Robust OLS)	Model 9 (Rand. Eff.)	Model 10 (Rand. Eff.)	Model 11 (Robust OLS)	Model 12 (Robust OLS)	Model 13 (Robust OLS)	Model 14 (Robust OLS)	Model 15 (Robust OLS)
Value of FDI from exporter to importer								-0.017
								0.017
Value of FDI from importer to exporter								0.098***
								0.010
Weighted average tariff rate importer					-0.337			
					0.366			
Sigma_u		0.977	1.266					
Sigma_e		0.485	0.488					
Rho		0.802	0.871					
Number of observations	169	78	78	78	78	102	78	70
Groups	11	9	9	9	9	11	9	8
Average years per group	15.4	8.7	8.7	8.7	8.7	9.3	8.7	8.8
R^2 /1	0.470	0.589	0.487	0.717	0.741	0.667	0.725	0.684
F-Test or Wald Chi-square	11.79***	92.32***	90.32***	339.41***	420.5***	41.60***	296.46***	170.9***
degrees of freedom	[7,10]	[5]	[4]	[6,8]	[7,8]	[6,10]	[7,8]	[6,7]
Hausman test	42.71***/1	5.78	0.93	4.88 /1	12.84**/1	--/2	5.89 /1	24.46***/1
degrees of freedom	[4]	[5]	[4]	[4]	[5]	[4]	[6]	[4]
Breusch-Pagan Lagrange Multiplier test	260.79***	109.88***	129.50***	37.23***	30.96***	150.57***	14.25***	5.96***

Notes: Statistical singificance of the parameter estimates: *** 99%, ** 95%, and * 90% confidence level, respectively. Continuous variables in the models are estimated in natural logarithms.

/1 Matrix of differences between fixed and random effects variance estimates is not positive definite.

/2 Model estimates fail to meet asymptotic assumptions of the Hausman test.

Table 6

Estimates of FDI between GMS Countries

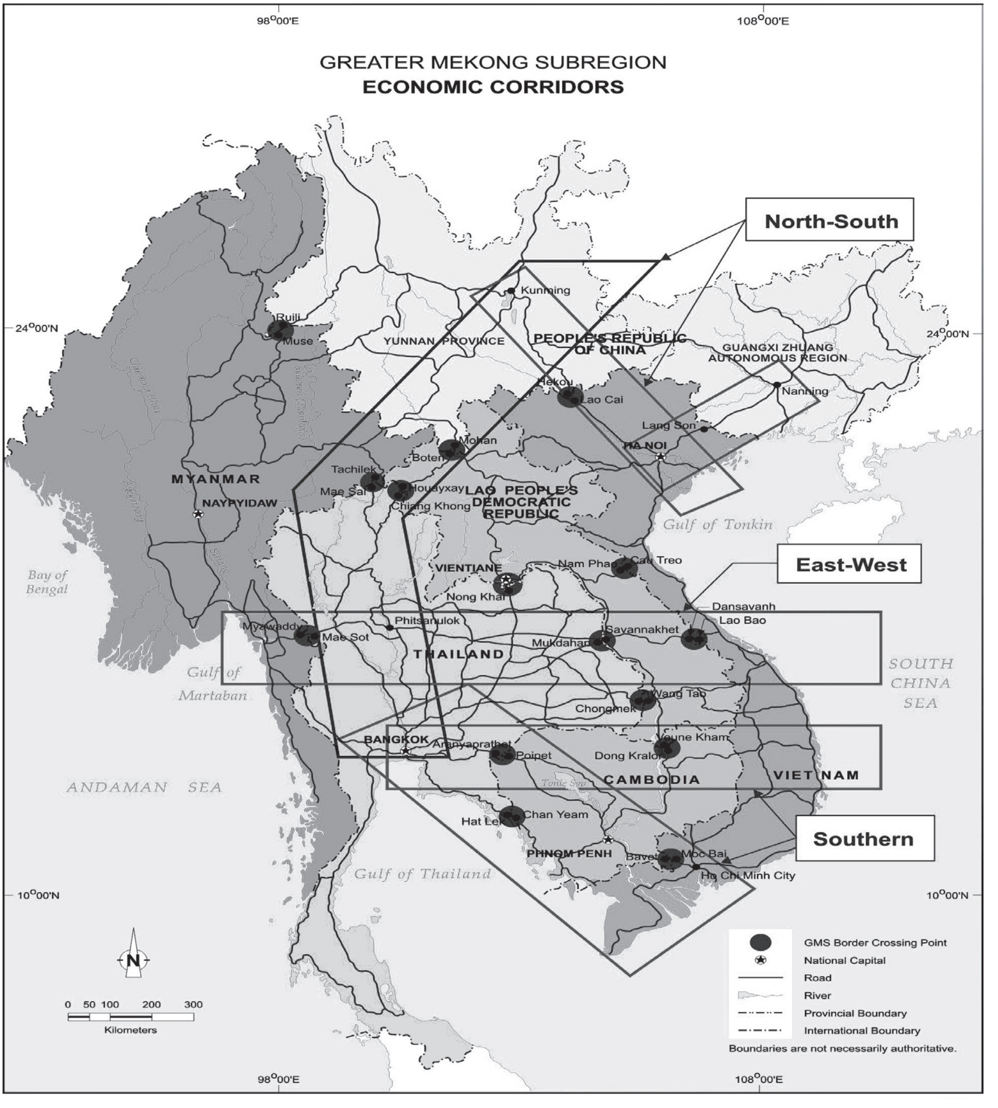
Estimated Coefficient Standard Error of estimate		FDI Model 16	FDI Model 17	FDI Model 18
Coefficients		(Robust OLS)	(Robust OLS)	(Robust OLS)
Intercept		-18.095 ***	-8.270	-30.650
		6.520	45.549	30.240
Distance between countries		0.626	0.181	2.081
		0.893	2.309	1.883
GDP exporter	GDP exp.* GDP imp.	1.767 ***	2.663 ***	0.782 **
		0.274	0.913	0.292
GDP importer	--	-0.555	-0.579	
		0.466	0.732	
Population exporter	Pop.exp.* Pop.imp.	-1.180	-2.020	-0.238
		0.830	1.847	0.805
Population importer	--	0.895	0.027	
		0.553	1.411	
Area exporter	Area imp.* Area exp.	1.922	3.859	0.780
		1.137	2.322	0.744
Area importer	--	-0.812	-0.951	
		0.680	3.780	
Cross-border roads exporter			1.760	1.702
			2.070	1.332
Cross-border roads importer			2.568	-0.351
			3.006	1.140
Domestic roads exporter			-2.708	-1.052
			3.146	2.181
Domestic roads importer			-0.992	-0.608
			2.331	1.043
PPP ratio				0.495
				0.969
Level of exports			-0.419	
			0.412	
Number Observations		219	112	95
Groups		21	14	11
Average years per group		10.4	8.0	8.6
R^2		0.394	0.406	0.370
F-Test		14.23 ***	73.81 ***	209.65 ***
degrees of freedom		[7,20]	[12,13]	[9,10]
Hausman test		23.75 ***	35.33 ***/1	21.79 ***/1
degrees of freedom		[4]	[9]	[7]
Breusch-Pagan Lagrange Multiplier test		16.11 ***	5.32 **	1.13

Notes: Statistical significance of the parameter estimates: *** 99%, ** 95%, and * 90% confidence level, respectively. Continuous variables in the models are estimated in natural logarithms.

/1 Matrix of differences between fixed and random effects variance estimates is not positive definite.

Figure 1

ECONOMIC CORRIDORS, ROAD NETWORK, AND MAJOR BORDER CROSSING POINTS IN THE GMS



Source: ADB [2006], p.5.

Appendix

Table 1A

Estimates of Total Exports between GMS Countries

Estimated Coefficient Standard error of estimate		Total Exports	Total Exports	Total Exports	Total Exports	Total Exports	Total Exports	Total Exports
Coefficients		Model 1 (Robust OLS)	Model 2 (Robust OLS)	Model 3 (Rand. Eff.)	Model 4 (Robust OLS)	Model 5 (Robust OLS)	Model 6 (Robust OLS)	Model 7 (Robust OLS)
Intercept		6.330	12.842	10.616	-12.613*	-14.243*	-8.408	0.187
		9.816	7.837	18.448	6.699	7.547	9.741	6.013
Shipping cost between countries		-4.503	-1.045	-3.667	-2.826		-3.419	1.393
		2.863	2.327	3.926	2.081		2.614	1.974
GDP exporter	GDP exp.* GDP imp.	1.051**	0.734***	0.871**	1.090***	1.030***	0.769**	0.262
		0.392	0.186	0.361	0.243	0.244	0.312	0.196
GDP importer	--	0.758			0.576			
		0.489			0.516			
Population exporter	Pop. exp.* Pop. imp.	-0.435	-0.357	-1.003	-0.007	-0.027	0.165	-0.758
		0.787	0.489	1.030	0.602	0.411	0.371	0.517
Population importer	--	-0.977			0.452			
		0.996			0.953			
Area exporter	Area imp.* Area exp.	1.013	0.558	1.670	0.888	0.685	0.951**	0.860*
		0.940	0.484	1.189	0.630	0.441	0.423	0.465
Area importer	--	1.988			0.803			
		1.130			0.806			
Cross-boarder roads exporter			1.806***		2.056***	1.940***	2.110***	
			0.361		0.469	0.493	0.508	
Cross-boarder roads importer			1.295***		2.612***	2.383**	2.646***	
			0.390		0.884	0.885	0.761	
Domestic Roads exporter				0.524	-1.239	-0.973*	-1.135**	
				0.474	0.802	0.559	0.530	

Table 1A

Estimates of Total Exports between GMS Countries

Estimated Coefficient Standard error of estimate	Total Exports	Total Exports	Total Exports	Total Exports	Total Exports	Total Exports	Total Exports
Coefficients	Model 1 (Robust OLS)	Model 2 (Robust OLS)	Model 3 (Rand. Eff.)	Model 4 (Robust OLS)	Model 5 (Robust OLS)	Model 6 (Robust OLS)	Model 7 (Robust OLS)
Domestic Roads importer			0.437	-2.243*	-1.951**	-2.169***	
			0.472	1.070	0.875	0.744	
Weighted average tariff rate importer						0.315	
						0.313	
Value of FDI from exporter to importer							0.065
							0.040
Value of FDI from importer to exporter							-0.032
							0.035
Sigma_u			3.680				
Sigma_e			1.723				
Rho			0.820				
Number Observations	386	156	222	156	156	153	146
Groups	28	18	26	18	18	18	16
Average years per group	13.8	8.7	8.5	8.7	8.7	8.5	9.1
R^2	0.317	0.538	0.224	0.604	0.572	0.595	0.238
F-Test or Wald Chi-square	3.83***	17.95***	26.23***	34.86***	26.59***	24.93***	4.67***
degrees of freedom	[7,27]	[6,17]	[6]	[11,17]	[7,17]	[9,17]	[6,15]
Hausman test	31.77***	29.85***	0.99	18.95 **/1	4.97***/1	14.86 /1	6.27 /1
degrees of freedom	[4]	[4]	[4]	[8]	[6]	[7]	[4]
Breusch-Pagan Lagrange Multiplier test	284.26***	20.97***	199.81***	8.18***	25.84***	15.40**	200.29***

Note: Statistical singificance of the parameter estimates: *** 99%, ** 95%, and * 90% confidence level, respectively. Continuous variables in the models are estimated in natural logarithms.

