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September 2013

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IERAL - Fundación Mediterránea



Inter-American Development Bank

2013

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Zúñiga, Jimena.

A cycle-adjusted fiscal rule for sustainable and more equitable growth in Argentina / Jimena Zúñiga,
Marcelo Capello, Inés Butler, Néstor Grión.

p. cm. (IDB working paper series ; 439)

Includes bibliographical references.

1. Fiscal policy—Argentina. 2. Economic development—Argentina. I. Capello, Marcelo. II. Butler, Inés.
III. Grión, Néstor. IV. Inter-American Development Bank. Fiscal and Municipal Management Division. V.
Title. VI. Series.

IDB-WP-439

<http://www.iadb.org>

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Abstract^{*}

This paper seeks to identify the most promising fiscal strategy to boost long-term economic growth in Argentina and quantify its effects. To this end, the authors updated a growth-diagnostics study for Argentina and corroborated that low appropriability of social returns and insufficient public infrastructure are key constraints to private investment. Further, low appropriability stands out among the key constraints to productivity-enhancing activities. Because low appropriability is largely rooted in macroeconomic volatility, the authors argue that a cycle-adjusted fiscal rule is one of the most promising fiscal reforms the country could implement to tackle this problem, and discuss the specific design features that such a rule could include. Then, the authors construct a model reflecting the stylized facts of the Argentine Republic's fiscal federalism structure to assess the effect that a cycle-adjusted fiscal rule, in different variants, would have on the volatility of key macro variables. The authors find that the rule would meaningfully reduce macroeconomic volatility, thereby contributing to improved appropriability and long-term growth.

JEL codes: E62, H00, O40, O54

Keywords: Macroeconomic policy, growth, fiscal policy, fiscal rules, Argentina, Latin America

^{*} The authors thank Arturo Antón, Ana Corbacho, Gustavo García, Teresa Ter-Minassian, and the rest of the participants of seminars held in Washington, DC for their invaluable comments; as well as Martín Clausse, Gustavo Diarte, and Lucía Valsagna for excellent research assistance.

Introduction

What can fiscal policy do to boost growth in a given country? As is often the case in economics, it depends. In particular, following the growth diagnostics framework outlined by Hausmann, Rodrik, and Velasco (2005), it often depends on what constrains growth most severely in the country in question. If a country's binding constraint on growth is low overall savings, then the most promising fiscal policy to boost growth may be to cut spending and/or raise revenue to increase public savings. If a country's binding constraint is insufficient human capital, then the most promising fiscal policy probably involves higher public spending on education and on-the-job training.

Of course, fiscal policy may be just part of the answer. If a country's problem is low overall savings, perhaps an institutional reform (e.g., a pension reform) is just as necessary as raising public savings. If human capital is lacking, then education reform may be just as promising as increasing education spending. Whichever the role of fiscal policy in relaxing a country's binding constraints to growth, it is likely that other policies and reforms have to be implemented in conjunction with fiscal policy.

With this in mind, what can fiscal policy do to boost growth in Argentina? To answer this, it is important to consider what the binding constraints on growth are. Although the growth diagnostics framework has not developed an undisputed method to evaluate specific hypotheses (Chisari et al., 2007), existing studies (Sánchez and Butler, 2007; Chisari et al., 2007; and Auguste, 2012) highlight low appropriability (emanating from both macro and micro risks due to government failures) as the most binding constraint on growth.

Second, it is necessary to determine which fiscal reform strategy is best suited to tackle that binding constraint. Because low appropriability is largely rooted in macroeconomic volatility (Sánchez and Butler, 2007; Chisari et al., 2007), in turn exacerbated by procyclical fiscal policies (Lafuente, 2008; Escudero et al., 2009), arguably, one of the most promising fiscal policies to boost growth in Argentina would be a cycle-adjusted fiscal rule, including all levels of governments and designed to stabilize key macroeconomic variables.

Granted, low appropriability is *also* rooted in institutional factors that affect the overall quality of policies in Argentina (Spiller and Tommasi, 2002; Chisari et al., 2007; Tommasi, 2008). Thus, the country needs broader institutional reforms than a fiscal rule to tackle this constraint. What is more, stronger institutions are a prerequisite for any fiscal rule's successful

implementation (Braun and Gadano, 2007; Ter-Minassian, 2010). But if asked to recommend a *fiscal* reform to boost growth in Argentina, a cycle-adjusted fiscal rule seems the most appropriate.

Similarly, this does not mean that procyclicality or outright volatility is the *only* problem with Argentina's fiscal policy. For one thing, Argentina boasts a very high level of legal tax pressure (Capello, Cohen, and Grion, 2011), and relies largely on distortive taxes (Rivas, 2011; García, 2012). However, because low appropriability is the most salient binding constraint on growth, and this problem is largely rooted in macroeconomic volatility fueled by procyclical fiscal policies, addressing the procyclicality of fiscal policy appears more promising to boost growth than addressing other flaws in fiscal policy.

Finally, it is necessary to determine empirically to what extent the proposed reform has an effect on the binding constraints identified. To this end, we use a dynamic and stochastic general equilibrium (DSGE) model matching the stylized facts of the Argentine Republic and calculate the effect that the adoption of a cycle-adjusted fiscal rule would have on appropriability, using the volatility of key macro variables as a proxy.

We find that a cycle-adjusted fiscal rule would indeed be effective to reduce Argentina's macroeconomic volatility. In addition, we find that its design and jurisdictional scope are important for the rule's effectiveness. Finally, we argue that the proposed reform is feasible from an economic point of view, even if it would require a non-negligible fiscal contraction in the current context.

The Achilles' heel of the proposed reform is its limited *political* feasibility given Argentina's weak institutions (Spiller and Tommasi, 2002); its bad experience with the adoption of rules (Braun and Gadano, 2007; García, 2012); and, particularly in the case of the current administration, a strong bias toward discretionary rather than institutionalized policymaking. However, given the increasingly visible limits of the current demand-driven growth strategy (i.e., slower growth, high inflation, infrastructure bottlenecks, concern about real appreciation, and narrowing trade surpluses, etc.) this paper makes an important contribution to the current policy debate in the country by (i) raising awareness about the cycle-adjusted fiscal balance and (ii) highlighting the potential of the proposed cycle-adjusted fiscal rule to make Argentina's growth trajectory once and for all *sustainable*.

The rest of the paper is structured as follows. Building on existing empirical work, the first section discusses the main constraints on sustained growth in Argentina. The second section revisits the links between procyclical fiscal policy and growth, strengthening the case for a cycle-adjusted fiscal rule as an instrument to boost growth. The third section delves into the design specificities that the proposed cycle-adjusted rule could include. The fourth section presents the analytical framework used to assess the growth impact of the proposed rule and some variants, taking into account the identified constraints on growth. The fifth section lays out the main findings from this methodological approach. The sixth section discusses issues related to the practical implementation of the rule in Argentina. The final section provides conclusions.

Argentina's Binding Constraints on Growth

As noted in IDB (2011), any rigorous study on the impact of fiscal policy on growth in a given country must start with the definition of an analytical framework for growth itself. Following Sánchez and Butler (2007), compiled and edited by Agosin, Fernández-Arias, and Jaramillo (2009), we use the growth diagnostics analytical framework outlined in Hausmann, Rodrik, and Velasco (2005) and summarized below.

As specified in the growth diagnostics framework, the balanced growth path of consumption and capital is given by:

$$dct/ct = dkt/kt = \sigma[r(1-\tau)-\rho]$$

where: c = consumption, k = capital, r = the rate of return on capital, τ = the tax rate on capital, actual or expected, formal or informal, ρ = the world rate of interest, and σ = the intertemporal elasticity of consumption.

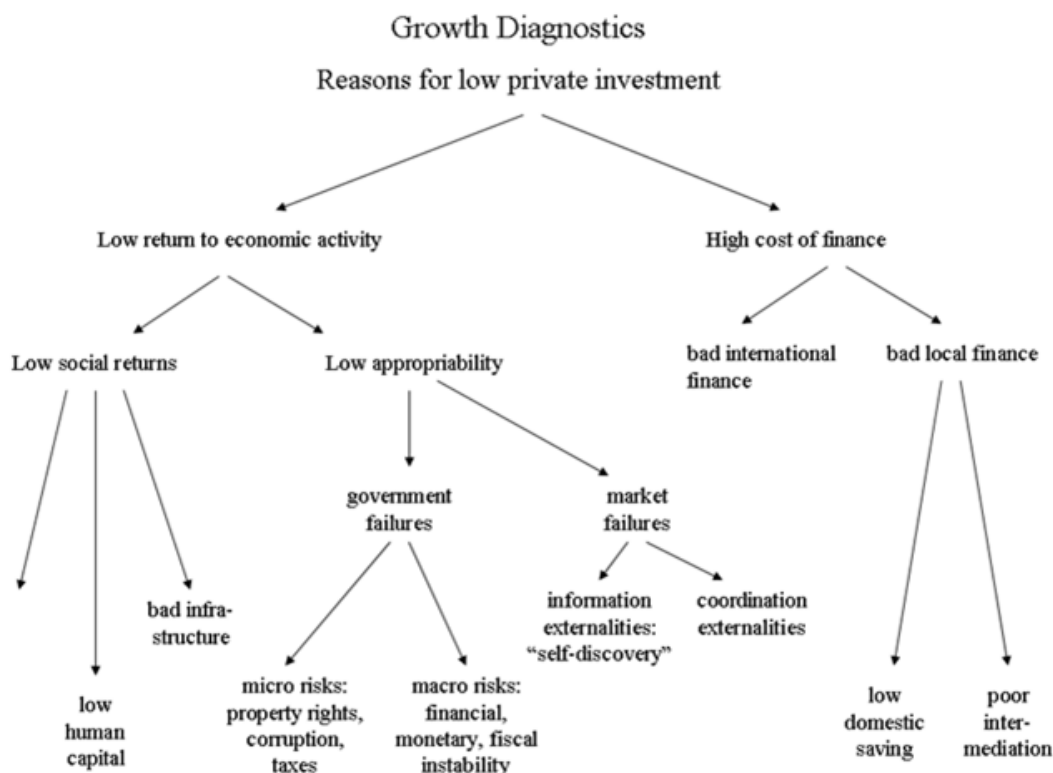
In addition, the private return on capital r is given by:

$$r = r(a, \theta, x)$$

where a = indicator of total factor productivity, x = availability of complementary factors of production, such as infrastructure or human capital, and θ = index of externality (a higher θ means a larger distortion).

Taking into account these equations, Hausmann, Rodrik, and Velasco (2005) propose a decision tree approach to identify the variable where the binding constraint on growth takes place (Figure 1).

Figure 1: Growth Diagnostics Decision Tree



Source: Dani Rodrik's weblog.

As in Sánchez and Butler (2007), our approach differs slightly from the decision tree approach in that, instead of a neoclassical growth model with exogenous technical change, we consider the Schumpeterian growth model with endogenous technical change (e.g., Howitt, 2000; Klenow and Rodríguez-Clare, 2005). Therefore, we apply the growth diagnostics decision tree approach not only to private investment but also to productivity-enhancing activities, in particular the structural transformation of exports (Hausmann, Hwang, and Rodrik, 2005) and innovation activities.

We note that Argentina's 10 years of continuous economic expansion (at least, based on what has been officially-reported) does not make the search for its growth binding constraint

any less timely. First, the limits to the current demand-driven growth strategy are increasingly visible (Figure 2). Second, the empirical evidence documented in Hausmann, Pritchett, and Rodrik (2004) suggests that episodes of growth acceleration underpinned by positive terms-of-trade shocks (similar to those experienced in Argentina and in contrast to episodes of growth acceleration underpinned by economic reform or democratization) tend not to be sustained.

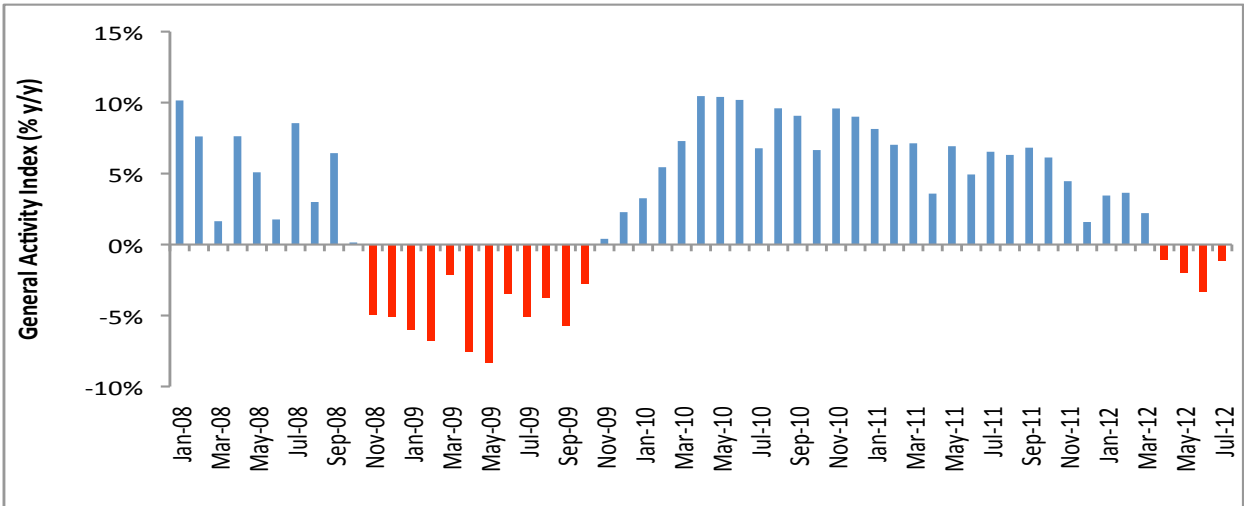
Appendix 1 details the datasets analyzed to assess the binding constraints on each of these activities. Regarding investment, Sánchez and Butler (2007) find the most binding constraints to be low appropriability of returns due to government failures generating micro and macro risks, and low social returns due to poor infrastructure. Based on our analysis, infrastructure constraints continue to apply and appropriability issues have become even more severe, as evidenced by the worsening of relevant international indicators and by the increased arbitrariness of public policy, which is epitomized by the heightened restrictions on imports and foreign exchange purchases. In this sense, our analysis agrees with the conclusions of Sánchez and Butler (2007), Chisari et al. (2007) and Auguste (2012), which highlight low appropriability as the most salient binding constraint on investment.

Regarding the structural transformation of exports, Sánchez and Butler (2007) conclude that the most binding constraint was low appropriability of social returns due to *market* failures (coordination and information externalities) that hinder the discovery of modern export activities. Since the publication of their work, low appropriability has become more binding, not only because there is no evidence of a relaxation in the market failures that Sánchez and Butler identify, but also because of greater *government* failures that affect the export sectors in particular. These failures are both micro and macro, and correspond to capricious trade and foreign exchange policies, and a strong real exchange rate appreciation (Figure 3), respectively.