/1 Matrix of differences between fixed and random effects variance estimates is not positive definite.

Table 2A

ESTIMATES OF MAJOR EXPORTS BETWEEN GMS COUNTRIES

ESTIMATED COEFFICIENT STANDARD ERROR OF ESTIMATE Coefficients		Major Exports Model 8 (Robust OLS)	Major Exports Model 9 (Robust OLS)	Major Exports Model 10 (Rand. Eff.)	Major Exports Model 11 (Robust OLS)	Major Exports Model 12 (Robust OLS)	Major Exports Model 13 (Robust OLS)	Major Exports Model 15 (Robust OLS)
Intercept		-12.839**	18.990**	7.210	31.399***	31.423***	8.550	-6.320
		5.671	6.485	7.477	4.451	4.487	12.164	2.168
Shipping cost between countries		2.586***	-1.337	-0.161	0.949	0.766	0.544	1.075
		0.784	0.819	1.300	2.505	2.761	2.022	0.904
GDP exporter	GDP exp.* GDP imp.	0.995***	0.077	0.488***	-0.143	-0.135	0.499	0.796***
		0.216	0.191	0.134	0.241	0.211	0.360	0.179
GDP importer	--	1.339*	0.614**					
		0.617	0.189					
Population exporter	Pop. exp.* Pop. imp.	-0.346			0.520	0.488	0.047*	-1.082
		0.500			0.581	0.535	0.577	0.541
Population importer	--	-1.184						
		1.852						
Area exporter	Area imp.* Area exp.	0.367			-1.446	-1.366	-0.346	1.445
		0.710			1.250	1.210	0.860	0.603
Area importer	--	1.411						
		2.407						
Cross-border roads exporter			2.256**	0.861***	1.982***	1.985**		
			0.462	0.276	0.436	0.432		
Cross-border roads importer			1.150**	0.914***	1.776***	1.793***		
			0.395	0.277	0.389	0.400		
Domestic roads exporter							0.464	
							0.302	
Domestic roads importer							0.422	
							0.351	
Value of FDI from exporter to importer								-0.020
								0.016

Table 2A (continued)

Estimates of Major Exports between GMS Countries							
Estimated Coefficient							
Standard error of estimate Coefficients	Major Exports Model 8 (Robust OLS)	Major Exports Model 9 (Robust OLS)	Major Exports Model 10 (Rand. Eff.)	Major Exports Model 11 (Robust OLS)	Major Exports Model 12 (Robust OLS)	Major Exports Model 13 (Robust OLS)	Major Exports Model 15 (Robust OLS)
Value of FDI from importer to exporter							0.095^{***}
							0.010
Weighted average tariff rate importer					0.041		
					0.364		
Sigma_u			1.166				
Sigma_e			0.488				
Rho			0.851				
Number of observations	169	78	78	78	78	102	70
Groups	11	9	9	9	9	11	8
Average years per group	15.4	8.7	8.7	8.7	8.7	9.3	8.8
$R^{2\,/1}$	0.479	0.7	0.499	0.644	0.645	0.516	0.690
F-Test or Wald Chi-square	24.23^{***}	21.24^{***}	89.34^{***}	95.73^{***}	68.96^{***}	8.35^{***}	57.82^{***}
degrees of freedom	[7,10]	[5,8]	[4]	[6,8]	[7,8]	[6,10]	[6,7]
Hausman test	$27.25^{***/1}$	$-2.23^{/2}$	1.65	$6.70^{/1}$	$0.12^{/1}$	$0.267^{/1}$	$22.26^{***/1}$
degrees of freedom	[4]	[4]	[3]	[4]	[5]	[4]	[4]
Breusch-Pagan Lagrange Multiplier test	387.05^{***}	65.42^{***}	92.58^{***}	38.74^{***}	38.98^{***}	238.86^{***}	6.28^{**}

Notes: Statistical singificance of the parameter estimates: *** 99%, ** 95%, and * 90% confidence level, respectively. Continuous variables in the models are estimated in natural logarithms.

/1 Matrix of differences between fixed and random effects variance estimates is not positive definite.

/2 Model estimates fail to meet asymptotic assumptions of the Hausman test.

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Contents

The Macroeconomic Effects of Infrastructure Financing: A Tale of Two Countries

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Summary

Infrastructure financing is primarily undertaken by the public sector. Given the amounts involved, this has macroeconomic implications. The People's Republic of China (PRC) and India are the two most populous countries in the world and have two of the most dynamic economies. This paper compares infrastructure financing and delivery in these two economies and then examines simulations using a dynamic general equilibrium model with overlapping generations to explore the macroeconomic and distributional effects of alternative modalities of infrastructure financing. In particular, raising financing revenue through debt issuance, a consumption tax, and a labor income tax are considered. The alternative financing mechanisms are found to have differing long run effects, partly depending on the initial macroeconomic conditions and demographic trends in each country.

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I. Introduction

The financing of infrastructure still remains primarily a task for the public sector in developing countries. Public-private partnerships play an expanding role, as does foreign direct investment. Changes in technology have led to unbundling in the power sector and huge private investments in telecommunications, but most of the burden of ensuring an adequate level of infrastructure services to support growth and development still lies with the public sector. Even there, there are a myriad of combinations of revenue raising, expenditure decentralization, financing mechanisms, and risk management practices.

This can be seen most clearly in large, rapidly growing developing economies. Rapid growth has been accompanied by increasing urbanization, rising incomes in the urban middle class, and shift towards greater consumption of services. All of this has led to strong demand growth for urban infrastructure, in particular. This paper compares and contrasts the recent experience of the People's Republic of China (PRC) with that of India in terms of infrastructure financing and resulting implications for macroeconomic growth. Similarities and differences are highlighted, and then each country is considered in more detail. A computable general equilibrium model is employed to examine the macroeconomic implications of alternative financing experiences. In particular, options of financing through a consumption tax, a labor income tax, or through debt are considered. Differential macroeconomic impacts of these options are revealed as dependent on differences in economic structure in the base period.

There are key differences and special characteristics within individual infrastructure sectors or projects, but it is beyond the scope of this paper to attempt to address those in detail. While the quantitative analysis looks at the macroeconomic impact of total public infrastructure investment, much of the background discussion focuses on urban infrastructure as a leading, dynamic example to illustrate likely future developments.

II. Comparison of Infrastructure Delivery and Financing between PRC and India

The PRC and India are the two most populous countries in the world. They have many similarities in infrastructure financing, but also important differences. Take the scale of investment, for example. While the PRC economy was roughly two and a half times the size of India's in 2002, Beijing made 13.8 times the capital investment in infrastructure of Mumbai, an Indian city of roughly similar size (Mahadevia [2006]). In both, PRC and India, the municipal government is an important entity in infrastructure provision and maintenance. Private sector funds are not yet very important in infrastructure systems in the two countries in aggregate terms, although they may occasionally contribute critical technology, project design, or management skills. However, the potential remains enormous. Out of 483 private sector projects in the PRC's energy, telecoms, transport, water and sewerage sectors that reached financial closure from 1990 to 2005, only 4 were in the telecoms sector (PPI database).

While in the PRC infrastructure is constructed, operated and maintained by separate companies set up by local governments, in India, it is the local government itself that carries out these functions through its own departments. As a consequence, cost recovery has been more efficient in PRC than in India. Both countries could benefit from greater legal, policy, and contractual standardization in relation to infrastructure investments.

There is a very high order of fiscal decentralization in PRC, associated with administrative decentralization. In India, the lowest levels of government do not have much taxation power. There is still greater centralization of the entire fiscal system, which then percolates down with local infrastructure provision becoming, to a great extent, state governments' responsibility (see Table 1).

Infrastructure Financing in the People's Republic of China

In recent decades, PRC has devolved governmental authority from central to local levels (including provinces, prefectures, counties, towns and townships) to a significant extent. Local government units (LGUs) now have the authority to determine

the structure of local expenditure and are responsible for the provision of local public goods, including those for urban development.

In terms of fiscal decentralization, LGUs have long-term (usually 5-year) revenue sharing contracts with higher level governments and can keep a share of the revenue collected. In addition, LGUs are authorized to collect extra-budgetary funds not incorporated in the budgetary process. Since these extra-budgetary funds are entirely at the LGUs' expenditure discretion, they have become an important financing source for municipal infrastructure development.

In 1985, the Urban Maintenance and Construction Tax (UMCT), a systematic source for financing urban infrastructure investment, was launched nationwide. This tax on enterprises for government services is collected as a surcharge on the consolidated industrial and commercial tax levied on the income of private enterprises, and therefore fluctuates with output levels. While full proceeds of the tax are retained by LGUs for local infrastructure development, their share in total LGU revenue collection has declined from 26% in 1991 to 10% in 2002 (see Table 2). Consequently, non-tax methods of raising revenue started increasing in 2001 to supplement the UMCT (Mahadevia [2006]).

Other contributing factors in infrastructure financing have been domestic loans, primarily from the banking sector which increased from 9% of revenue for the Urban Maintenance and Construction Fund in 1991 to 28% in 2002. Self-raised funds (for example, through a utility company's own efforts) increased from negligible amounts in 1991 to 19% in 2002. Foreign investment remains low (2% in 2002) and is concentrated in the coastal areas.

Except for national level and those qualifying for central assistance, all cities must rely on their own, and their provincial government's, finances for capital and maintenance expenditures on infrastructure and public utilities. In large cities, urban districts and sub-districts are responsible for local level infrastructure such as special development zones. Generally, for city-level infrastructure, a separate company is set up, which receives grants from the city government or borrows with city government guarantees. 99% of the population now has access to electricity, and 77% to an improved water source (PPI database).

Promotion of Private Investment in PRC's Infrastructure

The PRC has experimented with many models for private participation in infrastructure. Most infrastructure projects involving the private sector have been negotiated and implemented through joint ventures between private enterprises and governmental or quasi-governmental entities. Such arrangements raise concerns over conflicts of interest between the government's roles as regulator and as a project participant.

In accordance with the 1995 build, operate, transfer (BOT) circular, three pilot BOT projects were procured through competitive public bidding. Most of the resulting project companies were wholly foreign-owned enterprises, which helped to reduce potential conflicts of interest (Bellier and Zhou [2003]). However, the pilot BOT projects were not all judged to have satisfactory outcomes, and other arrangements are still being explored. Weaknesses in the legal and regulatory framework in PRC, with underdeveloped property rights and limited means of legal recourse, remain an obstacle to broader private participation in infrastructure. The complicated approvals process is slow and redundant. Lack of transparency has also led to inefficient investment at local levels, increased and misallocated financing risks, and an inefficient pattern of infrastructure investments at the national level.

Risk allocation remains inefficient in PRC infrastructure projects. Too often, private investors face legal and regulatory risks, government units face excessive commercial risks, and counterpart credit risk constrains private project financing. At the same time, constraints on the banking system mean that domestic banks play a limited role in financing infrastructure projects (Bellier and Zhou [2003]).