Regarding innovation, Sánchez and Butler (2007) identify low social returns from these activities as the most binding constraint as a result of “insufficient participation in FDI flows and imports of capital goods from knowledge-abundant countries, and specialization in export activities with low technological frontiers.” Moreover, they find local inadequacies in the areas of human capital. Since the publication of their work, local inadequacies in the area of human capital persist, while the problem of low social returns due to insufficient participation in foreign direct investment (FDI) flows and imports of capital goods from knowledge-abundant

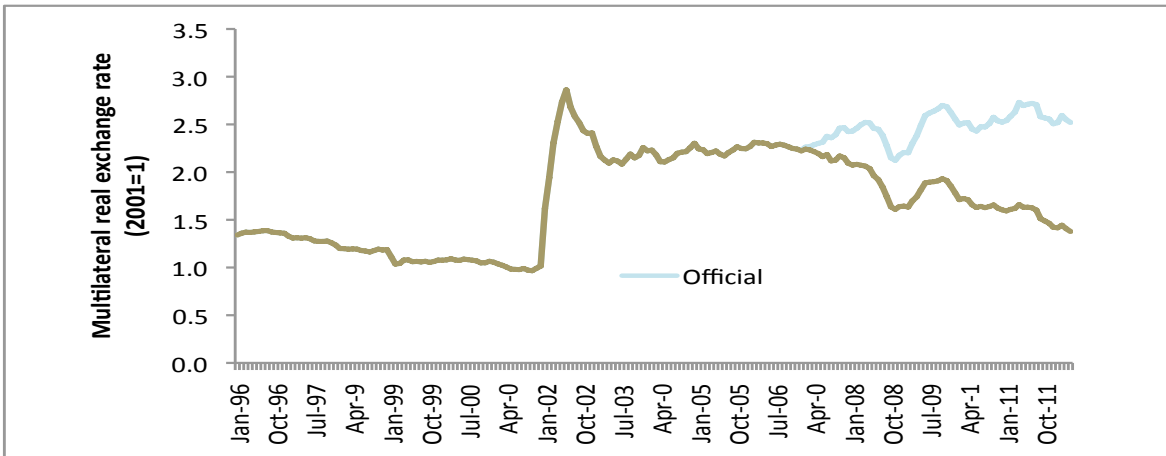
countries has become more severe in the context of recent trade and foreign exchange policies. Moreover, generally low appropriability from macro and micro risks has become an important constraint on innovation activities as well.

Figure 2: Slowing Down



Source: IERAL based on Orlando Ferreres and Associates.

Figure 3: Losing Competitiveness



Source: IERAL based on Mecon and provincial CPI indexes.

We argue that a cycle-adjusted fiscal rule designed to reduce the procyclicality of fiscal policy and preserve macroeconomic stability has an important role to play in relaxing some of the binding constraints on investment and productivity-enhancing activities identified for Argentina. In particular, the rule would:

- a) Boost investment through higher appropriability ($1-\tau$ in the above equation) even if, as explained above, low appropriability is not only rooted in macroeconomic instability. It would also reduce the volatility of investment in public infrastructure (potentially boosting r in the above equation).
- b) Favor the structural transformation of exports via higher appropriability $1-\tau$, in particular, greater output stability in the tradable sector (especially when facing terms-of-trade shocks).
- c) Favor innovation by improving overall appropriability $1-\tau$ and boosting the social returns to this activity r , insofar as the social returns to innovation have been negatively affected by arbitrary trade and foreign exchange policies that would be unnecessary in the context of a sounder fiscal framework.

Procyclical Fiscal Policy and Growth

Although a body of literature presents procyclical fiscal policy as *optimal* under specific political-economy or financial-market imperfections (see, for example, Talvi and Végh, 2000; Riascos and Végh, 2003; Sarker, 2009; Cuadra, Sánchez, and Saprizza, 2009; Banjeree, 2010), there are also a number of documented channels through which procyclical fiscal policy can have a detrimental impact on growth.

First, to the extent that there are rigidities in the social component of public spending, greater procyclicality results in suboptimal public investment in infrastructure over time (because both components of spending rise during booms but infrastructure suffers more during busts, as documented by Perry, 2008). Moreover, the volatility of infrastructure spending contributes to inefficiencies in this spending insofar as it impacts maintenance (Fay and Morrison, 2005). The resulting suboptimal infrastructure negatively affects growth (Agenor and Moreno-Dodson, 2006; Romp and de Haan, 2007; Estache and Fay, 2007; Del Bo, 2009; Sutherland et al., 2009).

Second, the procyclicality of fiscal policy negatively affects potential GDP growth, because macroeconomic volatility hinders growth (Perry, 2002; Hnatkovska and Loayza, 2003; Aghion et al., 2005; Fatás and Mihov, 2009). Volatility hinders growth because it holds back private investment (Servén, 1998) in terms of both physical capital (including infrastructure and R&D) due to higher risk and human capital because of higher risk and labor market hysteresis, as well as reduced access to health services and education for vulnerable income groups during crises.

Third, crisis episodes associated with economic volatility and procyclical fiscal policies have important negative consequences for long-term growth. Crises provide some (dubious) justification for reckless policymaking and contract violations—“exceptional” and “emergency” measures—damaging the overall quality of institutions that are critical to growth (North, 1990; Rodrik and Subramanian, 2003; Acemoglu, Johnson, and Robinson, 2004). Further, crises cause massive redistributions of wealth, which negatively affect low-income groups in particular, erode the basis of a meritocratic society, and create renewed demand for shortsighted policies, creating a negative feedback loop. In addition, these redistributions harm long-term growth in other ways than compromising equity, the literature on inequality and growth explores (Birdsall, 2007). In contrast, Rodríguez, Tokman, and Vega (2006) and Velasco et al. (2010) highlight how the cycle-adjusted fiscal rule in Chile has ensured the continuity of social policies, protecting the most vulnerable segments of the population from the devastating effects of crises.

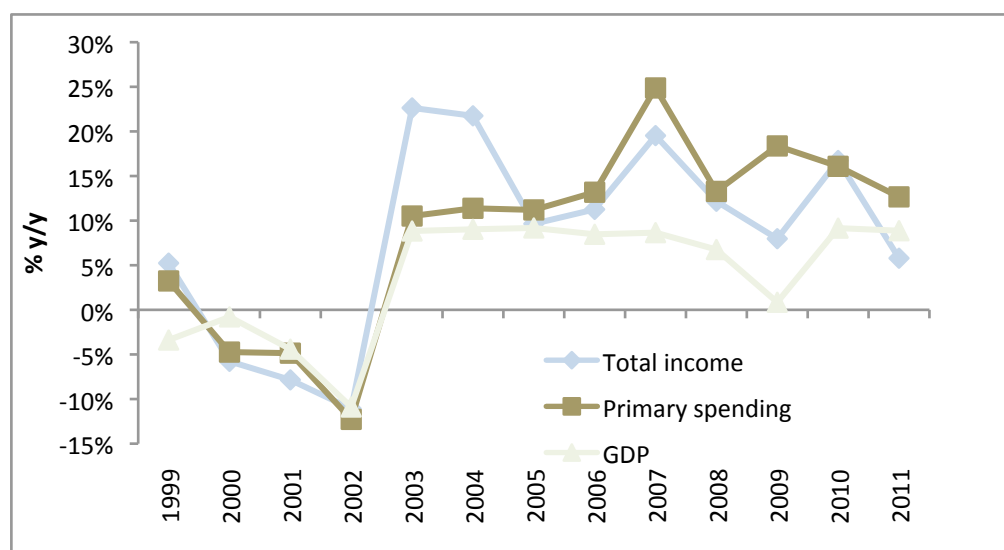
Fourth, procyclical fiscal policies result in excessive real exchange appreciation during booms (when access to finance is most widely available), detracting from the attractiveness of investments in new export activities that are critical for growth (Hausmann, Hwang, and Rodrik, 2005). In contrast, in Chile, for example, the cycle-adjusted fiscal rule has contributed to a more competitive real exchange rate, thus providing strong support for the export sector (Velasco et al., 2010). In Colombia, the Inter-Institutional Technical Committee (Comité Técnico Interinstitucional, 2010) has advocated for the adoption of a cycle-adjusted fiscal rule, highlighting the need to avoid the “undesired macroeconomic effects that exchange rate appreciation could produce.”

Fifth, procyclical fiscal policies are more likely to result in fiscal unsustainability insofar as contracting fiscal policy during busts usually meets political and social constraints. As noted

in World Economic Forum (2010) “although sound fiscal policy does not contribute directly to raising productivity and competitiveness, disarray can be very harmful.”

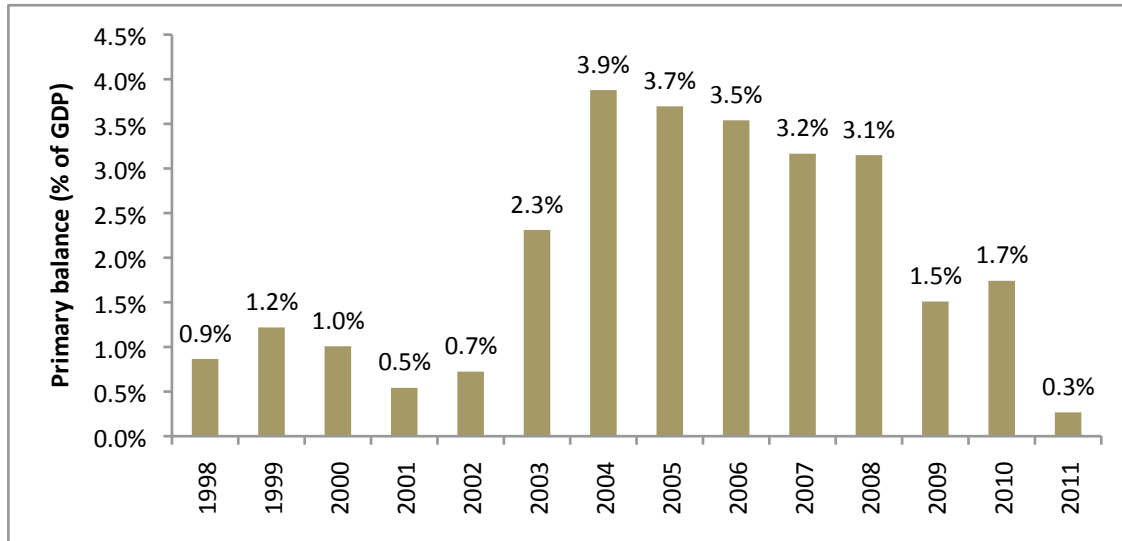
Unfortunately, in the past, to the detriment of growth, Latin American countries have tended to implement procyclical fiscal policies (Gavin and Perotti, 1997; Stein, Talvi, and Grisanti, 1998; Kaminsky, Reinhart, and Végh, 2004; Talvi and Végh, 2000; Clements, Faircloth, and Verhoeven, 2007; Ilzetzki and Végh, 2008) and Argentina has certainly not been the exception (Lafuente, 2008; Escudero et al., 2009). Figures 4 and 5 (and Figure 9 for the provinces) illustrate this.

Figure 4: Income and Spending Hold Hands



Source: IERAL of the Mediterranean Foundation.

Figure 5: Withering Fiscal Surplus



Source: IERAL of the Mediterranean Foundation.

Of late, some countries in the region have made efforts to reduce the procyclicality of their fiscal policy (most successfully Chile, with its well-established fiscal rule; and most recently, Colombia; and probably soon Peru). But there have been no such attempts in Argentina, where the issue remains all but absent from public debate. This paper fills that gap by proposing a cycle-adjusted fiscal rule and assessing its effects.

A Cycle-Adjusted Fiscal Rule

We propose a cycle-adjusted fiscal rule and discuss three different design variants. The proposed reform draws inspiration from the old and recent experience, as well as debate in the region about cycle-adjusted fiscal rules (synthesized in Table 1), but it also takes into account Argentina's challenges related to fiscal federalism. The variants of our proposed cycle-adjusted fiscal rule are as follows:

- A rule (similar to the one in place in Chile) that mandates meeting a structural target balance (e.g., 0 percent of GDP) by making each year's public spending a function of structural public revenue (in turn defined as a function of trend GDP and long-term international export prices). By making spending a-cyclical, this rule would result in

higher (lower) surpluses when actual revenue exceeds (comes short of) structural revenue, whether thanks to observed GDP, or prices, or both.

- A rule like that outlined above but extended to the provinces by making the automatic transfers from the national government a function of structural (as opposed to actual) revenue. Although the reform would not prevent the provinces from exercising their autonomy to spend or borrow, it could smooth local public spending (almost 40 percent of consolidated public spending) by stabilizing a sizable fraction of the provinces' total revenue (44.2 percent in 2010). This variant of the reform draws from Argañaraz et al. (2003) and IERAL (2003).
- A rule (inspired by the recently introduced rule in Colombia) that modifies the variants outlined above by making federal public spending components sensitive to the cycle, as opposed to a-cyclical. For example, the rule can be set such that the authorities spend more (less) on a given component during bad (good) times, resulting in lower (higher) structural balances than in the context of an a-cyclical rule. This rule variant could imply greater stabilization benefits and could be particularly crucial in a LAC country given the reportedly limited size of their automatic stabilizers (Martner, 2000; Suescún, 2007). However, this may be less the case in Argentina given its increased tax pressure over the past few years (Capello, Cohen, and Grion, 2011).

While the first two variants of the rule do not require any changes to tax or spending policy over time, the third variant calls for a definition of the public spending categories to be adjusted to modify the structural balance. Moreover, although not analyzed quantitatively in this paper, tax policy could also be cycle-dependent to make the structural balance rule sensitive to the cycle. Table 2 summarizes the potential advantages and disadvantages of using different tax and spending instruments to smooth the cycle, drawing from some available empirical evidence (e.g., Baldacci, Gupta, and Mulas-Granados, 2009; Spilimbergo, Symansky, and Schindler, 2009).

Table 1: The Latin American Cycle-Adjusted Fiscal Rule Know-How

	COLOMBIA	CHILE (2006–2009)	CHILE (proposed)
Legal status	Law	Law	Proposal
Scope	National central government	Consolidated central government	Consolidated central government
Target fiscal variable	Primary Balance	Total balance	Total balance, with information on the primary balance
Mandate	Structural deficit \leq 1 percent of GDP	Structural balance = 1 percent of GDP (changed twice, to 0.5 percent and 0 percent, respectively)	Path to lower structural deficit to 1 percent of GDP by 2014
Transition	Structural deficit \leq 2.3 percent by 2014, 1.9 percent by 2018, 1.0 percent by 2022	No	See above
Countercyclical device	Government can boost spending asymmetrically under specific slow-growth conditions	No	Greater emphasis on possibility of deviating from the rule in exceptional circumstances
Escape clause	Rule can be suspended for “extraordinary events”	No	There may be deviations during extraordinary events
Non-compliance	No penalty for authorities. Government will have to explain reasons for non-compliance and set goals to return to compliance	No	Monitoring and assessment of reasons for deviation
Expert committee	Nonbinding opinion on methodological and compliance issues	Provides inputs for calculation of output gap and long-term price of copper	Provides inputs for calculation of output gap and long-term price of copper
Stabilization fund	Funded with fiscal surpluses and can be used to amortize debt, extraordinary spending, or (\leq 10 percent of fund's balance) countercyclical spending	Funded with fiscal surpluses; no emphasis on de-accumulation rules	Funded with fiscal surpluses; emphasis on de-accumulation rules
Estimation of trend GDP	Hodrick-Prescott filter	Based on advisory board inputs and calculation of a Cobb-Douglas function	Based on advisory board inputs and calculation of a Cobb-Douglas function
Estimation of commodity revenue	With respect to the base year	Copper: based on advisory board inputs Molybdenum: based on moving average	Copper: based on advisory board inputs. Molybdenum: Based on moving average of past 7 years
Adjustment mechanism (to correct deviations)	Within next years of deviation, when accumulated deviation reaches 0.5 percentage points (0.3 and 0.2 each year) and whatever exceeds that threshold over next year	No	Path to lower structural deficit to 1 percent of GDP by 2014

Sources: Chile, Law #20128 about Fiscal Responsibility, September 22, 2006; Colombia. Ley # 1473, July 5, 2011; Comité Técnico Interinstitucional (2010); Velasco et al. (2010); Larraín et al. (2011).

In addition to the basic tenets outlined above, any reform variant should include:

- A definition of the public balance on which the fiscal rule will be applied. As highlighted in Ter-Minassian (2010) and Comité Técnico Interinstitucional (2010), the primary balance has the advantages that it would leave out spending that is not under the control of the authorities. Given Argentina's improved debt-to-GDP ratio (from 166 percent in 2002 to 43 percent in 2011), the risk of excluding interest spending from the rule has become relatively manageable. A possible target for Argentina could be 2 percent of GDP, as this would be broadly in line with the actual average primary surplus in the recent past (1998–2011) and cover almost 100 percent of the interest payments in that period (2.2 percent of GDP on average). As discussed later in this paper, this target could be modified to take into account debt ratio objectives or demographic considerations.
- A definition of the level of government and scope of the public sector to fall under the rule.
- An independent advisory board comprised of experts from academic and applied research centers (such as those established in Chile and Colombia), to monitor compliance with the rule by government, express opinions on the rule's methodology, and potentially define the rule's relevant parameters.
- A methodology to estimate the level of potential GDP and the long-term price of export products—inputs in the calculation of the structural revenues—and the income elasticity of taxes.
 - a. The methodology to estimate the level of potential GDP could be based on a simple HP filter, a production function, a principal component analysis, a Bayesian rule, a VAR exercise, or a combination of these (Comité Técnico Interinstitucional, 2010). Additionally the estimation could be based on inputs provided by members of the advisory board (as in Chile). While an HP-filter approach would have the advantage of being simple and symmetric, the production-function-based approach could better capture inflexion points arising from changes in the availability of production factors. The other approaches seem potentially too inaccessible to the public to be embedded in legislation.

Finally, relying on an advisory board could lend itself to manipulation and does not guarantee symmetry.

- b. The methodology to estimate the long-term price of relevant export products could be based on a formula incorporating past and forward prices (as in Mexico), a reference to a “base year” (similar to the Colombian rule), or, again, be set by the advisory board (as in Chile). The formula-based approach has the advantage of limiting discretionary decisions, but it could turn out to be too rigid and not forward-looking enough.
- An accumulation rule for the surpluses, whereby surplus funds can only be used during periods when observed public revenue comes short of structural revenue (because of below-trend output, below-average prices, or both). There could be a ceiling on the fund at “x” percent of GDP, with the exceeding funds allocated to debt repayment. This would moderate the political-economy risk that opportunist governments would be tempted to grab the saved funds at their convenience. Although any ceiling could prove insufficient when bad times come along and there is need to run deficits, the rule, along with debt repayment, should enhance access to international finance (as it did in Chile according to Rodríguez, Tokman, and Vega, 2006; Velasco et al., 2010; Marcel, 2013; Lefort, 2006).

Table 2: A Menu of Fiscal Policy Instruments to Smooth the Cycle

Adjustment variable	Advantages	Disadvantages
Transfers	Targeted to liquidity-constrained consumers.	Downward rigidity. Indirect effect on demand. Lower multiplier effect, especially when transitory.
Current spending	Direct effect on demand. Higher multiplier effect. More timely than capital spending (Baldacci, Gupta, and Mulas-Granados, 2009). Potential substitutability with private consumption.*	Downward rigidity. Potential complementarity with private consumption.*
Capital spending**	Direct effect on demand. Higher multiplier effect than current spending (Spilimbergo, Symansky, and Schindler, 2009). Relatively flexible from a political economy point of view. Potential substitutability with private capital (Aschauer, 1989).*	Potential complementarity with private capital.* Optimality of increasing capital spending when productivity is high. Less effective than current spending due to lags (BGM, 2009).
Capital spending composition** (reproductive capital in booms and nonreproductive capital in busts)	Possibility of acknowledging the potential complementarities between public and private capital.	Big changes in composition may be required to attain directional effects.
Income tax		Indirect effect on demand. Lower multiplier effect, especially when transitory. Difficult implementation. Usually does not target liquidity-constrained consumers.
Labor taxes	Potentially targeted to liquidity-constrained consumers.	Indirect effect on demand. Lower multiplier effect especially when transitory. In booms, aggravation of distortions of relative factor prices.
Export taxes	Neutral for expected returns (provided symmetry) and limiting of ex-ante risks for producers (stabilizing effective real exchange rate). Simple implementation.	Indirect effect on demand. Politically difficult following (asymmetric) 2009 attempt. In booms, aggravation of distortions of relative prices.
Import taxes	Stabilizing of effective real exchange rate.	Indirect effect on demand. Difficult implementation given treaties. In booms, aggravation of distortions of relative prices.
VAT	Feasible implementation. Greater effect on demand than income taxes, especially when transitory.	Indirect effect on demand. Has to be sizable to be noticed.
A symmetric combination of different alternatives		

Source: IERAL of the Mediterranean Foundation based on empirical literature cited above.

Notes: *Technically, this would depend on the utility or production function. **Because sound institutions are key to determine the productivity of infrastructure investment (Del Bo, 2009; Sutherland et al., 2009), this would have to be complemented with an investment project bank, such as that proposed in IERAL (2003).

- A specification of the treatment of transitory changes in tax policy. This has been the subject of some debate in Chile. During the Bachelet administration, it was established that transitory tax policy changes would not be taken into account for the calculation of structural revenue. Subsequently, during the Piñera administration, it was established

that tax policy changes, even if transitory, would count as changes in structural revenue. Although the Piñera administration followed recommendations issued by an advisory committee (Larraín et al., 2011), the modification does not foreclose the political-economy risks it aimed to prevent (e.g., transitory increases in taxes can be spent as if they were permanent).

- A calendar and methodology to update relevant parameters (such as the income elasticity of taxes, as suggested in Velasco et al., 2010) and incorporate new ones to reflect structural changes in the economy and the composition of fiscal revenue. For example, although Argentina has lost its status as a hydrocarbon exporter, there could be a new “boom” on the back of shale oil exploitation. Similarly, the 2012 nationalization of the state-owned energy company YPF implies that a portion of government revenue could depend on oil prices. Both developments could call for the consideration of long-term oil prices in the determination of structural revenue.
- Possibly an escape clause for natural disasters or “exceptional circumstances.” The inclusion of this clause is debatable, as it could be avoided by making the rule sufficiently countercyclical .
- A mechanism to assess compliance and return to compliance when deviations occur.
- A transition clause given the current situation of structural deficit.

Analytical Framework

To assess the growth impact of this fiscal reform, we built a DSGE model, which draws from McGrattan (1991); Arezki and Ismail (2010); Engel, Neilson, and Valdés (2011); García, Restrepo, and Tanner (2011); and Uribe (2013) for inspiration. The model allows us to reflect key features of the fiscal federalism structure in Argentina.

The Model

Consumers

There are two types of consumers in the economy. Ricardian consumers can smooth consumption while non-Ricardian consumers depend more on their labor and transfers from the federal government. The presence of two consumers allows us to explore distributional effects

of the proposed reform. Moreover, as noted in Mankiw (2000), the inclusion of part of the population subject to constraints can alter fiscal policy results and is critical to our conclusions. We assume that a fraction ω of the population are Ricardian consumers and $1 - \omega$ are non-Ricardian. The (per capita) aggregate level of any variable associated with the consumers is the weighted average of its respective value for each type of consumer.

For example, per capita consumption of tradable good c_t^T is:

$$c_t^T = \omega c_t^{Tr} + (1 - \omega) c_t^{Tnr}$$

Ricardian Consumers

The consumers' utility is a function of their consumption c_t , labor l_t , and public goods provided by the national and provincial governments, g_t^N and g_t^P :

$$V = \sum_{t=1}^{\infty} \beta^t U(c_t, l_t, g_t^N, g_t^P),$$

Consumption comprises that of a nonprimary tradable good that is both produced domestically and imported, c^T , and a “combined” nontradable good, in turn comprised of a nontradable private good c^N and the public goods provided by the national and provincial governments, g_t^N and g_t^P . Consumer appreciation of the public goods is determined by the parameter π . When $\pi = 1$, public goods are a perfect substitute for the nontradable private good. Private consumption alone is given by the expression $cpri_t \equiv c_t^T + p_t^{N0} c_t^N$

$$U = \frac{\left(c_t - \frac{\gamma_2}{\gamma_4} l^{\gamma_4}\right)^{1-\gamma_1} - 1}{1 - \gamma_1}$$

$$c_t = c_t^{T\gamma_3} (c_t^N + \pi(g_t^N + g_t^P))^{1-\gamma_3}$$

$$0 \leq \pi \leq 1$$

Thus, after paying any interest on their debt $r_{t-1}^d D_{t-1}$, consumers allocate their budget in each period to the purchase of the private tradable good c_t^T , the nontradable good c_t^N , and investment i_t in the accumulation of private capital k_t employed by the representative firm to produce the non-primary tradable good of the economy Y_t^T . This budget consists of their disposable income YD_t and the possibility of borrowing from the international bond market.

For their disposable income YD_t consumers rely on factor income $w_t l_t + r_t k_t$, export revenue from the sale of the primary good $p_t^X x_t$, and transfers from the national and provincial governments T_t^{NC} and T_t^{PC} (e.g., pensions). However, the return to their capital is affected by a depreciation rate δ , and they bear the burden of consumption taxes (by the federal government and the provinces) and import tariffs τ_{cn}, τ_{cp} y τ_m ; social security contributions or other labor income taxes, taxes on capital income, and export taxes τ_w, τ_k y τ_x ; and other national and provincial taxes not included in the other groups, such as property taxes, the financial transactions tax, etcetera TA_t^N y TA_t^P . This results in the following budget restriction:

$$p_t^T c_t^T + p_t^N c_t^N + i_t + r_{t-1}^d D_{t-1} = YD_t + (D_t - D_{t-1})$$

$$YD_t = (1 - \tau_w)w_t l_t + r_t k_t - \tau_k(r_t - \delta)k_t + p_t^X x_t + T_t^{NC} + T_t^{PC} - TA_t^N - TA_t^P$$

where market prices reflect the impact of taxes as follows:

$$p_t^T = (1 + \tau_{cn} + \tau_{cp})(1 + \tau_m)$$

$$p_t^N = (1 + \tau_{cn} + \tau_{cp})p_t^{N0}$$

$$p_t^X = (1 - \tau_x)p_t^{*X}$$

and where the value τ_m , which we assume constant for simplicity, stems from applying the import tax to the share of the tradable good consumption that is imported.

We model direct taxes as a function of the gap between disposable income and its long-term level, reflecting the fact that tax compliance varies with the economic cycle:

$$TA_t^N = q_N yd_t^{\gamma_N}$$

$$TA_t^P = q_P yd_t^{\gamma_P}$$

where:

$$yd_t \equiv \frac{YD_t}{\overline{YD}}$$

Finally, investment has adjustment costs to reduce the volatility that would otherwise take place.

$$k_{t+1} = (1 - \delta)k_t + i_t - \frac{\varphi}{2} \left(\frac{k_{t+1} - k_t}{k_t} \right)^2$$

Non-Ricardian Consumers

Non-Ricardian consumers face the same utility function but a different budget restriction because they cannot accumulate assets or get export revenue:

$$p_t^T c_t^T + p_t^N c_t^N = (1 - \tau_w) w_t l_t + T_t^{NC} + T_t^{PC} - TA_t^N - TA_t^P$$

Production

We model the domestic production of the nonprimary tradable good in the following way:

$$Y_t^T = A_t^T f(k_t^{GN}, k_t^{GP}, k_t, L_t^T)$$

$$Y_t^T = A_t^T k_t^{\alpha_1} k_t^{GN\alpha_2} k_t^{GP\alpha_3} l_t^{T(1-\alpha_1)}$$

where the parameter A^T allows us to reflect shocks to the production possibility frontier (productivity, institutional, etc.)¹; and where national and provincial public capital k^{GN} and k^{GP} represent public infrastructure. They are accumulated in this way:

$$k_{t+1}^{GN} = (1 - \delta_N) k_t^{GN} + i_t^N - \frac{\varphi^{GN}}{2} \left(\frac{k_{t+1}^{GN} - k_t^{GN}}{k_t^{GN}} \right)^2$$

$$k_{t+1}^{GP} = (1 - \delta_P) k_t^{GP} + i_t^P - \frac{\varphi^{GP}}{2} \left(\frac{k_{t+1}^{GP} - k_t^{GP}}{k_t^{GP}} \right)^2$$

The production of exports is exogenous, to focus on those primary products whose production is quite inelastic:

$$x_t = \bar{x}$$

Nontradable goods (private and public) employ only workers that are paid the market wage w in their production process:

$$Y_t^N = A^N L_t^N$$

$$g_t^{GN} = A^{GN} L_t^{GN}$$

$$g_t^{GP} = A^{GP} L_t^{GP}$$

¹Even though we consider an endogenous growth model for the determination of the binding constraints on growth, this complication is unnecessary to assess the impact of the fiscal rule on the volatility of the macro variables of interest.

Governments

To reflect Argentina's fiscal federalism structure, there are two levels of government and a complex revenue-sharing scheme, or co-participation. The national government collects revenue, of which a fraction $1-a$ must be shared with the provinces or coparticipables RC and revenue that it gets to keep for itself or no coparticipables, Rn :

$$RC_t = \tau_{cn}(1 + \tau_m)c_t^T + \tau_{cn}p_t^N c_t^N + \tau_k(r_t - \delta)k_t$$

$$RnC_t = \tau_m c_t^T + \tau_x p_t^X x_t + \tau_w \square_t l_t + TA_t^N$$

Meanwhile, the provinces collect the following taxes, in addition to receiving discretionary transfers from the national government:

$$RP_t = \tau_{cp}(1 + \tau_m)c_t^T + \tau_{cp}p_t^N c_t^N + TA_t^P$$

As a result, the total resources RT for each level of government are:

$$RT_t^N = aRC_t + RnC_t$$

$$RT_t^P = (1 - a)RC_t + RP_t + T_t^{NP}$$

In a scenario without fiscal rule, we assume that governments spend all their income. The stock of public debt remains constant (full roll-over of the principal) and interests are exogenous for the government.

$$GP_t^N \equiv RT_t^N - SP_t^N = RT_t^N - r_{t-1}^d \bar{D}^N$$

$$GP_t^P \equiv RT_t^P - SP_t^P = RT_t^P - r_{t-1}^d \bar{D}^P$$

Now, to determine the evolution of government spending, one should establish an objective function that captures stylized facts. However, to make the model more manageable from a computational standpoint, we established parametric behavior rules.