Infrastructure Financing in India

Public financing is more streamlined in India than in PRC. India is a federation with constitutional demarcation of functions and taxation powers between central and state governments. Urban development in India, including urban housing and land and infrastructure development, is primarily the sole responsibility of state governments. They may pass on this responsibility to LGUs, in whole or in part, through state legislation. State governments set up parastatals, such as water supply and sewerage boards, or public transport corporations, to perform certain functions. State governments may make capital investments and authorize the parastatals with partial cost recovery authority (Mahadevia [2006]). Some kinds of infrastructure that benefit broad or diffuse areas, such as airports and some railways, remain the responsibility of the central government.

Tax bases are assigned exclusively either to the center or the states. Most broad-based and progressive taxes are assigned to the central government. States have the right to levy value added tax (VAT), and to authorize LGUs to collect certain taxes such as property tax or the Octroi.[1] The states are primarily responsible for ensuring the necessary legal and regulatory framework for private provision of urban infrastructure in India.

Although the major share of taxes collected goes to the central government, state governments have the major share of expenditure responsibilities. The Constitution provides for the sharing of revenue from personal income tax and VAT, while the states are given grants as additional assistance, along with some tax devolution as decided by the Finance Commission. Large cities may be able to access loans from various public sector, private sector, and multilateral financial institutions. Municipal bonds debuted in 1997 and have spread in larger cities. Other localities may have to depend entirely on grants and soft loans from their state governments, although some innovative efforts at pooled financing show promise.

Underdeveloped pension and long-term debt markets have restricted project finance. Lack of available debt with sufficient maturity has led to front-loading of tariffs to ensure debt repayment capacity, negatively influencing both users and project competitiveness (Secretariat for the Committee on Infrastructure [undated]). To partially alleviate such problems, the India Infrastructure Finance Company was created to raise funds on the basis of government guarantees and provide financial assistance through long-term debt, primarily to private companies participating in public-private partnership projects.

There is thus an asymmetry between revenue sources and expenditure responsibilities. For example, over half of expenditures in 2002 were made by state governments, when they collected just 37% of total revenue (Mahadevia [2006]). The states have commonly borrowed to supplement their expenditures and have consequently become faced with mounting debts and deficits, limiting their ability to increase their allocations for infrastructure projects.

While gross domestic savings remain roughly 25% of gross domestic product (GDP), the public sector continues to be a net dis-saver. Consequently, infrastructure services, such as telecommunications, where the private sector is very active, or banking, where there is a high degree of competition, are growing rapidly to meet the growth in demand. But services

that are essentially provided by or through the public sector, such as water and sewerage, electricity, and roads, are lagging in both quantity and quality (Garg [2005]).

State Finance Commissions first decide on the proportions of state revenues to be distributed between rural local governments and urban local governments and then devolve state finances either on an ad hoc basis or according to a formula. There are also mechanisms for transfers between different government departments and access to financing windows such as the Rural Infrastructure Development Fund. The end result is that it is very difficult to get a coherent picture of the amounts going into public infrastructure development in the country as a whole.

Municipalities can charge for the services which they deliver and can also charge for the use of municipalities' assets by private persons. Municipal authorities are empowered to borrow from banks and other financial institutions and can also raise funds in the capital markets, as per the provisions of the state municipalities' legislations. However, no uniform model of empowering or entrusting infrastructure functions to municipal bodies has emerged in India (Garg [2005]).

Promotion of Private Investment in India's Infrastructure

Since 1991, India has had a policy of attracting private investment into infrastructure. In 1997, the Infrastructure Development Finance Corporation Ltd. (IDFC) was incorporated as a specialized financial intermediary for infrastructure. The IDFC covers a wide range of infrastructure services, including energy, telecommunications and information technology, integrated transportation, urban infrastructure, and health, education, and tourism infrastructure. Through lead arranger mandates and key advisory assignments, the IDFC undertakes initiatives to rationalize policy and regulatory frameworks, and remove impediments to the movement of capital to infrastructure sectors.

Claims that the public sector must be responsible for infrastructure services to ensure access for the poor have been largely discredited by repeated failures to fulfill that ensured access. At the same time, projects involving private sector participation (including privatizations) have demonstrated significant efficiency gains (including in project design efficiency), enhanced quantity and quality of infrastructure services, and benefits for the poor (Mukhopadhyay [2004]). Fortunately, the rapid economic growth in recent years facilitates reform, as it both draws on and encourages private sector investment.

III. The Model

This section describes the model used for simulating the macroeconomic effects of different infrastructure financing mechanisms. The model economy is populated by 72 overlapping generations with uncertain life spans. The agents are rational, forward-looking, and face no liquidity constraints. A representative, perfectively competitive private firm produces output using labor, private capital and public infrastructure capital. Installing new capital is assumed to be costly. Government owns public infrastructure and supplies it to firms for free. The economy is open to international trade of goods and services, but financially closed to international capital flows, implying the interest rate is determined by the domestic capital market. The supply of labor is elastic, reflecting the labor-leisure choice of agents. The long-term steady state rate of output growth is exogenous at rate g, which is driven by labor-augmenting technological change and population growth. For notational simplicity, the time subscript t is omitted in what follows where doing so does not lead to confusion.

(1) Households

The modeling of household behavior follows the life-cycle approach. Agents are born at age 1 and live a maximum of 72 years, corresponding to adult ages 18 through 89. The probability of surviving between age j and age $j+1$ is s_j. All agents have identical preferences over consumption and leisure that are given by the following utility function:

$$\sum_{j=1}^{72} \beta^j \left(\prod_{i=1}^{j} s_i \right) u\left(c_j, l_j\right) \tag{1}$$

where β is the subject discount rate. The period utility function $u(c_j, l_j)$ is of the constant relative risk aversion class with constant elasticity of substitution utility over consumption and leisure, where γ is the coefficient of relative risk aversion and $1/\gamma$ is the inter-temporal elasticity of substitution, and ρ is intra-temporal elasticity of substitution between consumption c_j and leisure l_j.

$$u\left(c_j, l_j\right) = \frac{\left(c_j^{1-1/\rho} + \alpha l_j^{1-1/\rho}\right)^{\frac{1-\gamma}{1-1/\rho}}}{\left(1-\gamma\right)} \tag{2}$$

The agent maximizes (1) subject to the following sequence of period budget constraints for each age $j = 1, \ldots, 72$:

$$PC \cdot c_j + (1+g)\, a_{j+1} = (1-\tau_n)(e_j - l_j)\, \varepsilon_j w + t + (1+r)(a_j + b) \tag{3}$$

together with $0 \leq l_j \leq e_j$, $l_j = e_j$ if $j \geq 53$, $c_j \geq 0$ and $a_{j+1} \geq 0$ if $j=72$. In the above budget constraint resources are derived from asset holdings a_j, labor endowment e_j, a lump-sum transfer t and an unintended bequest b. Assets pay an interest rate r. Labor receives a real wage $w \cdot \varepsilon_j$ and is taxed at rate τ_n, where the efficiency parameter ε_j reflects the skill difference across age. In the absence of annuity markets, assets of individuals who die in a given period are assumed to be distributed to all living individuals as lump sum transfer b. Expenditures in the left-hand side of (3) include the purchase of consumption goods and acquisition of assets for next period. PC is the tax-inclusive consumer price. There are no liquidity constraints, so the assets in (3) can be negative, although the terminal wealth must be non-negative if the agents survive up to terminal period ($j=72$). Leisure may not exceed time endowment and may not be negative. In addition, agents are forced to retire at the age 53 (i.e. the real age 70). The model calculates a shadow wage, which represents the excess over the efficient wage per unit of leisure foregone, to solve the problems of kinked budget constraints.[2]

(2) Firms and Technology

Production technology is characterized by a Cobb-Douglas function with two private factors of production (aggregate labor L and private capital K_p) and public capital, K_g:

$$Y = A K_p^{\kappa} L^{\theta} K_g^{1-\kappa-\theta} \overline{K}_g^{\gamma}, \qquad 0 \le \gamma < \theta < 1, \tag{4}$$

where Y is gross output and A is total factor productivity. κ and θ represent output share parameters of private capital and labor, respectively. Public capital generates a positive externality for private production, which is regulated by parameter γ. The condition $\gamma < \theta$ precludes the possibility of endogenous growth.

In each period, the firm decides on the intensities of labor input, taking as given the price of labor and the current stock of public and private capital, to minimize their cost. Thus, the firm employs factors according to marginal productivity rules.

$$R = \kappa A K_p^{\kappa-1} L^{\theta} K_g^{1-\kappa-\theta} \overline{K}_g^{\gamma} \tag{5}$$

$$w = \theta A K_p^{\kappa} L^{\theta-1} K_g^{1-\kappa-\theta} \overline{K}_g^{\gamma} \tag{6}$$

where R is the marginal product of private capital and w is the wage rate. As the production function exhibits decreasing returns to scale for private inputs, the firm earns an economic profit, Π, equal to the return to public capital.

$$\Pi = (1-\kappa-\theta) \cdot Y \cdot P \tag{7}$$

where P is the price of the good.

The firm alters its private capital stock through investment I_p to maximize the value of the firm, V, defined as the present value of net cash flow. By assuming a quadratic and homogenous adjustment cost function, the investment expenditure J_p, can be defined as:

$$J_p = \left[1 + \frac{\psi}{2}\frac{I_p}{K_p}\right] \cdot I_p \cdot PA \tag{8}$$

where PA is the price of the composite good and reflects the replacement cost of capital. The dynamic optimization problem of firms leads to the following two arbitrage conditions: (i) marginal cost of new investment is equal to the shadow price of installed capital, i.e. Tobin's q:

$$\partial(J_p)/\partial(I_p) = q, \ i.e. \ \ \frac{I_p}{K_p} = \frac{1}{\psi}\left(\frac{q}{PA} - 1\right) \tag{9}$$

and (ii) returns to financial and real investment are identical:

$$r_t q_{t-1} = (1-\tau_k)\left(R_t + \frac{\Pi_t}{K_{p,t}}\right) + \tau_k \cdot \delta \cdot PA_t + \frac{\psi}{2}\left(\frac{I_{p,t}}{K_{p,t}}\right)^2 \cdot PA_t + (1-\delta) q_t - q_{t-1} \tag{10}$$

where δ is the depreciation rate of capital and τ_k is the corporate income tax rate. The right-hand side of (10) defines the total return to capital, including the after-tax marginal product and capital gains.

(3) Government

The model specifies a general national government. At each period, the government purchases of goods and services, G, and public investment in infrastructure, $J_{g,}$ are financed by tax revenue and debt issue, D. The government budget constraint in period t is:

$$\begin{aligned} G_t + J_g + t_t \cdot N + (1+r_t) D_t \; &= \; \tau_k (R_t - \delta \cdot PA_t) K_{p,t} + \tau_k \Pi_t + \tau_m M_t \\ &+ \; \tau_n w_t L_t + \tau_c PA_t \left(C_t + G_t \right) + (1+g) D_{t+1} \end{aligned} \tag{11}$$

The left-hand side of (11) represents uses of government revenue, where $N = \sum_{j=1}^{72} n_j$ is the total number of the population. Government purchases, G, are assumed to be unproductive and generate no utility to households. Government revenue in the right-hand side of (11) includes corporate income tax, labor income tax, consumption tax, tariff revenue for imports M, and newly issued debt. Corporate income tax is levied on the profits of firms net of depreciation. By assuming a fixed world price of imports and choosing the exchange rate as numeraire, the import price is omitted in (11).