Regarding the national government, the components of spending comprise the provision of the public good, discretionary transfers to the provinces, transfers to consumers, and public investment. Spending on the public good and on transfers is proportionate to total revenue. Spending on the public good is also a function of the ratio of actual versus long-term revenue, with elasticity γ_{GN} lower than 1 and subject to a shock sn_t . Investment is obtained as a residual.

$$GP_t^N \equiv g_t^N + i_t^N + T_t^{NP} + T_t^{NC}$$

$$\begin{aligned}
g_t^N &= b_{GN} \overline{RT}^N \left(\frac{RT_t^N}{\overline{RT}^N} \right)^{\gamma_{GN}} sn_t \\
T_t^{NP} &= b_{GNP} RT_t^N \\
T_t^{NC} &= b_{GNC} RT_t^N \\
i_t^N &= RT_t^N - g_t^N - T_t^{NP} - T_t^{NC} - r_{t-1}^d \overline{D}^N \\
0 &< b_{GN}, b_{GNP}, b_{GNC} < 1
\end{aligned}$$

We establish similar rules of thumbs to model provincial spending:

$$\begin{aligned}
GP_t^P &\equiv g_t^P + i_t^P + T_t^{PC} \\
g_t^P &= b_{GP} \overline{RT}^P \left(\frac{RT_t^P}{\overline{RT}^P} \right)^{\gamma_{GP}} sp_t \\
T_t^{PC} &= b_{GPC} RT_t^P \\
i_t^P &= RT_t^P - g_t^P - T_t^{PC} - r_{t-1}^d \overline{D}^P \\
0 &< b_{GP}, b_{GPC} < 1
\end{aligned}$$

Fiscal Rule

When subject to a fiscal rule, the federal government estimates its structural revenue RNE_t^N as a function of potential GDP, long-term prices, and neutral interest rates. Then, it sets its target spending TS_t^N in the following way:

$$TS_t^N \equiv \bar{g}^N pib_t^{\varphi_g} + \bar{i}^N pib_t^{\varphi_i} + \bar{T}^{NP} pib_t^{\varphi_{TP}} + \bar{T}^{NC} pib_t^{\varphi_{TC}} + r_t^d \overline{D}^N$$

where:

$$pib_t \equiv \frac{PIB_t}{\overline{PIB}}$$

where the parameter φ determines the degree of cyclicity of each component of government spending. Note that, when $\varphi = 0$, the rule is in fact a-cyclical, as TS_t^N would equal structural national revenue RNE_t^N in each period. The difference between actual and structural revenue determines the evolution of the countercyclical fund:

$$dFA_t = RT_t^N - TS_t^N$$

$$FA_{t+1} = (1 + r_t^*)FA_t + dFA_t$$

Two small modifications allow us to explore the rule variants. First, to extend the rule to the provinces, the revenue-sharing scheme was modified to make the automatic transfers to the provinces a function of structural (as opposed to actual) RC_t . We did not assume that the provinces would implement individual rules to stabilize RP_t .

$$\begin{aligned} RT_t^P &= (1 - a)RCE_t + RP_t + T_t^{NP} \\ dFA_t &= (RT_t^N - TS_t^N) + (1 - a)(RC_t - RCE_t) \end{aligned}$$

Second, to make the rule sensitive to the cycle as opposed to a-cyclical, we set one or several of the parameters $\varphi \neq 0$ in the above TS_t^N equation. This variant of the rule can allow for some stabilization of provincial revenue through discretionary transfers by properly establishing the value of φ_{TP} . It also allowed us to search for each optimal φ_i before each type of shock facing the economy, which we did in a separate exercise. Note that when altering the value of any φ_i , TS_t^N may be different from RNE_t^N in each period, but it still needs to equal RNE_t^N on average.

Shocks

Fiscal policy is subject to shocks, according to:

$$\log(sn_{t+1}) = \rho_{gn}\log(sn_t) + \varepsilon_t^{GN}$$

The price of the primary export good behaves in the following way:

$$\log(p_t^{*X}) = \rho_{px}\log(p_{t-1}^{*X}) + \varepsilon_t^{px}$$

The shocks to the production possibility frontier are:

$$\log(A_{t+1}^T) = \rho_A\log(A_t^T) + \varepsilon_t^A$$

And we assumed that the international interest rate evolves according to:

$$\begin{aligned} r_t^D &= r^* + \theta(e^{(D_t - \bar{D})} - 1) + e^{(v_t - 1)} - 1 \\ \log(v_t) &= \rho_r\log(v_{t-1}) + \varepsilon_t^r \end{aligned}$$

The effective interest rate prevailing in the small open economy is affected by a risk premium θ , which depends on the level of debt, as well as a shock v . In all the stochastic processes employed in the model, we assumed $0 < \rho < 1$ with ε_t being white noise.

Equilibrium

In equilibrium, this is true for factor and production markets:

$$\begin{aligned} K_t &= k_t \\ L_t &= l_t^N + l_t^T + l_t^{GN} + l_t^{GP} \\ PIB_t &\equiv Y_t^T + p_t^{*X} x_t + p_t^{N0} (Y_t^N + g_t^{GN} + g_t^{GP}) \\ Y_t^N &= c_t^N \\ Y_t^T + M_t &= c_t^T + i_t + i_t^N + i_t^P + S_t \end{aligned}$$

where M_t are imports and S_t is the debt service, which must be paid in units of the tradable good:

$$S_t \equiv r_{t-1}^d D_{t-1} + r_{t-1}^d \bar{D}^N + r_{t-1}^d \bar{D}^P$$

The trade balance is:

$$TB_t \equiv p_t^{*X} x_t - M_t$$

And the current account is:

$$CC_t \equiv TB_t + S_t$$

Model Calibration

We simulated the model on an annual basis. To estimate its parameters, we relied on the available empirical literature as well as our own calculations, especially for fiscal variables. To this end we used data series from MECON and, when needed, IERAL's 2011 estimations. For tax rates we simply took the effective rate average for the period 2007–11. For the elasticities of national and provincial public consumption with respect to disposable income, we ran a least squares regression on views for the period 1993–2011. We used the same period and methodology to estimate the parameters associated with the shocks to public expenditures and export prices.

Preference parameters

For the β , γ_1 and γ_4 values, we relied on García-Cicco, Pancrazi, and Uribe (2010). Following their approach, we set γ_2 such that the fraction of time allocated to work turns out 20 percent in steady state. Following Burstein, Eichenbaum, and Rebelo (2005), we set γ_3 —a parameter that reflects the share of tradable goods in aggregate consumption—at 0.5. For π —the parameter that accounts for the substitutability between private and public consumption—we assumed a value of 0.5, broadly in line with the value estimated by Bergoeing and Soto (2005) for Chile (0.45).²

Table 3: Calibration of the Preference Parameters

β	Discount factor	0.9224
γ_1	Utility curvature	2
γ_2	Labor weight	0.44
γ_3	Tradable consumption share	0.5
γ_4	Labor curvature	1.6
π	Value of public consumption in the utility function	0.5

Source: IERAL of the Mediterranean Foundation.

Technological Parameters

The productivity parameter of the tradable good A^T can be thought of as a scale factor with a value of 1. We set the productivity parameters of the nontradable goods A^N , A^{GN} , and A^{GP} at 0.8, adjusting this value to reflect the country's productive structure and assuming equal productivity in the public and private nontradable sectors.

We followed García-Cicco, Pancrazi, and Uribe (2010) to set the share of private capital in the production of tradable goods α_1 . Meanwhile, the shares of national and provincial public capital in this production α_2 and α_3 varied significantly in the literature, from zero to values close to that of α_1 (e.g., Guo and Lansing, 1997). We assumed a value of 0.03 in both cases.

Regarding the rates of depreciation, we assumed a value of 0.10 for that of private capital δ and 0.05 for the case of public capital δ_N and δ_P . This reflects the prevalence of construction among public capital investments.

² If > 0 , government consumption substitutes for private consumption, with perfect substitution if $= 1$, as in Christiano and Eichenbaum (1992).

Finally, we set the adjustment cost of private capital at 0.5291. In the context of an open economy and in the absence of other restrictions, this value is typically adjusted to avoid excessive investment volatility. The specific value we assumed allows the model to replicate the volatility of investment relative to GDP observed empirically. We assumed the adjustment costs of public capital φ^{GP} and φ^{GN} to be zero.

Table 4: Calibration of the Technological Parameters

A^T	Tradable productivity factor	1
A^N	Nontradable productivity factor	0.8
A^{GN}	Federal public good productivity factor	0.8
A^{GN}	Local public good productivity factor	0.8
α_1	Private capital exponent	0.32
α_2	Federal public capital exponent	0.03
α_3	Local public capital exponent	0.03
δ	Depreciation rate (private capital)	0.09
δ_N	Depreciation rate (federal public capital)	0.05
δ_p	Depreciation rate (local public capital)	0.05
φ	Adjustment cost (private capital)	0.5291
φ^{GN}	Adjustment cost (federal public capital)	0
φ^{GP}	Adjustment cost (local public capital)	0

Source: IERAL of the Mediterranean Foundation

Fiscal Parameters

We estimated tax rates $\tau_{cn}, \tau_{cp}, \tau_m, \tau_x, \tau_k, \tau_l$ as the effective tax rates of the economy in the period 2007–2011. We focused on the relatively recent past to reflect the substantial changes observed in the Argentine tax structure. The parameters reflecting the share of the remainder of taxes, q_N and q_P , and their respective elasticities, γ_N and γ_P , were based on the period 1993–2011. (For this and similar calculations, we cleaned for the trend through a Hodrick-Prescott filter.) Finally we set α —the share of the federal government in the revenue that is coparticipables—at 0.4, based on the 2007–11 average.

Table 5: Calibration of the Fiscal Parameters

τ_{cn}	Consumption effective tax rate (federal)	0.137
τ_{cp}	Consumption effective tax rate (local)	0.059
τ_m	Imports effective tax rate	0.014
τ_x	Exports effective tax rate	0.131
τ_k	Capital effective tax rate	0.151
τ_l	Labor effective tax rate	0.107
q_N/PIB	Rest of taxes (federal)	0.0398
q_P/PIB	Rest of taxes (local)	0.0121
γ_N	Elasticity – federal rest of taxes	1.6
γ_P	Elasticity – local rest of taxes	1.4
a	Share of the co-participation (federal)	0.40
b_{GN}	Share of federal public consumption	0.269
b_{GNP}	Share of federal transfers to local governments	0.102
b_{GNC}	Share of federal transfers to consumers	0.510
b_{GP}	Share of local public consumption	0.744
b_{GPC}	Share of local transfers to consumers	0.104
γ_{GN}	Elasticity – federal public consumption	0.66
γ_{GP}	Elasticity – local public consumption	0.76

Source: IERAL of the Mediterranean Foundation.

We calibrated the parameters to reflect the breakdown of national and provincial spending b_{GN} , b_{GNP} , b_{GNC} , b_{GP} and b_{GPC} to match the actual breakdown observed in 2007–11. We estimated the elasticities of national and provincial public consumption with respect to disposable income γ_{GN} and γ_{GP} for 1993–2011.

Other Parameters

We set the value of private and public external debt D , \bar{D}^N and \bar{D}^P to reflect the average interest payments (as a percentage of GDP) made in 2007–11. This calculation was also a function of the international interest rate of the model. We took the debt risk premium θ from García-Cicco, Pancrazi, and Uribe (2010). Following Galí, López-Salido, and Vallés (2007), we assumed the share of Ricardian agents in the economy ω at 0.5 (Céspedes, Fornero, and Galí, 2012).

Shock Parameters

We took those parameters associated with productivity shocks from García-Cicco, Pancrazi, and Uribe (2010) and those associated with the interest rate shocks from Neumeyer and Perri

(2005). We estimated the parameters associated with the shocks to public expenditures and export prices based on the period 1993–2011. For the latter, we relied on the terms-of-trade series, as imports in our model have the same price as the numéraire.

Table 6: Calibration of Other Parameters

\bar{x}/PIB	Exports	0.20
D/PIB	Private external debt	0.0861
\bar{D}^N/PIB	Federal public external debt	0.0905
\bar{D}^P/PIB	Local public external debt	0.0097
θ	Debt risk premium	2.8
ω	Share of Ricardian consumers	0.5

Source: IERAL of the Mediterranean Foundation.

Table 7: Calibration of Shock Parameters

ρ_A	Serial correlation of the technology shock	0.87
ρ_{px}	Serial correlation of the export price shock	0.78
ρ_r	Serial correlation of the interest rate shock	0.81
ρ_{GN}	Serial correlation of federal public consumption shock	0.28
ρ_{GP}	Serial correlation of local public consumption shock	0.58
σ_A	Standard deviation of the technology shock	0.033
σ_{px}	Standard deviation of the export price shock	0.11
σ_r	Standard deviation of the interest rate shock	0.0063
σ_{GN}	Standard deviation of federal public consumption shock	0.055
σ_{GP}	Standard deviation of local public consumption shock	0.053

Source: IERAL of the Mediterranean Foundation.

Table 8: Calibration of the Fiscal Rule Parameters

φ_g	Elasticity of public consumption	0
φ_i	Elasticity of public investment	0
φ_{TP}	Elasticity of the transfers to the provinces	0
φ_{TC}	Elasticity of the transfers to the consumers	0
\bar{g}^N	Public consumption (federal)*	
\bar{i}^N	Public investment (federal)*	
\bar{T}^{NP}	Transfers to the provinces*	
\bar{T}^{NC}	Transfers to the consumers*	

* Set to match the case without fiscal rule.

Source: IERAL of the Mediterranean Foundation.

Fiscal Rule Parameters

Finally, when introducing the fiscal rule, we considered the variant a, implying a full stabilization of federal public spending. We set the spending breakdown \bar{g}^N , \bar{i}^N , \bar{T}^{NP} and \bar{T}^{NC} to match the case without the fiscal rule, and we set the elasticities of the federal spending components to the cycle φ_g , φ_i , φ_{TP} , φ_{TC} equal to zero. We evaluated the effects of modifying the value of these elasticities in response to different shocks in a separate exercise.

Model Solution

The model's complexity and its dynamic nature call for a computational solution. We use MATLAB and Dynare (which computes approximated decision rules and transition equations by a perturbation method—Juillard, 1996; Collard and Juillard, 2001) to compute the model's steady state and impulse responses, as well as to simulate the model's second moments. Tables 9 to 11 compare the second moments generated by the model with those observed in the period 1993–2011. To perform this comparison, we applied a Hodrick-Prescott filter to the series in log form (except for the ratio of trade to GDP).

Table 9: Volatility

Variable	Volatility		Volatility to output		relative
	Observed	Model	Observed	Model	
GDP	0.0640	0.0428	1.0000	1.0000	
Private consumption	0.0716	0.0359	1.1190	0.8390	
Private investment	0.1888	0.1264	2.9517	2.9519	
Imports	0.2349	0.1219	3.6737	2.8465	
Trade balance/GDP	0.0333	0.0070	0.5203	0.8195	
Federal tax revenues	0.0963	0.0479	1.5061	1.1194	
Local tax revenues	0.1024	0.0406	1.6009	0.9477	
Federal primary spending	0.0815	0.0507	1.2747	1.1836	
Federal public consumption	0.0624	0.0602	0.9753	1.4053	
Federal transfers to the provinces	0.1597	0.0479	2.4969	1.1194	
Federal transfers to the private sector	0.1106	0.0479	1.7291	1.1194	
Federal public investment	0.3861	0.3871	6.0367	9.0384	
Local primary spending	0.0660	0.0409	1.0314	0.9552	
Local public consumption	0.0427	0.0608	0.6680	1.4187	
Local transfers to the private sector	0.0921	0.0406	1.4396	0.9477	
Local public investment	0.2570	0.4764	4.0180	11.1234	

Source: IERAL of the Mediterranean Foundation.

As shown in Table 9, simulated GDP volatility is lower than in reality, reflecting the fact that the model is obviously a simplification, not receiving supply shocks to output, for example. Simulated consumption is slightly smoother than output, in contrast with observed data, which shows consumption is more volatile than output. Investment is roughly three times more volatile than GDP, in line with observed data. Simulated imports are 2.8 times more volatile than GDP versus 3.6 times more volatile in observed data. The ratio of the trade balance-to-GDP is smoother than GDP, as in observed data.

Regarding fiscal variables, the volatility of the model's federal and local revenues falls a little short of that observed in actual data, but the volatility of the model's federal and local primary spending is just below that observed in actual data, which is in turn similar to GDP volatility. The model very successfully replicates the observed volatility of federal public consumption and investment, although it slightly underestimates the volatility of federal transfers—a component greatly affected by discretion. With respect to the components of local public spending, the fit is still good, albeit not as precise.

As shown in Table 10, the correlation of the model's variables with output matches the sign of that observed in the data. In particular, consumption, private investment, and imports are positively and strongly correlated with output (though not as strongly in the case of imports as observed in the data) and the ratio of trade-to-GDP is negatively correlated (though also not nearly as strongly as in the period of comparison).

Regarding the fiscal variables, the model fairly to very well approximates the correlations with GDP observed in reality for federal and local taxes, federal and local primary spending, federal and local public consumption, and federal and local transfers to the private sector. However, it overestimates the correlation with GDP of the federal transfers to the provinces (which is intuitive, as some of these go up in bad times, when there is greater need for support at the provincial level) and underestimates the correlation in the case of public investment.

Table 10: Correlation with Output

Variable	Observed	Model
GDP	1.0000	1.0000
Private consumption	0.9904	0.9904
Private investment	0.9584	0.8943
Imports	0.9633	0.6779
Trade balance/GDP	-0.9048	-0.1345
Federal tax revenues	0.8594	0.9990
Local tax revenues	0.9538	0.9896
Federal primary spending	0.8015	0.9958
Federal public consumption	0.4436	0.5452
Federal transfers to the provinces	0.2842	0.9990
Federal transfers to the private sector	0.7389	0.9990
Federal public investment	0.7636	0.4604
Local primary spending	0.9532	0.9891
Local public consumption	0.8753	0.5540
Local transfers to the private sector	0.8946	0.9896
Local public investment	0.8997	0.2080

Source: IERAL of the Mediterranean Foundation.

Finally, as shown in Table 11, the serial correlations predicted by the model are broadly in line with those observed in actual data, especially for the GDP components and fiscal revenue. If anything, the model seems to underestimate a little of the persistence of GDP, as well as that of most public spending variables (except the federal transfers to the provinces, probably due to their very discretionary nature).

Table 11: Serial Correlation

Variable	Observed	Model
GDP	0.6679	0.4803
Private consumption	0.6429	0.5118
Private investment	0.5551	0.4594
Imports	0.4982	0.5180
Trade balance/GDP	0.4253	0.4165
Federal tax revenues	0.5013	0.4827
Local tax revenues	0.5531	0.5022
Federal primary spending	0.7581	0.4957
Federal public consumption	0.5748	0.1849
Federal transfers to the provinces	0.2899	0.4827
Federal transfers to the private sector	0.7231	0.4827
Federal public investment	0.5271	0.1747
Local primary spending	0.6181	0.5043
Local public consumption	0.5173	0.3509
Local transfers to the private sector	0.6424	0.5022
Local public investment	0.5342	0.2062

Source: IERAL of the Mediterranean Foundation.

Table 12: Other Variables

Variable	Mean	SD	SD/Mean
Consumption of the tradable good by Ricardian consumers	0.1007	0.0131	13.0%
Consumption of the tradable good by non-Ricardian consumers	0.0646	0.0101	15.6%
Consumption of the tradable good	0.0827	0.0115	13.9%
Consumption of the nontradable good by Ricardian consumers	0.1029	0.0050	4.9%
Consumption of the nontradable good by non-Ricardian consumers	0.0602	0.0036	5.9%
Consumption of the nontradable good	0.0815	0.0039	4.7%
Employment of Ricardian consumers	0.2084	0.0150	7.2%
Employment of non-Ricardian consumers	0.2084	0.0150	7.2%
Employment	0.2084	0.0150	7.2%
Tradable output	0.0604	0.0126	20.9%
Nontradable output	0.0833	0.0040	4.8%
Tradable employment	0.0608	0.0080	13.1%
Nontradable employment	0.1042	0.0050	4.8%

Source: IERAL of the Mediterranean Foundation.

The model also allowed us to analyze the cyclical behavior of other variables of interest. As shown in Table 12, the consumption of non-Ricardian consumers is more volatile than that of Ricardian consumers (because it cannot smooth consumption). Similarly, the production of tradable goods and employment in this sector are more volatile than those of the nontradable

private sector. Finally, it is worth noting that the different shocks considered in the model have different relative importance in terms of explaining aggregate fluctuations.

Table 13 shows the variance decomposition of the model's main variables of interest relative to the five shocks considered. We found that productivity and terms-of-trade shocks explain the bulk of the variance in most variables; productivity shocks being more critical for non-Ricardian consumers and terms-of-trade shocks affecting Ricardian consumers (who own the exportable good) relatively more strongly. Productivity shocks explain the bulk of the volatility of tradable output, consumption, and employment, whereas terms-of-trade shocks explain most of the variance of nontradable output (which equals consumption) and nontradable private employment.

Table 13: Variance Decomposition

Variable	ε^A	ε^{px}	ε^r	ε^{GN}	ε^{GP}
GDP	73.2%	26.5%	0.1%	0.0%	0.1%
Tradable output	90.0%	9.5%	0.1%	0.1%	0.3%
Nontradable output	39.5%	58.6%	0.3%	0.3%	1.3%
Consumption of tradable goods (Ricardian)	65.2%	34.5%	0.1%	0.0%	0.2%
Consumption of tradable goods (non-Ricardian)	81.6%	17.7%	0.1%	0.1%	0.5%
Consumption of tradable goods	73.1%	26.5%	0.1%	0.0%	0.3%
Consumption of nontradable goods (Ricardian)	12.5%	84.7%	0.7%	0.4%	1.7%
Consumption of nontradable goods (non-Ricardian)	81.3%	18.1%	0.1%	0.1%	0.5%
Consumption of nontradable goods	39.5%	58.6%	0.3%	0.3%	1.3%
Federal primary spending	69.0%	30.7%	0.1%	0.0%	0.2%
Local primary spending	75.0%	24.8%	0.1%	0.0%	0.1%
Private investment	72.6%	25.8%	1.5%	0.0%	0.1%
Federal public investment	53.2%	32.2%	0.6%	13.8%	0.1%
Local public investment	38.1%	13.0%	0.0%	0.0%	48.8%
Employment in the tradable sector	86.0%	12.5%	0.2%	0.2%	1.1%
Employment in the nontradable private sector	39.5%	58.6%	0.3%	0.3%	1.3%
Employment in the nontradable federal public sector	53.8%	21.7%	0.0%	24.3%	0.1%
Employment in the nontradable local public sector	55.3%	18.0%	0.0%	0.0%	26.7%
Employment	83.6%	16.0%	0.1%	0.0%	0.2%
Total federal taxes	73.4%	26.4%	0.1%	0.0%	0.1%
Total local taxes	75.3%	24.5%	0.1%	0.0%	0.1%
Debt	9.6%	70.6%	18.8%	0.2%	0.9%
Price of the nontradable good	83.6%	16.0%	0.1%	0.0%	0.2%
Wages	83.6%	16.0%	0.1%	0.0%	0.2%
Interest rate	77.4%	21.5%	0.1%	0.1%	0.8%

Source: IERAL of the Mediterranean Foundation.

Public consumption shocks are relatively more important for fiscal variables, their main transmission mechanism to the rest of the economy being investment. Finally, interest rate shocks are relatively less important, except for external debt.

Sensitivity Analysis

We ran a sensitivity analysis to make sure that our results are robust to changes in the values of the calibration parameters. In particular, we considered two parameters that could be somewhat controversial given that the model does not get to replicate the fact that consumption is more volatile than GDP:

- 1) the fraction ω of the population that are Ricardian consumers (with a lower ω we would expect more consumption volatility) and
- 2) the consumer appreciation of public goods, determined by the parameter π (we would expect greater volatility of private consumption, the higher the appreciation of the public good).

Table 14 shows the volatility and the volatility relative to output of several consumption variables in the baseline scenario, a scenario that assumes $\omega = 0.3$ as opposed to $\omega = 0.5$, and a scenario that assumes $\pi = 0.7$ as opposed to $\pi = 0.5$. The results barely change across scenarios.

Table 14: Sensitivity Analysis

Variable	Volatility			Volatility relative to output		
	Base	$\omega = 0.3$	$\pi = 0.7$	Base	$\omega = 0.3$	$\pi = 0.7$
GDP	0.0428	0.0428	0.0425	1.0000	1.0000	1.0000
Private consumption	0.0359	0.0352	0.0354	0.8390	0.8212	0.8328
Consumption of the tradable good by Ricardian consumers	0.0364	0.0345	0.0362	0.8507	0.8063	0.8517
Consumption of the tradable good by non-Ricardian consumers	0.0424	0.0428	0.0427	0.9900	0.9984	1.0061
Consumption of the tradable good	0.0377	0.0371	0.0377	0.8801	0.8660	0.8878
Consumption of the nontradable good by Ricardian consumers	0.0212	0.0240	0.0217	0.4943	0.5596	0.5114
Consumption of the nontradable good by non-Ricardian consumers	0.0156	0.0157	0.0156	0.3650	0.3655	0.3678
Consumption of the nontradable good	0.0166	0.0153	0.0169	0.3880	0.3581	0.3977
Employment of Ricardian consumers	0.0184	0.0185	0.0182	0.4289	0.4326	0.4292
Employment of non-Ricardian consumers	0.0184	0.0185	0.0182	0.4289	0.4326	0.4292
Employment	0.0184	0.0185	0.0182	0.4289	0.4326	0.4292

Source: IERAL of the Mediterranean Foundation.

The Effect of the Rule

Variants a and b

Table 15 compares the variability of the model's variables in the presence of all types of shocks and in the scenarios without the rule, with the a-cyclical rule applied to the federal government, and with the a-cyclical rule extended to stabilize provincial transfers. Our main finding is that the rule would produce a 16.3 percent drop in the variance of GDP. What is more, when extended to the provinces using a modification in the revenue-sharing scheme system, GDP volatility would drop 19.4 percent. Moreover, the rule would result in a substantial drop in the volatility of consumption, especially for non-Ricardian consumers (–32.2 percent for tradable goods and –41.9 percent for nontradable goods), suggesting a probably benign distributional effect. The extension of the rule to the provinces would make this volatility drop even more, especially for the consumption of tradable goods (–37.8 percent). In the same vein, the rule would reduce the volatility of employment by 20.6 percent, and by 24.8 percent when extended to the provinces.

Table 15: All the Shocks

Variable	Standard deviation			Standard deviation change	
	No rule	Fiscal rule	Fiscal rule w/p	Fiscal rule	Fiscal rule w/p
Consumption of tradable goods (Ricardian)	0.013	0.010	0.009	−25.4%	−29.6%
Consumption of tradable goods (non-Ricardian)	0.010	0.007	0.006	−32.2%	−37.8%
Consumption of tradable goods	0.012	0.008	0.008	−28.9%	−33.8%
Consumption of nontradable goods (Ricardian)	0.005	0.005	0.005	−10.9%	−8.8%
Consumption of nontradable goods (non-Ricardian)	0.004	0.002	0.002	−41.9%	−41.3%
Consumption of nontradable goods	0.004	0.003	0.003	−27.1%	−25.0%
Private investment	0.003	0.003	0.003	−5.8%	−6.1%
Federal public investment	0.002	—	—	−100.0%	−100.0%
Local public investment	0.002	0.002	0.001	−16.2%	−26.6%
Federal primary spending	0.006	—	—	−100.0%	−100.0%
Local primary spending	0.004	0.003	0.001	−36.4%	−71.7%
Employment in the tradable sector	0.008	0.008	0.008	7.0%	10.5%
Employment in the nontradable private sector	0.005	0.004	0.004	−27.1%	−25.0%
Employment in the nontradable federal public sector	0.002	—	—	−100.0%	−100.0%
Employment in the nontradable local public sector	0.004	0.003	0.002	−25.4%	−43.7%
Employment	0.015	0.012	0.011	−20.6%	−24.8%
Tradable output	0.013	0.013	0.013	−3.6%	−3.2%
Nontradable output	0.004	0.003	0.003	−27.1%	−25.0%
GDP	0.029	0.024	0.024	−16.3%	−19.4%
Price of the nontradable good	0.075	0.060	0.057	−20.6%	−24.8%
Wages	0.060	0.048	0.045	−20.6%	−24.8%
Interest rate	0.021	0.022	0.022	3.8%	5.5%
Debt	0.005	0.005	0.005	−6.5%	−7.3%
Total federal taxes	0.006	0.005	0.005	−22.0%	−25.4%
Total local taxes	0.004	0.003	0.001	−36.5%	−71.9%

Source: IERAL of the Mediterranean Foundation.

The rule would also result in a slight drop in the volatility of private investment, but above all, elimination of the volatility of federal public investment. Unsurprisingly, extending the rule to the provinces would also bring about a 26.6 percent drop in the volatility of local public investment. Regarding the GDP supply-side breakdown, the rule would be particularly effective to reduce the volatility of nontradable output (−25.0 percent), though not so much that

of tradable output (−3.2 percent), though this result varies in an interesting way when considering the different shocks facing the economy individually.

Table 16 compares the relative effectiveness of the rule at reducing macroeconomic volatility in the presence of productivity and terms-of-trade shocks, which account for the bulk of the volatility observed in the economy. In the presence of either shock, we observed a similar drop in the volatility of GDP when introducing the rule (−15.7 percent in the context of productivity shocks and −18.1 percent in the presence of terms-of-trade shocks). This is also the case when extending the rule to the provinces.

However, in the presence of terms-of-trade shocks, the rule would bring about a more impressive drop in the volatility of non-Ricardian consumption (−45.0 percent for tradable goods and −56.3 percent for nontradable goods), suggesting greater distributional effects of the rule in this context. These drops are 50.9 percent and 56.0 percent, respectively, when extending the rule to the provinces. In the same vein, the rule would attain greater stabilization of employment in this context, with volatility dropping 33.5 percent, and dropping 38.2 percent when extending the rule to the provinces.

In the context of terms-of-trade shocks, the rule would also be more effective at reducing the volatility of tradable output (−28.8 percent in the base case and −30.9 percent when extending the rule to the provinces), which is relevant from a policy perspective because reducing the volatility of the tradable sector can favor structural transformation. In this context, there would also be a slightly more significant drop in the volatility of private investment.

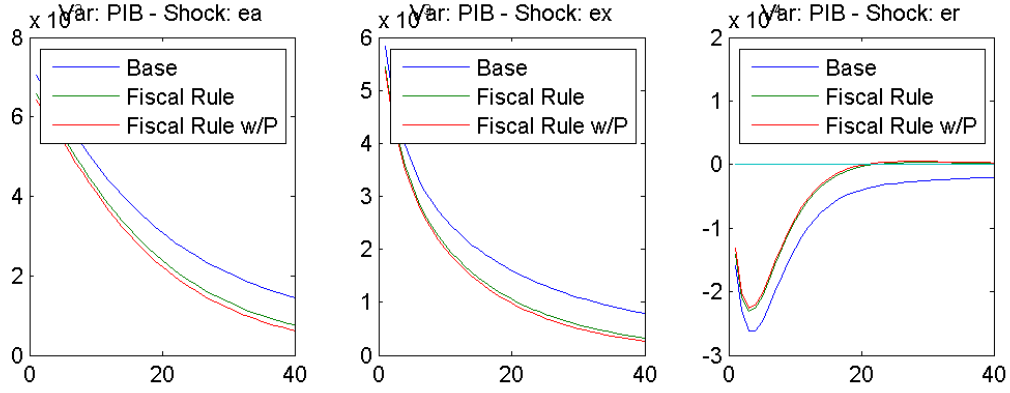
Figure 6 illustrates the response of the GDP to a productivity shock, a terms-of-trade shock, and an interest rate shock. In all three cases the rule favors a quicker return to steady state than the baseline case, which is slightly quicker in the case of the rule extended to the provinces.