Public investment is also assumed to entail adjustment costs similar to (8).

$$J_g = \left[1 + \frac{\psi}{2} \frac{I_g}{K_g} \right] \cdot I_g \cdot PA \tag{12}$$

Government also faces a no-Ponzi-game constraint, i.e. $\lim_{T \to \infty} \left(D_T \Big/ \prod_t^T (1+r_t) \right) \leq 0$, implying that the present value of government expenditure must be less than or equal to the present value of revenue plus the initial stock of government debt. To ensure the inter-temporal budget constraint holds, we fix the ratios of G and D to GDP throughout the transition period, and let the personal income tax rate or lump-sum transfer to households be endogenous to balance the period budget.

(4) Foreign trade

Demand is for composites of foreign and domestic goods. A CES function is utilized to specify the aggregation of composite goods, implying that products are differentiated by region of origin, i.e., the Armington assumption (Armington [1969]).

$$C + G + (J_p + J_g)/PA = \left[(1-\alpha^m)\left(Y - E\right)^{(\sigma-1)/\sigma} + \alpha^m \left(M\right)^{(\sigma-1)/\sigma} \right]^{\sigma/(\sigma-1)} \tag{13}$$

where C denotes aggregate consumption and E denotes exports.

The corresponding price index PA is a combination of the price of imports (normalized to 1) and the producer price of the composite domestic good, P. It is specified as a unit cost function.

$$PA = \left[\alpha_m^{\sigma} + (1-\alpha_m)^{\sigma} \left(P\right)^{1-\sigma} \right]^{1/(1-\sigma)} \tag{14}$$

Export demand is in accordance with constant-elasticity demand curves, i.e.

$$E = \eta \cdot P^{\sigma_e} \tag{15}$$

(5) Aggregation

Total consumption equals the sum of consumption by each cohort:

$$\sum_{j=1}^{72} c_j n_j = C \tag{16}$$

Aggregate labor input is given by:

$$\sum_{j=1}^{72} \varepsilon_j \left(e_j - l_j\right) n_j = \sum_s L_s \tag{17}$$

The clearing condition in the capital market requires that total national wealth, including total private wealth and government net wealth, equals the value of domestic firms plus net foreign assets F. F is determined by the exogenous current account balance, B.

$$\sum_r \sum_{j=1}^{72} a_{j,r} n_{j,r} - D = F + V \tag{18}$$

6) Equilibrium

For a given government policy $\{G_t, D_t, J_{g,t}, \tau_n, \tau_k, \tau_m, \tau_c\}_{t=0}^{\infty}$, net foreign capital flows $\{B_t\}_{t=0}^{\infty}$ that ensure that net foreign assets F satisfy the no-Ponzi-game restriction, and $\{K_{p,0}, K_{g,0}, F_0,\}$, the model's dynamic competitive equilibrium is the sequences of prices $\{w_t, r_t, R_t, q_t, P_t, PA_t, PC_t\}_{t=0}^{\infty}$ and allocations $\{b_t, c_t, l_t, L_t, K_{t+1}, Y_t, \Pi_t, C_t, J_{p,t}, I_{p,t}, I_{g,t}, E_t, M_t, V_t, F_{t+1}, t_t\}_{t=0}^{\infty}$ such that:

(i) The allocation solves the dynamic program (1)-(3) for all agents, given the prices and government policy.

(ii) The allocation satisfies (5)-(10) to maximize the profits of firms.

(iii) The allocation and government policy satisfy the government's budget constraint (11) given the prices.

(iv) M_t satisfies the first order conditions of the optimization problems of minimizing the costs of composite goods.

(v) Capital and labor markets clear, that is (16) and (17) are satisfied.

(vi) Unintended bequests equal lump sum transfers b.

IV. Calibration

We implement the model separately for the PRC and India. The model parameters are determined through a dynamic calibration process, which finds a set of data to replicate the base year data and satisfies the intra-period and inter-temporal equations of the model. The dynamic calibration assumes that the base year is on a temporal equilibrium along a dynamic adjustment path, rather than a stationary steady state, and therefore is more appropriate for fast growing developing economies like the PRC and India.

The year 2002 is chosen as the base year for the PRC. For India, the base year is 2003-2004. The static benchmark equilibrium data are compiled from national account data

and demographic statistics. Some parameters, mainly elasticities, need to be determined extraneously for model calibration. Most of these parameters are selected by drawing on a large number of empirical studies. Other parameters, like share parameters in production functions, tax rates, etc., are calibrated to replicate the base year data. Table 3 summarizes the major parameters in the model.

In calibration of the household sector, the inter-temporal substitution elasticity and intra-temporal substitution elasticity between consumption and leisure need to be set. There has not been an empirical study trying to estimate these parameters for the PRC and India, while the international evidence on these parameters is controversial. We choose the value of $1/3$ $(\gamma = 3)$ in our model, which is close to the upper end of the range of empirical studies. The intra-temporal substitution elasticity between consumption and leisure is set at 0.8 in line with Auerbach and Kotlikoff [1987]. The age-earning profile, ε_j, which is assumed to be hump-shaped, is also taken from Auerbach and Kotlikoff [1987]. As the age-specific wealth distribution is not available, US data is used to approximate this distribution in the base year. All these parameters are assumed to be identical across the two countries.

For India, the household discount rate is endogenously determined in the model calibration to match the base year consumption. Given the high saving rate in the current PRC economy, we adopt a different method of calibrating the discount rate of PRC households. We assume that the long run discount rate in the PRC is different from its base year level. The long-run discount rate is computed residually to generate a steady-state real interest rate of 3%, a value that is close to the average value of real long-term interest rates in the Organisation for Economic Cooperation and Development (OECD) countries (Botman *et al.* [2006]). The discount rates of all cohorts in the base year are endogenously determined in the model calibration to match the base year consumption in each region. We gradually lower the discount rates of successive cohorts so that the cohorts that reach adulthood in 2032 and thereafter have the long-run time preference rate. The different calibration approaches for household discount rates result in a higher long-term interest rate of 4.9% in India, consistent with its lower saving rate. We set the relative parameter weights of leisure against consumption so that on average 40% of available time endowment during work years are spent at work in base year.

The externality parameter of public capital γ is set to be zero, implying constant returns to scale for all inputs. This specification is the same as that used in Aschauer [1989], Cassou and Lassing [1998] and Canning and Pedroni [2004]. It can be viewed as incorporating an implicit congestion effect associated with the scale of private capital. The empirical evidence for the value of output elasticity with respect to public capital, $1\text{-}\kappa\text{-}\theta$, has been mixed. We choose a value of 0.07 which lies in the lower range of these estimates. This value is consistent with the recent cross-country estimates by Canning and Bennathan [2000].

The value of adjustment cost parameters is taken to be 2, which corresponds to the low end of some estimates, and implies that adjustment costs are 12.5% of the value of gross investment in the steady state, under our assumptions on the depreciation rate and technical progress. The depreciation rate is assumed to be 10%. The values of private and public capital stock in the two countries are estimated by means of the perpetual inventory method. The estimated private capital-output ratios are 1.83 for PRC and 1.60 for India. The rest of the world elasticities of export demand are set at -6. The elasticities of substitution between imports and domestic goods, i.e. the Armington elasticities, are set equal to 2.0.

In constructing the baseline scenario for model calibration, it is necessary to make some hypothetical assumptions on all exogenous variables for the period after the

base year. The number of people newly entering into adulthood after 2050 is taken from the projection results of a separate demographic model. We assume that this number will be constant after 2050 and this results in the population being stationary after 2122 for PRC and 2123 for India.

The GDP growth rate, which is exogenous in dynamic calibration, is assumed to decline from 8% to 2.5% from the base year to 2050, and be stable at 2.5% afterwards. We introduce two types of labor-augmented technical progress in this model. The first type of technical progress follows the definition in Altig *et al.* [2001], i.e. the technical progress is assumed to cause the time endowment of each successive generation to grow at a constant rate, namely 2.5% in our model. The second type of technical progress is the standard assumption of labor-augmented technical progress, which entails multiplying the labor input by a factor that grows through time. The rate of the second type of technical progress is endogenously adjusted to match the pre-specified GDP growth rate.

All tax rates, which are calibrated from base year data, are held constant over the baseline. The government debt as a fraction of GDP is kept constant at the baseline level and the lump-sum transfers from government to households in each period after the base year are endogenous to maintain the government budget constraint. Since we assume non-steady state equilibrium in the base year, time-variant discount rates, and non-steady state growth of population and productivity, the endogenous variables from the baseline change over time along a transition path.

V. Simulations

Empirical work has repeatedly confirmed that public infrastructure plays an important role in promoting productivity and output growth. However, infrastructure investment does not come without costs. As the main financier, government has to either raise distortionary taxes or cut other expenditures to finance its investment in infrastructure, which would offset some of the positive effects of public infrastructure investment. Therefore, the net effects of public infrastructure investment vary across countries, depending on their fiscal positions, tax structures, indebtedness levels, infrastructure endowments, and other country-specific factors. To explore the interaction of these factors and evaluate the implications of alternative financing modes, we conduct three policy experiments of expanding public investment for both PRC and India using the dynamic general equilibrium model described in Section III. In all three experiments, we assume that public infrastructure investment as a fraction of GDP is doubled from the base line levels to 5.1% in PRC and 4.7% in India, roughly in line with the OECD average.

The three experiments differ in their ways of financing the additional investment expenditure. The first two experiments assume a tax-financed, balanced-budget policy under which the increase in public spending is financed by adjusting the rates of either consumption tax or labor income tax on a period-by-period basis. The third experiment assumes the government runs deficits to fund the investment expenditure during a 10-year period from the base year, and then raises the consumption tax rates on a period-by-period basis to stabilize the debt-to-GDP ratio thereafter.

People's Republic of China

Table 4 presents the evolution of major macroeconomic variables through transitional dynamics to final steady state under the scenarios of increasing public

infrastructure investment in PRC. All these variables are presented as deviations from the baseline. Generally, the increased public infrastructure leads to a higher return to private capital, stimulating more private investment. As a result, private capital increases by 4.5% to 7.4% and output increases by 6.2% to 7.5% under the three scenarios. High investment also raises the long-term interest rate, which rises by 2.9%-5.5% in the scenarios of labor income tax financing and debt financing. However, the long run interest rate barely changes in the consumption tax financing scenario.

Despite the higher wage, labor input in the steady state is slightly lower than the baseline, as work efforts in the long run are reduced by the positive wealth effect, which dominates the intra-temporal substitution effect arising from the higher wage and the inter-temporal substitution effect arising from the higher interest rate. In the long run, private consumption rises only 3.2%-3.5% above the baseline, less than the corresponding gains in investment, reflecting the diminishing returns to public and private capital, as well as the larger tax burdens associated with higher public investment in infrastructure. To finance the increased investment spending or interest payments, the government has to raise tax revenue by 12.0%-12.9% ultimately. Under the debt financing scenario, the steady state government debt is two times higher than that in the baseline.

The results reported in Table 4 clearly demonstrate the importance of public infrastructure to output and private investment. By comparing the macroeconomic effects under different financing modes, it is also clear that the financing mode does matter. Under the consumption tax financing scenario, private investment in the steady state rises strongly by 7.4% in comparison with the baseline, two thirds greater than under the debt financing mode. The difference arises from their different impacts on saving. As older people tend to consume a larger fraction of their lifetime resources than do younger people, higher consumption tax rates impose larger tax burdens on older people. These intergenerational distributional effects increase total saving. The increased saving restrains the rise in the interest rate, in spite of a large increase in private investment. Under the labor income tax financing scenario, the response in saving rate is relatively small, resulting in a higher interest rate and less increase in investment. In the case of debt financing, the initial private investment is significantly crowded out by the enlarged government debt, inducing a lower level of capital stock and a much higher long-term interest rate.

The evolution of major macroeconomic variables over the short-term is illustrated in Figure 1. In the short-term, the increased public investment raises the interest rate and crowds out private investment. However, private investment turns to increase during 2007-2009 in the two tax financing scenarios, as the positive externality generated by the expansion of public infrastructure gradually dominates the negative impacts of higher interest rates. The higher interest rate in the short-term makes future consumption and leisure less expensive than current ones. The resulting inter-temporal substitution effect thus encourages a shift of consumption into the future, leading to less private consumption and more saving. Moreover, the values of the existing capital stock, as measured by Tobin's q, drop by around 1%-1.4% in the initial phase of the transition. This generates a negative wealth effect, inducing a further increase in saving in the short-term. In the case of debt financing, as the consumption of initial older generations is not impacted by the debt-financing policy, private consumption falls only slightly in the first three years, but increases thereafter until 2011. The anticipated tax hike on consumption after 2011 also contributes to the increases in consumption before 2011, as it leads consumers to substitute current, cheap, for future, expensive, consumption.

The same reason induces the larger labor supply in the short-term under the debt financing scenario, as leisure is relatively cheaper after 2011. The short-term decline of labor supply under the two tax financing scenarios is determined by the intra-temporal substitution effect arising from changes in the relative prices of consumption and leisure. In the case of consumption tax financing, the relatively higher price of consumption results in more leisure and less work effort. In the case of labor income tax financing, higher labor income tax lowers the opportunity cost of leisure, again resulting in less work effort.

One interesting finding from Figure 1 is that the short-term effects of debt financing on output and consumption are superior to those of tax financing. This result is exactly opposite to that in the long-term. Therefore, policy makers face a trade-off between short-term costs and long-term gains. This trade-off can be better illustrated through the effects on inter-generational distribution.

Figure 2 shows the effects of raising the public infrastructure stock on remaining lifetime utility for different generations. Following Auerbach and Kotlikoff [1987] and Altig *et al.* [2001], the change in remaining lifetime utility is measured as the equivalent variation of remaining full lifetime income. It represents the equivalent percentage change in each cohort's remaining full lifetime wealth (assets plus human wealth based on working full time) needed in the baseline to produce its realized level of utility under the alternative cases of public infrastructure investment.

Overall, the figure suggests a redistribution of lifetime wealth from older to younger generations induced by doubling public infrastructure investment. This intergenerational redistribution is modest under the labor income tax financing scenario and debt financing scenario, but very significant under the consumption tax financing mode. In the latter case, cohorts that reached adulthood 36 years before the base year are worse off. This corresponds to the generations older than 53 in 2002. Older cohorts receive little or no labor income, thereby gaining little from the increased wage. They also suffer from the fall in the value of existing capital, which depreciates their accumulated savings. Under the consumption tax financing mode, greater tax burdens are borne by the old because they account for a disproportionately large share of consumption.

Young and future cohorts achieve welfare gains from the expanded public infrastructure stock. In the long run, future cohorts' welfare gain is equivalent to 1.5% of their full lifetime wealth. Recall that full lifetime wealth includes the value of leisure and around two thirds of lifetime resources are spent on leisure. This welfare gain is consistent with the long-term increases in consumption reported in Table 4. The intergenerational welfare effects suggest that the larger long-term gain in output and welfare from consumption tax financing may come at the expense of current older generations.

India

Table 5 and Figure 3 present the major macroeconomic effects of doubling public infrastructure investment for India. It is not surprising that they follow a pattern similar to that obtained from the simulations for PRC. However, some quantitative differences between the simulation results for the two countries are instructive in revealing differences in their underlying economic structure.

The first observation arising from the comparison of the two countries' results is that doubling the stock of public infrastructure would generally bring larger output gains in India than in the PRC. Among the three financing modes investigated, India's steady-state output expansion is larger than PRC's under both tax financing scenarios. Only the mode

of debt financing scenario results in less output expansion in India than in the PRC. Three reasons account for this. First, India has a relatively smaller public infrastructure stock and public infrastructure investment in the base year. Doubling its public infrastructure investment would require less resources, and thereby impose smaller tax burdens on the economy in comparison with PRC. Thus, even assuming similar output elasticities of public infrastructure, countries with less developed infrastructure can gain more from increased infrastructure investment. Second, PRC has a higher initial ratio of investment to capital stock, which incurs higher adjustment costs when making further investments. This partly offsets the gains from expanded private and public investment, resulting in relatively smaller output and investment expansion in PRC. Third, the difference in household time preference rates and saving rates between PRC and India also contributes to the relatively larger gain of India, because the high time preference rate in India makes its household saving more sensitive to the changes in the interest rate. This leads to a generally smaller rise in interest rate in India following the increase of public investment, and therefore, a smaller crowding-out effect on private investment.

In further comparing the results across the three modes of public infrastructure financing, it is clear that India would gain most in the long run under the consumption tax financing scenario, mainly because of its higher steady state level of private capital stock. In comparison with the simulation results for PRC, India has only a modest additional gain from labor income tax. Labor income in India accounts for a relatively small share in GDP, thus financing public investment through a labor tax would require a higher tax rate. This leads to a stronger substitution effect against work effort, causing more shrinkage in labor supply. Consequently, the larger distortion from higher labor income tax rates in India partly offsets its potentially larger gains from increasing public investment in infrastructure.

The results in Table 5 of debt financing in India are most striking. Given its initial very high level of government debt, debt financing is very costly for India both because of the initial crowding-out effects on private investment and the long-term substitution effects away from work arising from higher consumption tax rates. Despite the initial smaller rises in interest rates in India than in PRC, the high level of public debt in India causes a heavier interest payment burden and, consequently, a larger expansion in government deficits in the initial stages. This results in a stronger crowding-out effect on private investment. Moreover, the higher debt-to-GDP ratio eventually translates into a larger tax burden for households. The simulation results in Table 5 show that if debt is used to finance public investment in India, the required long-term consumption tax rate to stabilize the government debt-to-GDP ratio would be 70% higher than that under consumption tax financing. This contrasts with the corresponding result obtained from the simulations for the PRC, in which the long-term tax rate under debt financing is only 12% higher than that in the consumption tax financing scenario. The higher consumption tax rates induce stronger substitution effects toward leisure, reducing the long-term supply of labor in India.

VI. Conclusions

Infrastructure expansion is critical for sustaining rapid growth and employment generation in Asia's giant developing countries. The PRC and India have been pursuing infrastructure investment policies and patterns that are in many ways similar, but also different in critical aspects. The devolution of revenue generation and expenditure authority is one of the most obvious areas. Given the fungibility of revenue once raised, financing

options to support the already large and expanding public infrastructure investment becomes important not just for raising revenue, but also in terms of macroeconomic impacts.

Using a dynamic general equilibrium model with overlapping generations, we examine the macroeconomic and intergenerational distributional impacts of increasing public infrastructure investment in the PRC and India. Three alternative financing modes are considered: consumption tax financing, financing through a labor income tax, and debt financing. The simulation results confirm that public infrastructure plays an important role in sustaining long-term output growth and private investment. However, its effects on the macroeconomy and intergenerational distribution heavily depend on the particular financing mode chosen by the policy maker. In general, the consumption tax financing option is the best in term of promoting long-term output growth and investment, but it involves large short-term transitional costs for existing older generations. Debt financing is more favorable to ensure intergenerational equality, but may have undesirable long-term effects.

The comparison of simulation results between the PRC and India also reveals that some country-specific factors are important in determining the magnitude of these effects. In particular, due to its relative scarcity of public infrastructure, India can generally benefit more from increasing the public infrastructure stock. Its current low household saving rate also makes it possible to increase public investment with a smaller crowding out of private investment. However, the high existing stock of government debt in India renders debt financing the least attractive mode of public infrastructure financing.

Two important limitations of our paper need to be mentioned. First, some model parameters, such as the output elasticity of public infrastructure, which are central to the simulation results reported here, have been taken from cross-country studies. Obtaining country-specific estimates of these parameters would significantly improve the empirical and policy relevance of the model simulations. Second, our model and simulations consider public infrastructure financing only. However, in some infrastructure sectors private firms have actively participated in investment and the public-private partnership has emerged as a vital option for infrastructure financing. Incorporating private infrastructure investment in the model analysis would be an important topic for future study.

Similarly, more detailed examination of the two countries' debt and taxation policies and the relationship of those policies with plans for infrastructure financing would improve the realism of any such analysis. However, such a task is, like the two economies, huge and complicated. The present analysis is intended to be just an indicative step towards fuller understanding.

Notes

[1] The Octroi is a tax on goods entering the area. It has been ended in many states but still persists in some locations.

[2] See Auberbach and Kotlikoff [1987]), pp. 29-30, for details.

Table 1

INFRASTRUCTURE FINANCING IN INDIA AND CHINA		
	PRC	India
Decentralized revenue raising	Yes	No
Decentralized expenditure authority	Yes	In transition
Adequate retention of user fees	Yes	Questionable
Private sector involvement	Very little	Very little
Foreign investment allowed/encouraged	Yes, but difficult	Somewhat

Source: Authors' estimations.

Table 2

SOURCES OF URBAN INFRASTRUCTURE FINANCING

China: Revenue for Urban Maintenance and Construction Fund in Percentage

	Central Financial Allocation	Foreign Investment	Self-raised Funds by Enterprises and Institutions	Urban Maintenance and Construction Tax	Local Financial Allocation	Fees of Utilities	Water Fee	Domestic Loans	Other Revenues	*Total*
1991	3.8	4.0	0.0	26.1	10.4	10.1	1.3	8.6	35.6	*100*
2000	5.8	4.3	16.8	11.9	10.5	2.7	0.5	20.9	26.7	*100*
2001	3.5	2.2	16.2	10.7	12.8	1.9	0.4	29.4	22.7	*100*
2002	2.4	1.9	19.0	10.0	12.4	1.6	0.4	27.7	24.5	*100*

Source: Mahadevia [2006], based on Department of Finance and Ministry of Construction data.