Table 16: Individual Shocks

	Productivity shocks			Terms-of-trade shocks		
	SD	Change in SD		SD	Change in SD	
Variable	No rule	Fiscal rule	Fiscal rule w/p	No rule	Fiscal rule	Fiscal rule w/p
Consumption of tradable goods (Ricardian)	0.011	-26.7%	-31.6%	0.008	-23.1%	-26.0%
Consumption of tradable goods (non-Ricardian)	0.009	-29.8%	-35.5%	0.004	-45.0%	-50.9%
Consumption of tradable goods	0.010	-28.2%	-33.4%	0.006	-31.3%	-35.2%
Consumption of nontradable goods (Ricardian)	0.002	-37.8%	-31.7%	0.005	-7.7%	-5.9%
Consumption of nontradable goods (non-Ricardian)	0.003	-39.6%	-38.9%	0.002	-56.3%	-56.0%
Consumption of nontradable goods	0.002	-41.7%	-38.3%	0.003	-19.4%	-17.8%
Private investment	0.002	-4.4%	-4.7%	0.001	-10.2%	-10.4%
Federal public investment	0.001	-100.0%	-100.0%	0.001	-100.0%	-100.0%
Local public investment	0.001	-35.1%	-71.8%	0.001	-39.8%	-69.5%
Federal primary spending	0.005	-100.0%	-100.0%	0.003	-100.0%	-100.0%
Local primary spending	0.004	-35.1%	-72.0%	0.002	-40.6%	-70.9%
Employment in the tradable sector	0.007	11.4%	15.4%	0.003	-27.3%	-29.9%
Employment in the nontradable private sector	0.003	-41.7%	-38.3%	0.004	-19.4%	-17.8%
Employment in the nontradable federal public sector	0.001	-100.0%	-100.0%	0.001	-100.0%	-100.0%
Employment in the nontradable local public sector	0.003	-35.1%	-72.1%	0.001	-41.0%	-71.6%
Employment	0.014	-18.4%	-22.5%	0.006	-33.5%	-38.2%
Tradable output	0.013	-1.3%	-0.7%	0.004	-28.8%	-30.9%
Nontradable output	0.002	-41.7%	-38.3%	0.003	-19.4%	-17.8%
GDP	0.025	-15.7%	-19.0%	0.015	-18.1%	-20.5%
Price of the nontradable good	0.069	-18.4%	-22.5%	0.030	-33.5%	-38.2%
Wages	0.055	-18.4%	-22.5%	0.024	-33.5%	-38.2%
Interest rate	0.018	7.8%	10.3%	0.010	-11.1%	-13.1%
Debt	0.002	-18.9%	-22.7%	0.005	-6.7%	-7.4%
Total federal taxes	0.005	-21.8%	-25.5%	0.003	-22.6%	-25.1%
Total local taxes	0.004	-35.1%	-72.1%	0.002	-41.0%	-71.6%

Source: IERAL of the Mediterranean Foundation.

Figure 6: Impulse Response of the GDP



Beyond the long-term growth benefits that can result from these predicted changes in volatility, using the channels outlined earlier in this paper, the introduction of the rule would have direct effects on welfare. The effects result because the rule reduces the volatility of variables that affect the welfare of the consumer.

We quantified these effects by calculating the “equivalent consumption” (i.e., the change in consumption that would be required to leave the consumer indifferent between the situations with and without the rule). Formally, welfare can be expressed as:³

$$W = E[U]$$

where

$$U = U(c_t^T, c_t^N, l_t, g_t^N, g_t^P)$$

Through a simulation, we verified that:

$$W^{rule} > W^{base}$$

To estimate the equivalent consumption that would leave the consumer indifferent between the situations with and without the rules, we solve for the value of d in the following equations for each type of agent and for each of the rule variants considered in this section:

$$W^{rule} = W^{base'}$$

$$W^{base'} = E[U((1+d)c_t^T, (1+d)c_t^N, l_t, g_t^N, g_t^P)]$$

³ In each case, we simulated 10,000 periods and took the average value of the utility for each type of agent.

Table 17 shows the results. In line with the volatility results, the bulk of the welfare effect on the consumers comes from the rule's variant a, with its extension to the provinces (variant b) contributing an additional effect on welfare. Interestingly, the effect is 2.2 times larger for non-Ricardian consumers, for whom the increase in welfare resulting from the rule is almost equivalent to a 1 percent increase in average consumption.

Table 17: Welfare Analysis (in percent)

	1) Ricardian	2) Non-Ricardian	2/1
a) Fiscal rule	0.36	0.80	223.0
b) Fiscal rule with provinces	0.40	0.89	221.9
a/b	89.5	90.0	

Source: IERAL of the Mediterranean Foundation.

Variant c

The presence of cyclical parameters φ in the federal government's target spending equation allows us to explore variants of the rule that can be sensitive to the cycle. Although a priori one could think the φ parameters should be set to make the rule countercyclical, our model suggests that the convenience of doing so depends on the policy objective as well as the type of shock facing the economy. Tables 18a and b shows what the sign of parameter φ should be to attain a decline in the volatility of each of the variables of interest. We considered all the spending components for which the parameter can be adjusted and all the shocks facing the economy. The analysis shows that, in the presence of all shocks combined, to lower the volatility of GDP, the parameter φ must be negative for any of the public spending components considered, which is intuitive. However, this is not without trade-offs. For example, making public consumption countercyclical would lower GDP volatility but increase the volatility of tradable and nontradable output and employment, nontradable consumption, and private investment. The same thing happens when making transfers to the provinces countercyclical. Making the transfers to the consumer countercyclical would be great for reducing the volatility of consumption, but at the expense of higher volatility in investment and tradable output and employment. Finally, making federal public investment countercyclical appears to effectively reduce the volatility of most variables. These results are a bit puzzling and cast a shadow of

doubt on the merits of adopting countercyclical fiscal policies using most public spending components. In any case, they highlight the need for further research in this area and on the effects of adopting countercyclical tax and spending strategies. This need is even greater in the LAC region as more governments move toward adopting cycle-adjusted fiscal rules.

Table 18a: What the Sign of φ Should Be in Public Consumption and Transfers to Provinces to Lower Volatility

Public spending component:	Public consumption						Transfers to provinces					
Type of shock:	ALL	EA	EX	ER	EGN	EGP	ALL	EA	EX	ER	EGN	EGP
Consumption of tradable goods (Ricardian)	–	–	–	–	–	–	–	–	–	–	–	–
Consumption of tradable goods (non-Ricardian)	–	–	–	–	–	–	–	–	–	–	–	–
Consumption of tradable goods	–	–	–	–	–	–	–	–	–	–	–	–
Consumption of nontradable goods (Ricardian)	+	+	+	–	–	–	+	+	+	–	–	–
Consumption of nontradable goods (non-Ricardian)	+	+	+	+	–	0	+	+	+	+	–	–
Consumption of nontradable goods	+	+	+	–	–	–	+	+	+	–	–	–
Private investment	+	+	+	+	–	+	+	–	+	+	–	+
Federal public investment	–	–	–	–	–	–	–	–	–	–	–	–
Local public investment	–	–	–	–	–	+	–	–	–	–	–	+
Federal primary spending	0	0	0	0	–	0	0	0	0	0	–	0
Local primary spending	–	–	–	–	–	+	–	–	–	–	–	–
Employment in the tradable sector	+	+	+	+	–	+	+	+	+	+	–	+
Employment in the nontradable private sector	+	+	+	–	–	–	+	+	+	–	–	–
Employment in the nontradable federal public sector	0	0	0	0	–	0	–	–	–	–	–	–
Employment in the nontradable local public sector	–	–	–	–	–	–	–	–	–	–	–	–
Employment	–	–	–	–	–	–	–	–	–	–	–	–
Tradable output	+	+	+	+	–	+	+	+	–	+	–	+
Nontradable output	+	+	+	–	–	–	+	+	+	–	–	–
GDP	–	–	–	–	–	+	–	–	–	–	–	–
Price of the nontradable good	–	–	–	–	–	–	–	–	–	–	–	–
Wages	–	–	–	–	–	–	–	–	–	–	–	–
Interest rate	+	+	–	–	–	–	+	+	–	–	–	–
Debt	–	–	–	+	–	–	–	–	+	+	–	–
Total federal taxes	–	–	–	–	–	–	–	–	–	–	–	–
Total local taxes	–	–	–	–	–	+	–	–	–	–	–	–

Source: IERAL of the Mediterranean Foundation.

Notes: ALL = all shocks; EA = productivity shock; EX = Term-of-trade shock; ER = Interest rate shock; EGN = Federal public spending shock; EGP = Local public spending shock.

Table 18b: What the Sign of φ Should be in Transfers to Consumers and Public Investment to lower Volatility

Public spending component:	Transfers to consumers						Public investment					
Type of shock:	AL L	E A	E X	E R	EG N	EG P	AL L	E A	E X	E R	EG N	EG P
Consumption of tradable goods (Ricardian)	–	–	–	–	–	–	–	–	–	+	–	–
Consumption of tradable goods (non-Ricardian)	–	–	–	–	–	–	–	–	–	–	–	–
Consumption of tradable goods	–	–	–	–	–	–	–	–	–	+	–	–
Consumption of nontradable goods (Ricardian)	–	–	–	+	–	+	–	–	+	–	–	–
Consumption of nontradable goods (non-Ricardian)	–	–	–	–	–	+	–	–	–	–	–	–
Consumption of nontradable goods	–	–	–	+	–	+	–	–	–	+	–	–
Private investment	+	–	+	+	–	+	–	–	–	–	–	–
Federal public investment	–	–	–	–	–	–	0	0	0	0	–	0
Local public investment	–	–	–	–	–	+	–	–	–	+	–	+
Federal primary spending	0	0	0	0	–	0	0	0	0	0	–	0
Local primary spending	–	–	–	–	–	–	–	–	–	+	–	–
Employment in the tradable sector	+	+	+	+	–	+	–	–	–	–	–	–
Employment in the nontradable private sector	–	–	–	+	–	+	–	–	–	+	–	–
Employment in the nontradable federal public sector	–	–	–	–	–	–	–	–	–	–	–	–
Employment in the nontradable local public sector	–	–	–	–	–	–	–	–	–	+	–	–
Employment	–	–	–	–	–	–	–	–	–	–	–	–
Tradable output	+	+	+	+	–	+	–	–	–	–	–	–
Nontradable output	–	–	–	+	–	+	–	–	–	+	–	–
GDP	–	–	–	–	–	+	–	–	–	–	–	–
Price of the nontradable good	–	–	–	–	–	–	–	–	–	–	–	–
Wages	–	–	–	–	–	–	–	–	–	–	–	–
Interest rate	+	+	–	–	–	–	–	–	+	+	–	+
Debt	–	–	–	+	–	–	+	+	+	–	–	+
Total federal taxes	–	–	–	–	–	–	–	–	–	–	–	–
Total local taxes	–	–	–	–	–	–	–	–	–	+	–	–

Source: IERAL of the Mediterranean Foundation.

Notes: ALL = all shocks; EA = productivity shock; EX = Term-of-trade shock; ER = Interest rate shock; EGN = Federal public spending shock; EGP = Local public spending shock.

The Rule in Practice

Someone once said that, in theory, there is no difference between theory and practice but, in practice, there is. While we have quantified the theoretical benefits of adopting a cycle-adjusted fiscal rule in Argentina, we recognize that macro-fiscal and distributional implications, political-economy and timing issues, institutional and administrative constraints, and fiscal federalism considerations could compromise the successful implementation of the proposed reform.

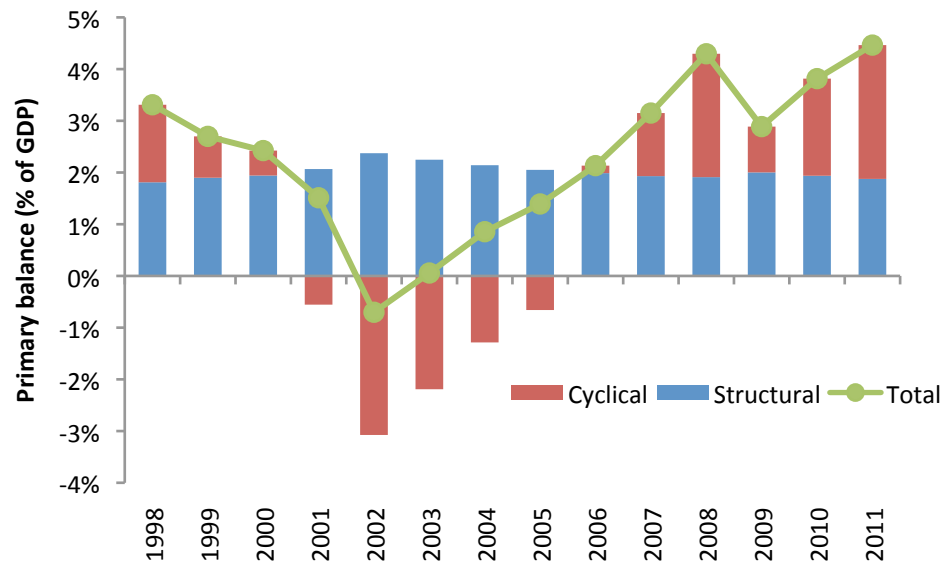
Macro-Fiscal and Distributional Implications

Macroeconomic Effects

Beyond long-term output stabilization, adopting a cycle-adjusted fiscal rule can have meaningful short-term macroeconomic effects because the rule can call for a change in the preexisting fiscal stance in the country in question to make that fiscal stance compatible with the chosen structural balance target. Although the required adjustment would depend on the specific rule adopted and its underlying methodological assumptions, it is safe to say that any reasonable cycle-adjusted rule would call for a significant fiscal contraction in today's Argentina.

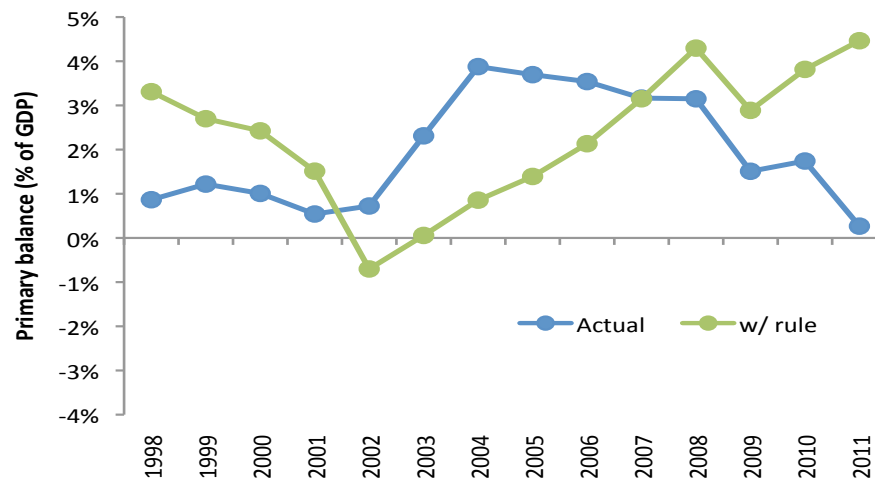
For example, using a specific set of assumptions, Rivas (2011) estimates that Argentina ran a structural public deficit of 2.6 percent of GDP in 2009. In turn, running our own set of simulations and establishing a target for the structural primary surplus at 2 percent of GDP, we found that Argentina should have run a primary surplus of 4.5 percent of GDP in 2011 (as opposed to the observed 0 percent); implying a required adjustment of 4.5pp of GDP!

Figure 7: An Example of a Rule at Work



Source: IERAL of the Mediterranean Foundation.

Figure 8: Primary Balance with and without Rule



Source: IERAL of the Mediterranean Foundation.

Because this level of fiscal adjustment would be very significant (slowing short-term growth, though also containing inflation and boosting the real exchange rate), a cycle-adjusted fiscal rule for Argentina should probably include a transition clause (similar to the one adopted in Colombia) to establish a path for the structural primary balance toward its chosen long-term target surplus.

In turn, following Ter-Minassian (2010), the choice of the target structural surplus should take into account debt sustainability and demographic considerations. Regarding the former, under the simplest debt sustainability framework, the evolution of the debt/GDP ratio is determined by the expression:

$$d\left(\frac{D}{GDP}\right)_t = \left(\frac{D}{GDP}\right)_{t-1} * (r - g)_t - pb_t$$

Where $\frac{D}{GDP}$ is the stock of debt in relation to the size of nominal GDP, r is the real interest rate, g is the real GDP growth rate, and pb is primary balance of the public sector as a share of GDP. Based on this equation, we solved for the required structural primary balance to stabilize or lower Argentina's $\frac{D}{GDP}$ ratio of 43 percent of GDP, assuming long-term GDP growth of 3.5 percent and a range of interest rates (Table 19). In particular, in a scenario of moderate interest rates, the government should run a primary balance of 2.2 percent of GDP to lower the $\frac{D}{GDP}$ ratio by approximately 2pp per year.

Table 19: Debt sustainability scenarios

Scenario	Change in D/GDP (pp)	D/GDP	r	g	pb
1	0.0	43%	10.0%	3.5%	2.8%
2	0.0	43%	4.0%	3.5%	0.2%
3	-2.0	43%	10.0%	3.5%	4.8%
4	-2.0	43%	4.0%	3.5%	2.2%
5	-1.8	43%	4.0%	3.5%	2.0%

Source: IERAL of the Mediterranean Foundation.

Regarding demographic considerations, it is worth noting that Argentina is undergoing a “demographic window of opportunity,” with low and falling dependency ratios expected to bottom in 2032 (Saad, 2011). In general, countries are advised to use this window of opportunity to make long-term investments or to generate savings for the future. This should be particularly the case in Argentina given the reversal to a pay-as-you-go pension system since 2009. Indeed, an aging population typically exerts upward pressure on the public pension and health-care bills, even if there could be reductions in public education expenses (Cotlear, 2011).

Distributional Effects

Aside from macroeconomic effects, implementing a cycle-adjusted fiscal rule would entail positive distributional implications. This is particularly the case when the economy faces terms-of-trade shocks. This makes sense given that the rule should soften the severity of crises, which typically have a disproportionate effect on lower income groups (IDB, 2011). Moreover, such a rule should contribute to the continuity of social policies during downturns, as highlighted by Rodríguez et al. (2006) and Velasco et al. (2010) for the case of Chile.

Political Economy and Timing Issues

Several authors have highlighted the difficulty in reducing fiscal policy procyclicality from a political-economy perspective. Talvi and Végh (2000) highlight that there is political pressure on governments to spend more in times of plenty, leading even optimizing governments to procyclical policy. Alesina and Tabellini (2005) argue that rational voters – concerned about the government’s misuse of resources and poorly informed about economic policy – demand lower taxes or higher spending during good times. Akitoby et al. (2006) also highlight the “voracity effect”, which leads to more-than proportionate increases in spending in response to increases in revenue, as multiple interest groups seek to secure a larger fraction of national wealth for themselves. Commenting on the Colombian case, Wiesner (2010) notes that a basic requirement for a fiscal rule is that there is political demand for macroeconomic stability as well as political support to the policies that pursue it.

In addition to these general political-economy challenges, there are specific features of Argentina’s institutional framework and current juncture that bode ill for the adoption of a

cycle-adjusted fiscal rule. First, the current administration has displayed little attention to compliance with rules and an ostensible preference for discretionary policy-making. Second, the administration's party enjoys a comfortable congressional majority, implying little need to negotiate with the opposition. Finally, implementing fiscal reform that involves provincial governments would require a modification to the federal revenue-sharing scheme, which appears daunting insofar as there has been an unfulfilled constitutional mandate to update this scheme since 1997 (Sturzenegger and Werneck, 2008).

In spite of these challenges, Perry (2002) argues in favor of adopting cycle-adjusted fiscal rules *precisely* to limit the political-economy factors engendering procyclical policies. Regarding the Argentine case, though, it appears very improbable that a window of opportunity to adopt a credible fiscal rule could present itself during the current administration.

Should the conditions for the adoption of a cycle-adjusted fiscal rule present themselves in the future, we believe that including the provinces in the arrangement should not be too problematic. This is mainly because the rule would not involve changes in the distribution coefficients, but merely a calculation of the distributions based on structural (as opposed to actual) revenue. Also, the central government could reassure the provinces by placing any of their accumulated savings in individual accounts under their respective names in the central bank, similar to what was done in Venezuela in 1998. Finally, the central government could explore compensation strategies to get the provinces on board, such as offering to make some of today's huge levels of discretionary transfers automatic.

Potential Institutional and Administrative Constraints

Several studies highlight the importance of underlying institutions for the effectiveness of fiscal reforms (Braun and Gadano, 2007; Gutiérrez and Revilla, 2010; Ter-Minassian, 2010). In particular, Manasse (2006) finds that, although fiscal rules and fiscal responsibility laws tend to reduce procyclical biases, they explain little after controlling for the quality of institutions. Argentina's weak institutions and poor record in complying with fiscal rules (Spiller and Tommasi, 2002; Braun and Gadano, 2007; Tommasi, 2008) speak for a poor institutional context to adopt a cycle-adjusted fiscal rule like the one proposed.

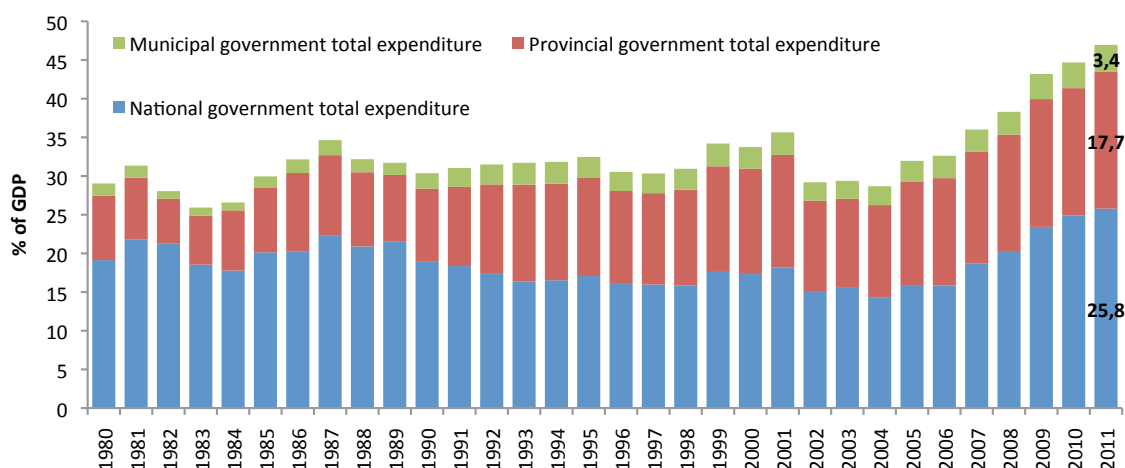
Rivas (2011) concludes this categorically, following the framework outlined in Ter-Minassian (2010). Specifically, he cites pending sovereign debt payments unresolved since the 2001 default, problems with the transparency and credibility of fiscal and inflation statistics, the prevalence of distortive taxes such as those on exports, and a public accounting that does not comply with international methodological criteria. Although these constraints are indisputable, we believe this paper represents a first step toward raising awareness of the benefits of adopting a cycle-adjusted fiscal rule.

From an administrative point of view, on the other hand, the adoption of a cycle-adjusted fiscal rule would be perfectly feasible. Argentina counts on a fairly elevated level of human capital in the public sector as well as one of the most advanced information technologies for the support of public administration in Latin America (Fariás and Pimenta, 2012).

Fiscal Federalism Considerations

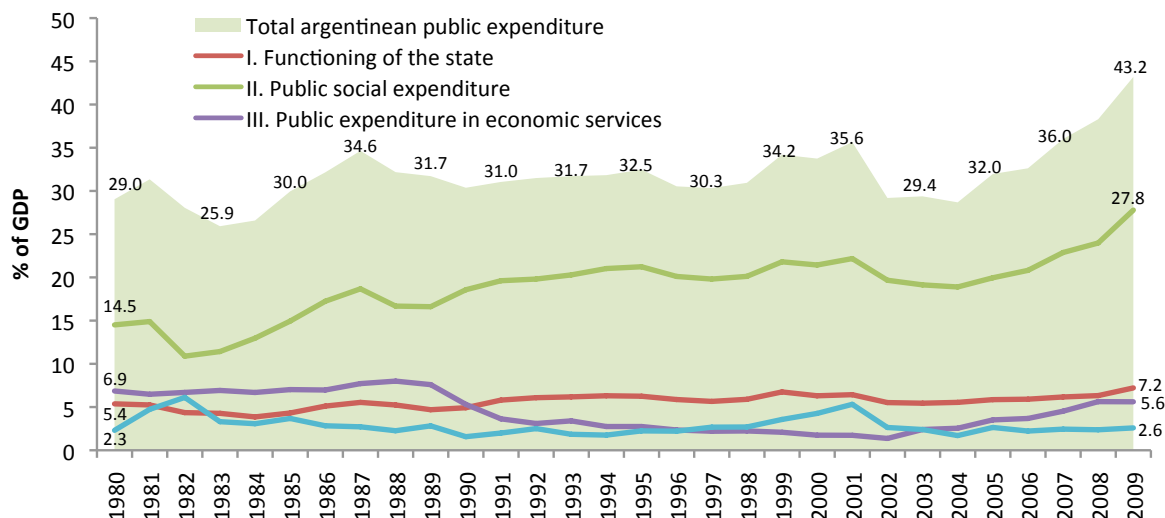
The importance of including subnational governments in the proposed reform cannot be overemphasized. These governments accounted for 45 percent of consolidated public spending in 2009 (38 percent for provinces and 7 percent for municipalities), explaining the bulk of the whopping 14pp-of-GDP expansion of this metric since 1980 (Figure 9). From a functionality standpoint most of this jump is explained by social spending (Figure 10).

Figure 9: Who Spends What?



Source: IERAL of the Mediterranean Foundation.

Figure 10: What do We Spend On?

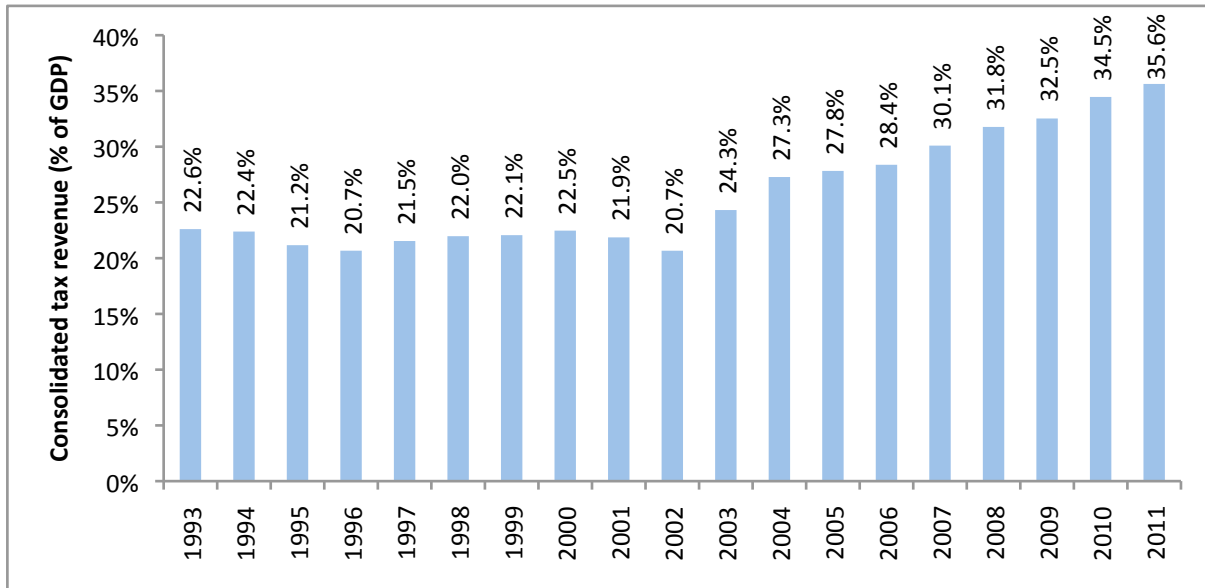


Source: IERAL of the Mediterranean Foundation.

In parallel with this increase in spending there has been a substantial jump in consolidated tax pressure (Figure 11). However, the federal government continues to collect the bulk of tax proceeds and has increased its share since 1980 (Figure 12). This gap means that federal transfers remain a very meaningful part of the total revenue of subnational governments. In particular, in 2009, federal transfers accounted for 61.6 percent of total subnational revenue (Figure 12), reaching over 90 percent in the more dependent provinces (Figure 13). This suggests a non-negligible stabilization potential of consolidated spending through transfers even if (as Sturzenegger and Werneck [2008] warn) procyclicality could persist on the back of the volatility of the provinces' own revenues.

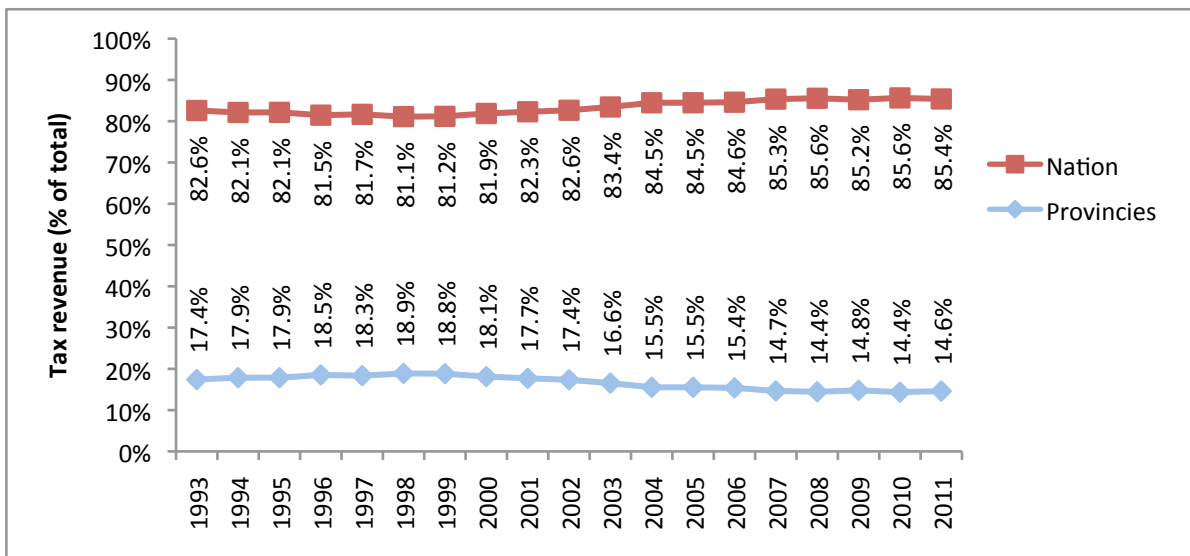
Indeed, the analysis herein shows that stabilizing automatic transfers to the provinces by modifying the revenue-sharing scheme would yield an additional 3.1 percent drop in the volatility of overall GDP. Moreover, it would bring about a 10.4 percent additional drop in the volatility of local public investment.