Table 3

	BENCHMARK PARAMETERS OF THE MODEL	PRC	India
Extraneously specified parameters			
$1/\gamma$	Inter-temporal elasticity of substitution	0.33	0.33
ρ	Elasticity of substitution between consumption and leisure	0.80	0.80
γ	Externality parameter of public capital in production	0.00	0.00
$1-\kappa-\theta$	Share parameter of public capital in production	0.07	0.07
σ	Elasticity of substitution between imports and domestic goods	2.00	2.00
σ^e	Price elasticity of export demand	-6.00	-6.00
ψ	Capital adjustment cost parameter	2.00	2.00
δ	Depreciation rate	0.10	0.10
g	Long-term growth rate of effective labor	0.025	0.025
Endogenously calibrated parameters			
$(1-\beta)/\beta$	Long-term time preference rate	-0.048	-0.045
	Base year time preference rate	-0.107	-0.045
α	Utility weight on leisure	1.83	2.57
κ	Private capital share parameter in production	0.355	0.38
θ	Labor share parameter in production	0.575	0.55
τ_n	Labor income tax rate (%)	1.8	2.7
τ_k	Corporate income tax rate (%)	18.8	20.2
τ_c	Consumption tax rate (%)	41.5	11.0

Source: Authors' assumptions and calibrated results. See text.

Table 4

Effects of Doubling Public Infrastructure Investment - PRC
% Change Relative to Baseline

Year	1	2	3	10	20	Steady state
Public infrastructure stock	0.0	11.2	21.6	69.7	92.7	100.0
Consumption tax financing						
Output	-0.6	0.0	0.6	3.5	5.6	7.5
Private consumption	-5.1	-4.7	-4.2	-1.4	1.0	3.5
Private investment	-4.6	-3.4	-2.4	2.1	5.0	7.4
Private capital stock	0.0	-0.6	-1.0	-0.2	3.0	7.4
Labor supply	-1.1	-0.9	-0.8	-0.4	-0.3	-0.4
Interest rate	4.4	5.9	6.9	7.7	5.4	0.0
Wage	0.5	0.9	1.2	3.3	5.1	6.8
Tax revenue	13.8	13.6	13.5	13.0	12.8	12.0
Consumption tax rate (*)	11.6	11.0	10.7	8.2	6.6	4.8
Labor income tax financing						
Output	-0.8	-0.4	0.1	2.8	4.9	6.9
Private consumption	-3.5	-3.3	-3.0	-1.0	1.1	3.4
Private investment	-6.8	-5.6	-4.5	0.2	3.2	5.9
Private capital stock	0.0	-0.9	-1.5	-1.7	1.2	5.9
Labor supply	-1.4	-1.4	-1.2	-0.6	-0.5	-0.6
Interest rate	4.8	7.0	8.3	10.1	8.1	2.9
Wage	0.7	1.1	1.3	2.9	4.6	6.4
Tax revenue	13.5	13.7	13.6	13.1	12.9	12.0
Labor tax rate (*)	6.2	6.3	6.1	4.9	4.1	3.4
Debt financing						
Output	0.4	0.9	1.3	3.4	4.7	6.2
Private consumption	-0.7	-0.4	-0.1	1.8	1.1	3.2
Private investment	-6.3	-5.2	-4.2	-0.8	2.9	4.5
Private capital stock	0.0	-0.8	-1.4	-1.9	1.0	4.5
Labor supply	0.7	0.7	0.7	0.5	-0.6	-0.8
Interest rate	6.1	8.1	9.4	16.6	8.3	5.5
Wage	-0.3	0.0	0.3	2.3	4.6	6.0
Tax revenue	-0.3	0.2	0.6	2.7	12.5	12.9
Government debt	0.0	22.2	44.5	182.5	199.8	199.8
Consumption tax rate (*)	0.0	0.0	0.0	0.0	6.4	5.4

Note: (*) Absolute changes in tax rate (%).
Source: Authors' model simulations.

Table 5

Long Run Effects of Doubling Public Infrastructure Investment - India % Change Relative to Baseline						
Year	1	2	3	10	20	Steady state
Public infrastructure stock	0.0	9.8	19.0	66.2	91.6	100.0
Consumption tax financing						
Output	-0.4	0.1	0.5	3.4	5.9	8.0
Private consumption	-2.7	-2.6	-2.3	-0.1	2.2	4.5
Private investment	-4.9	-3.5	-2.3	2.5	5.7	8.3
Private capital stock	0.0	-0.6	-0.9	0.0	3.6	8.3
Labor supply	-0.7	-0.6	-0.6	-0.4	-0.3	-0.5
Interest rate	3.5	4.2	4.7	5.0	3.1	-0.8
Wage	0.4	0.7	1.0	3.2	5.2	7.0
Tax revenue	16.7	18.0	18.4	18.6	17.7	16.7
Consumption tax rate (*)	4.8	5.1	5.2	4.7	3.8	2.9
Labor income tax financing						
Output	-0.6	-0.5	-0.2	2.2	4.6	7.0
Private consumption	-2.5	-2.6	-2.5	-0.6	1.6	4.0
Private investment	-6.4	-5.6	-4.7	-0.1	3.3	6.4
Private capital stock	0.0	-0.7	-1.3	-1.8	1.2	6.4
Labor supply	-1.1	-1.6	-1.7	-1.2	-0.9	-0.9
Interest rate	2.5	4.0	4.9	6.7	5.5	1.4
Wage	0.6	1.2	1.5	3.1	4.7	6.6
Tax revenue	16.4	18.3	19.3	20.3	19.4	18.0
Labor tax rate (*)	4.6	5.7	5.9	5.2	4.1	3.3
Debt financing						
Output	0.3	0.7	1.0	2.4	3.9	5.8
Private consumption	-0.6	-0.4	-0.1	1.9	1.0	3.3
Private investment	-7.2	-6.1	-5.3	-3.5	2.1	3.9
Private capital stock	0.0	-0.8	-1.5	-3.1	0.1	3.9
Labor supply	0.6	0.6	0.6	0.0	-1.4	-1.3
Interest rate	4.6	5.7	6.5	19.7	6.1	4.4
Wage	-0.3	-0.1	0.2	2.0	4.6	6.1
Tax revenue	-0.1	0.4	0.8	2.9	25.7	24.5
Government debt	0.0	2.7	5.9	33.9	38.4	38.4
Consumption tax rate (*)	0.0	0.0	0.0	0.0	6.3	5.0

Note: (*) Absolute changes in tax rate (%).
Source: Authors' model simulations.

Figure 1

Short-term Effects of Doubling Public Infrastructure Investment - PRC
% Change Relative to Baseline

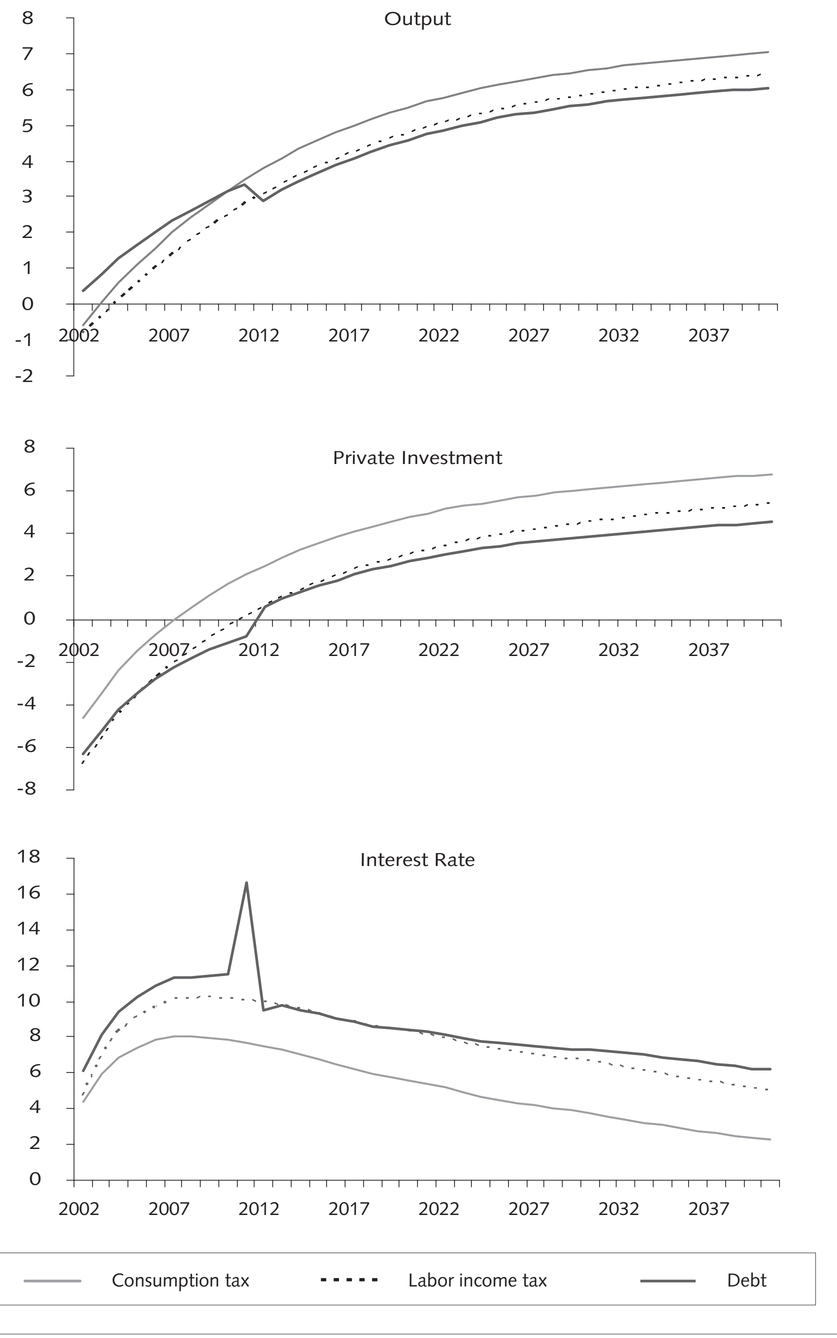


Figure 1 (continued)

Short-term Effects of Doubling Public Infrastructure Investment - PRC
% Change Relative to Baseline

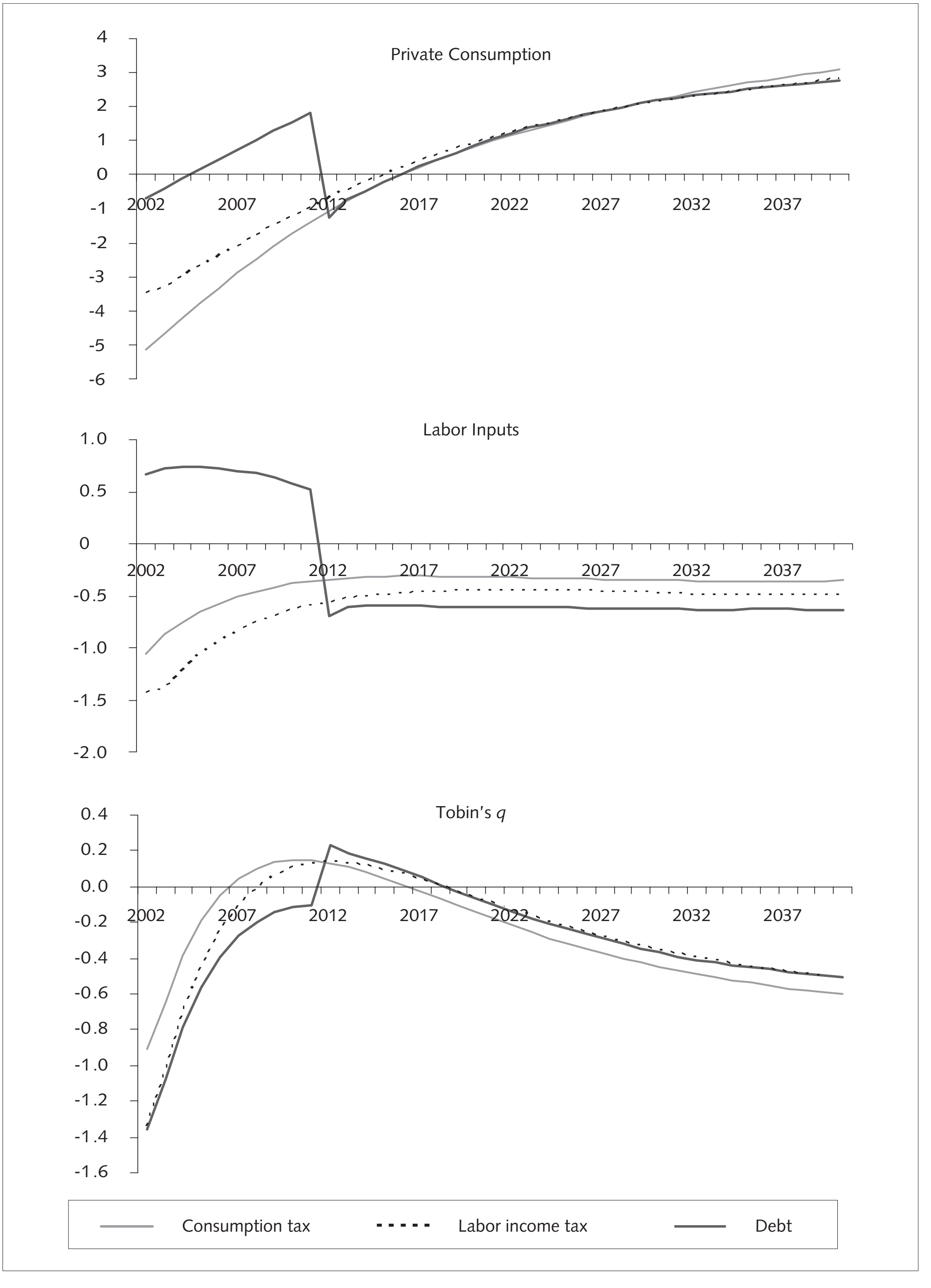


Figure 2

CHANGES IN REMAINING FULL LIFETIME UTILITY - PRC
EV as % of Wealth

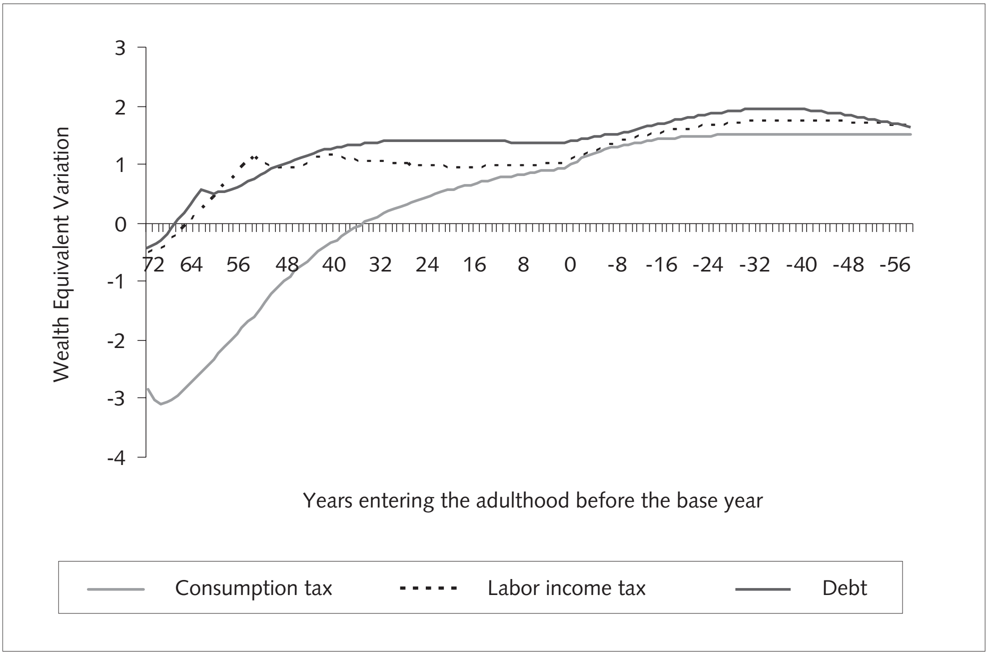


Figure 3

Short-term Effects of Doubling Public Infrastructure Investment - India
% Change Relative to Baseline

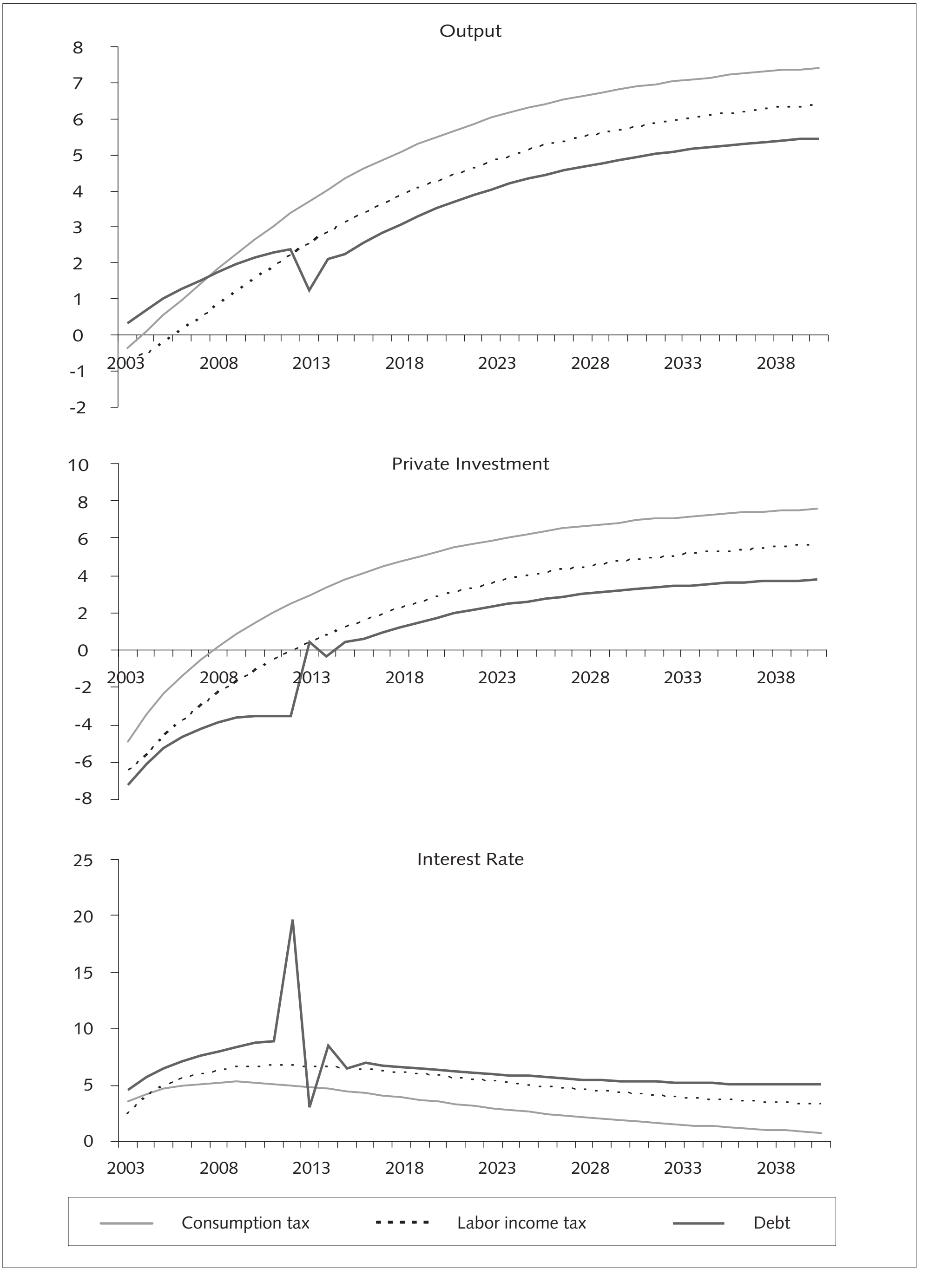
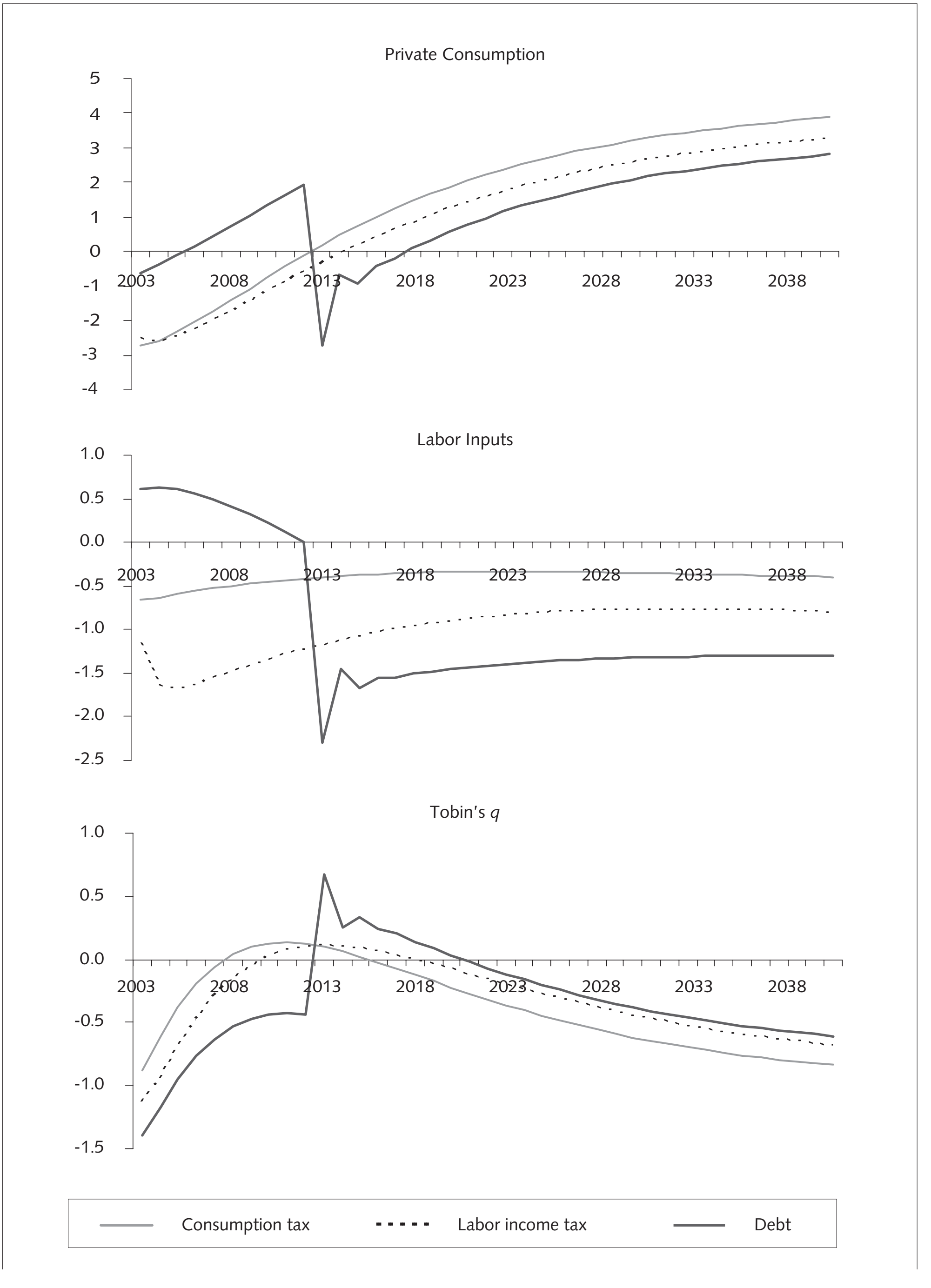


Figure 3 (continued)

Short-term Effects of Doubling Public Infrastructure Investment - India
% Change Relative to Baseline



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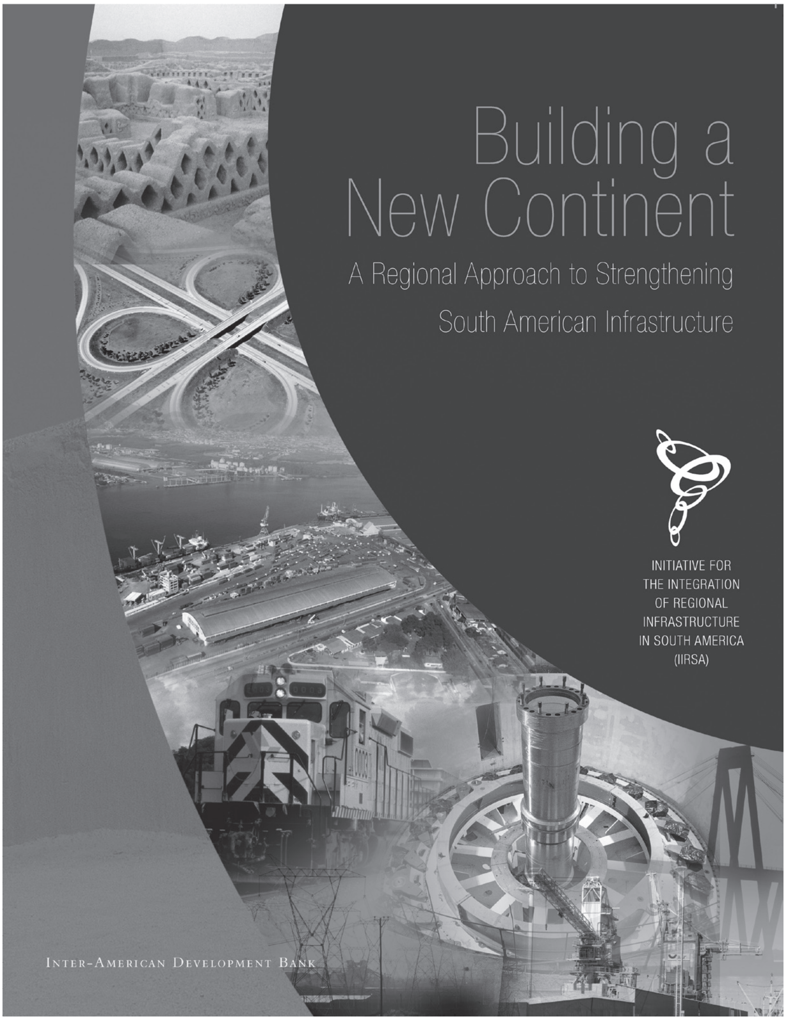

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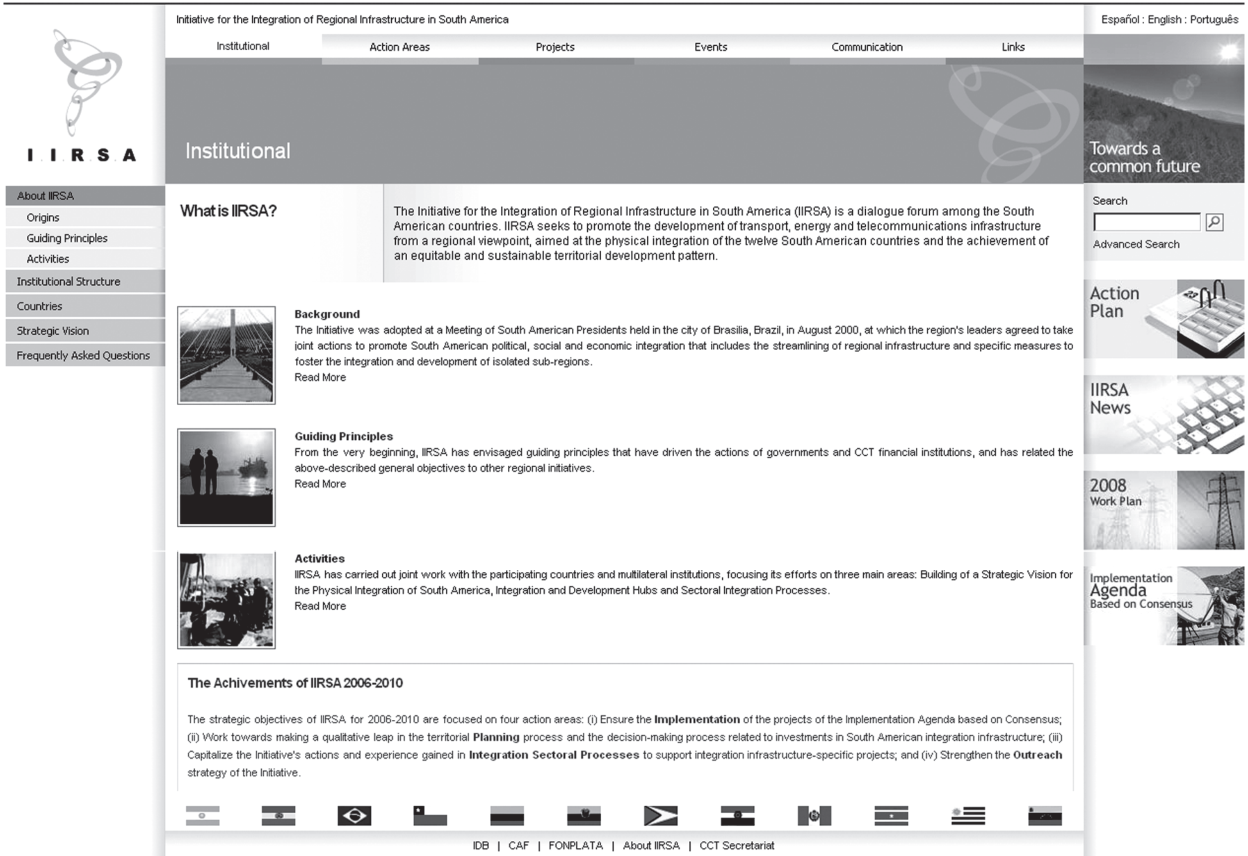

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Integration & Trade

INTAL

The Institute for the Integration of Latin America and the Caribbean (IDB-INTAL) was created in 1965 pursuant to an agreement between the Inter-American Development Bank (IDB) and the Government of Argentina. The Institute is part of the IDB Vice-Presidency for Countries and also coordinates activities with the Integration Sector, Vice-Presidency for Sectors and Knowledge. Since its beginnings INTAL has supported the Bank's regional integration strategy. Its activities are mainly focused on trade issues; regional integration and cooperation; technical assistance, specially directed to institutional strengthening and dialogue with civil society, including the private sector.
Its general objective is to promote and consolidate Latin American and Caribbean integration at the sub-regional, regional, inter-regional, hemispheric and international levels.
Current INTAL priorities relate to three components:

- *Capacity-building in trade and integration.*
  - *Specialized training programs for government officials and civil society representatives in trade and integration matters. Most of the activities take place within the framework of the Joint IDB/INTAL-WTO Program to Support Trade Negotiations in Latin America and the Caribbean.*
  - *Technical assistance to increase efficiency in government consultations with civil society for the formulation and enforcement of trade and integration policies.*

- *Support to research networks for sustaining policy reforms to reinforce the efficiency of research centers and individual experts, thus facilitating decision-making on integration and trade-related issues in the public and private sectors. The following are ongoing networks:*
  - *The Integration Research Network (RedINT)*
  - *The Latin American/Caribbean-Asia/Pacific Economic and Business Association (LAEBA)*
  - *The Euro-Latin Study Network on Integration and Trade (ELSNIT)*
  - *Latin American and the Caribbean Studies Network on Asia-Pacific (REDEALAP)*
  - *The INTAL Award*

- *Public outreach*
  - *Organization of workshops, fora and special events bringing civil society into contact with expert opinions so as to generate policy recommendations on integration and trade in the public and private sectors and greater civil society awareness.*
  - *Publications on integration and trade-related lines of action targeted to the public at large and to specialized groups:*
    - *Integration & Trade Journal (published every six months in English and Spanish)*
    - *INTAL Monthly Newsletter (in Spanish, English and Portuguese)*
    - *Working and Dissemination Papers*
    - *Special Reports*
    - *Publications arising from Research Networks or from Fora, Seminars and Regional Technical Cooperation.*
  - *Setting up of databases and documentation services on the Internet*
    - *The INTAL Documentation Center (CDI), a cooperative regional information center, is in charge of disseminating information and bibliography regarding integration and trade in Latin America and the Caribbean and in other extra-regional blocs.*
    - *The Trade Statistics System for the Americas (DATAINTAL) enables economic agents inside and outside the region to have access to the system.*
    - *Database of integration Treaties and Legal Instruments.*

INTAL's above-mentioned activities focus on the following thematic areas:

(i) The development of physical infrastructure; (ii) Legal aspects of Integration Agreements; (iii) Macroeconomic coordination and convergence; (iv) Integration and changes in the Latin American and Caribbean productive structure; (v) Social issues at the sub-regional level; (vi) Integration and development of border areas; (vii) Readiness of the region's countries to adhere to NAFTA or relate to the European Union or APEC, and participate in hemispheric convergence; (viii) Intra-sub-regional direct investment flows prompted by integration and economic complementation agreements; (ix) Harmonization of services market regulations; and (x) Development of sub-regional information systems.

Since 2001, INTAL is the Secretariat for the Technical Coordination Committee of the IIRSA project - Initiative for the Integration of Regional Infrastructure in South America. This Committee is made up of the Inter-American Development Bank (IDB), the Andean Development Corporation (CAF) and the Financial Fund for the Development of the River Plate Basin (FONPLATA).

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