Figure 11: Consolidated Fiscal Revenue



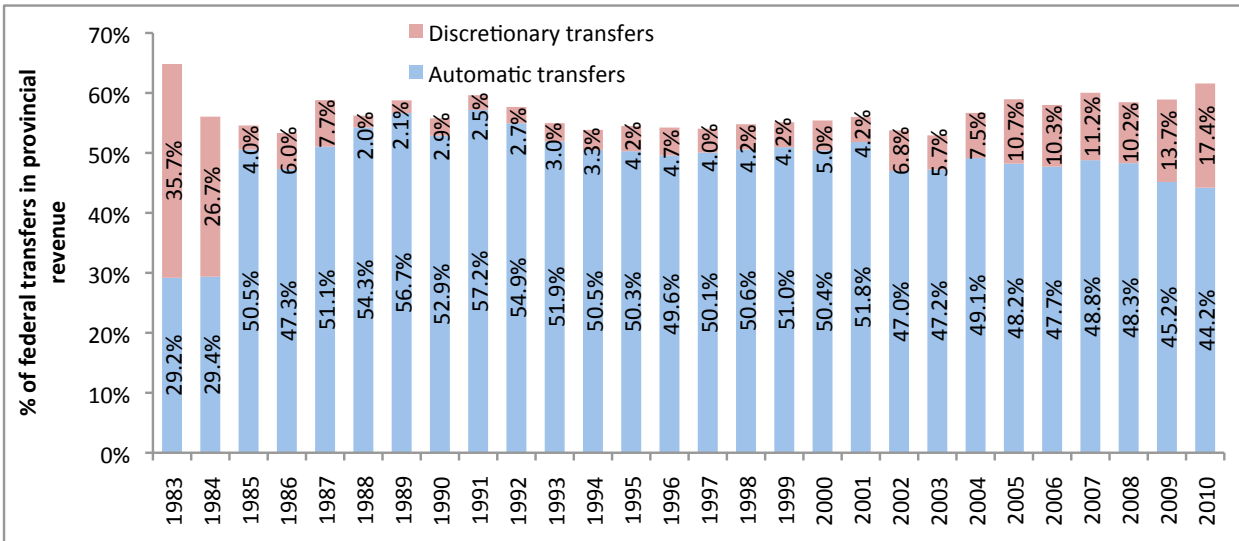
Source: IERAL of the Mediterranean Foundation.

Figure 12: Who Collects What?



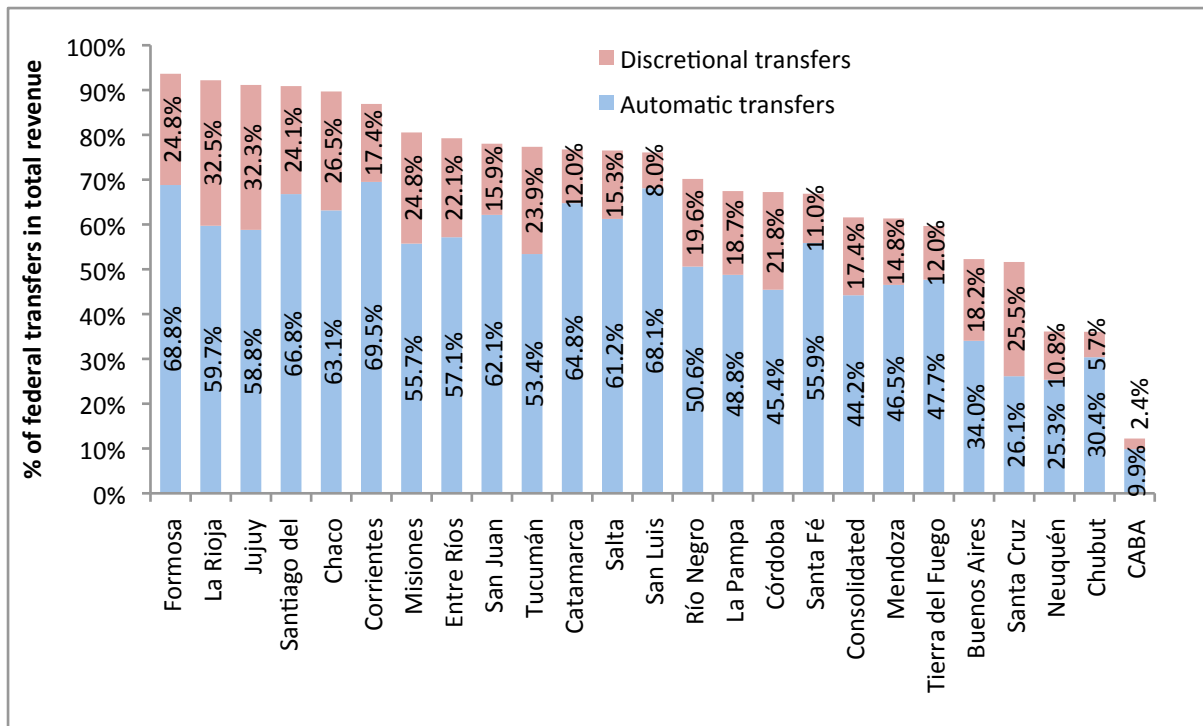
Source: IERAL of the Mediterranean Foundation.

Figure 13: The Origin of Provincial Revenue



Source: IERAL of the Mediterranean Foundation.

Figure 14: Dependency Ratios (2010)



Source: IERAL of the Mediterranean Foundation.

Conclusions

We sought to identify the most promising fiscal strategy to boost sustainable and more equitable economic growth in Argentina. To this end, we updated a growth-diagnostics study for Argentina and corroborated the importance of low appropriability and poor infrastructure as binding constraints on investment. Further we corroborated the importance of low appropriability and other factors as binding constraints on productivity-enhancing activities.

Given the salience of low appropriability among Argentina's binding constraints on growth, and because low appropriability is related to macroeconomic volatility, we proposed a cycle-adjusted fiscal rule as one of the most promising fiscal strategies to boost growth in the country. The abundant literature linking volatility and growth strengthens this case.

Based on the regional experience, we discussed the various design features that a cycle-adjusted fiscal rule could adopt. Then, we constructed and calibrated a DSGE model for Argentina and used it to assess the impact of a cycle-adjusted a-cyclical fiscal rule on the volatility of key macroeconomic variables.

We found that the rule would contribute to reduce the volatility of GDP by 16.3 percent and, when stabilizing automatic transfer to the provinces, by 19.4 percent. There would also be meaningful reductions in the volatility of consumption, especially of non-Ricardian consumers, suggesting benign distributional effects. In the context of terms-of-trade shocks, the rule would also effectively reduce the volatility of tradable output.

Beyond any long-term growth benefits that could result from these drops in volatility (through the channels identified in the literature linking volatility and growth), the rule would have direct effects on welfare because it would reduce the volatility of variables that affect the consumer's welfare directly. We estimate this effect would be 2.2 times larger for non-Ricardian consumers, for whom the increase in welfare resulting from the rule is almost equivalent to a 1 percent increase in average consumption.

We also explored the convenience of making the rule sensitive to the cycle using different spending components. While in the presence of most types of shocks making any spending component countercyclical would result in even greater reductions in GDP volatility, this almost always brings about increases in the volatility of other variables. These results are a

bit puzzling and highlight the need for further research in this area as well as on countercyclical tax policies.

Finally, we discussed the proposed reform's macroeconomic and distributional effects, political-economy factors potentially affecting its design and implementation; potential institutional and administrative constraints on its implementation; and fiscal federalism considerations. Overall, although adopting a cycle-adjusted fiscal rule in Argentina faces limited political viability in the country's current institutional and political context, the paper contributes to raising the visibility of the subject in the current policy debate, highlighting the benefits that such a reform would entail to unleash sustainable and more equitable growth.

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Appendix 1: Growth Diagnostics

Following the approach utilized in Sánchez and Butler (2007) we assess Argentina's comparative standing across three broad areas each representing key “candidate” binding constraints to private investment. These areas are: appropriability issues related to government failures in the form of micro and macro risks; access to finance; and infrastructure. Then, with an endogenous growth model in mind, we turn our attention to assessing the binding constraints to the undertaking of productivity enhancing activities, in particular the structural transformation of exports and innovation activities.

Low Appropriability Due to Government Failures

Relying on various indicators, Sánchez and Butler (2007) found very low appropriability in Argentina, associated with both micro and macro risks preventing firms from making long-term investments in particular. According to our assessment, these risks have become greater since the publication of their work. Evidence of this is provided by Argentina's worsened rankings in institutional indicators from multilateral organizations; a series of contract-violating economic policies over the past few years; and specific indicators speaking for heightened macro risks, such as the appearance of a parallel exchange rate market.

World Bank Governance Indicators (WBGI)

The World Bank Governance Indicators are related to “the respect of citizens and the state for the institutions that govern economic and social interactions” (Kaufmann, 2010). Regarding Rule of Law, Argentina is situated in the percentile 32.7—well below Brazil (55.5) and Chile (87.7), and below Latin American average (52,6). Regarding the control of corruption, it is in the percentile 39,7, compared with Brazil's 59.8, Chile's 90.9, and Latin America's 58.8 average (Table A.1). Moreover, Argentina's current standing has deteriorated from 34.4 in 2005 (the time considered in Sánchez and Butler, 2007), 46.9 in 2000, and 54.5 in 1998.

Table A.1: World Bank Governance Indicators

	WGI: Rule of Law				WGI: Control of Corruption			
	1998	2000	2005	2010	1998	2000	2005	2010
Argentina	55	47	34	33	52	47	42	40
Bolivia	47	40	27	13	51	46	26	38
Brazil	44	44	38	55	60	61	51	60
Chile	84	87	89	88	88	92	91	91
Colombia	22	20	32	45	39	42	52	43
Costa Rica	70	68	64	65	80	78	67	73
Cuba	21	23	17	34	70	72	64	72
Dominican Republic	37	33	31	25	29	31	35	22
Ecuador	33	31	23	12	13	10	28	20
El Salvador	32	29	39	23	24	37	41	51
Honduras	19	19	28	23	22	19	27	21
Mexico	33	39	40	34	40	51	48	44
Paraguay	16	17	15	19	5	3	5	25
Peru	31	30	30	32	49	39	47	50
United Kingdom	96	94	92	95	97	96	95	90
United States	92	93	91	91	92	93	92	86
Uruguay	65	66	61	71	79	77	81	86
Venezuela	22	21	10	1	16	34	18	7
OECD	91	92	90	90	92	92	90	88
Latin America	37	36	34	33	38	40	42	41

Source: World Bank Governance Indicators database.

Economic Freedom Ranking, Heritage Foundation

Among the indicators that are included in the previous two synthetic indexes, the property rights index elaborated by the Heritage Foundation stands out. Argentina scores only 20 out of 100, ranking 143 out of 179 countries, and 10 points lower than in 2005.

Table A.2: Heritage Foundation Property Rights Index

	World rank	Region rank	2012 score	Property rights				Property rank 2012
				1998	2000	2005	2012	
Hong Kong	1	1	89.9	90	90	90	90	2
Australia	3	3	83.1	90	90	90	90	2
Chile	7	1	78.3	90	90	90	90	2
Uruguay	29	3	69.9	70	70	70	70	25
Peru	42	6	68.7	50	50	30	40	72
Mexico	54	3	65.3	50	50	50	50	53
Paraguay	79	15	61.8	30	30	30	30	97
Brazil	99	20	57.9	50	50	50	50	53
Bolivia	146	25	50.2	70	50	30	10	166
Ecuador	156	26	48.3	50	50	30	20	143
Argentina	158	27	48.0	70	70	30	20	143
Venezuela	174	28	38.1	50	50	30	5	178

Source: Heritage Foundation.

In addition, the overall Economic Freedom Index not only highlights Argentina's poor standing across the various categories considered, but also a very elevated volatility in this standing over the past few decades. Tommasi and Spiller (2000) showed this by calculating the variation coefficient of the Economic Freedom Index for 105 countries, as a proxy for policy volatility. According to this metric Argentina was the seventh country with most volatile policies in the period 1970–97, with a variation coefficient of approximately 30 percent compared with one below 10 percent for the world average.

World Economic Forum (WEF) Competitiveness Report

The WEF Competitiveness Report reinforces the case of high microeconomic risks. Although Argentina ranks 87th out of 139 economies in overall competitiveness, it ranks 132nd in institutional environment and 138th in the public trust in politicians (ahead of only Venezuela, alas). Furthermore, within the set of indicators making up the “Rule of Law” category, Argentina ranks 132nd in judicial independence, 121st in the reliability of police, and 116th in

the costs imposed by crime and violence. Summing up, institutional factors are precisely the ones holding back the overall ranking, eclipsing the economy's other strengths and advantages.

The WEF country profile also includes information on the most problematic factors for doing business, based on a WEF survey asking respondents to rank the five most problematic factors in a list of 15. Table A.3 shows the answers for Argentina, highlighting its poor performance across institutional factors, such as policy instability and corruption. Moreover, it also highlights some newly obvious macro risks, such as inflation.

Table A.3: The Most Problematic Factors for Doing Business

Percentage of firms reporting as the most problematic factor	
Factor	%
Policy instability	19.4
Inflation	15.1
Access to financing	13.9
Corruption	12.7
Inefficient government bureaucracy	9.0
Restrictive labor regulations	7.0
Tax regulations	6.4
Tax rates	5.9
Inadequate supply of infrastructure	2.9
Poor work ethic in national labor force	2.7
Government instability/coups	1.6
Crime and theft	1.2
Foreign currency regulations	1.1
Inadequately educated workforce	0.6
Poor public health	0.6

Source: WEF Competitiveness Report 2010–2011.

A News Timeline

In addition to cross-country rankings, the deterioration of the institutional environment since the publication of Sánchez and Butler (2007) is highlighted by a series of controversial measures undertaken by the administration. These include the nationalization of the private pensions system; the attack on central bank independence for the utilization of FX reserves for debt repayment; and the imposition of restrictions on capital and currency markets (Table A.4).

Table A.4: Selected News Timeline

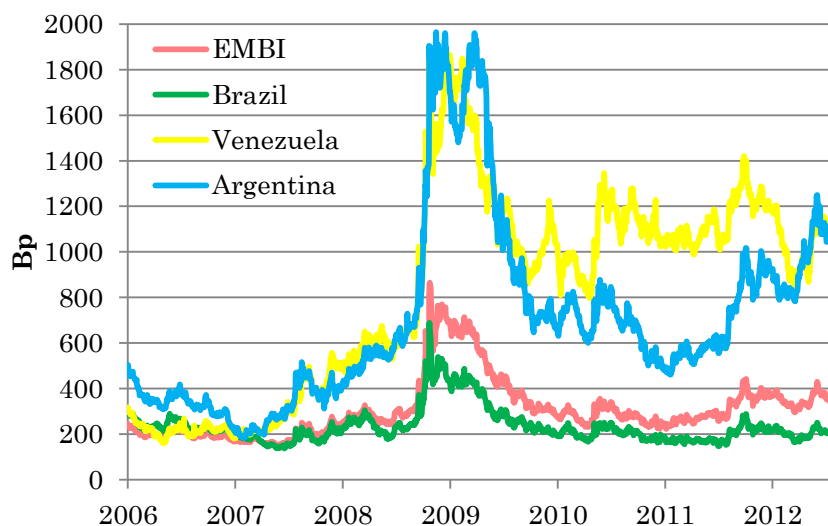
Date	Fact	Description
January 23, 2004	Non-automatic import licensing (LNA)	Some import products were subject to LNA. The number of products increased in 2005, 2007, and 2009.
January 26, 2007	Official Statistics Institute (INDEC) controversy	Dismissal of the Director of Price Statistics, Graciela Bevacqua.
April 9, 2008	Statization of Aerolíneas Argentinas – Austral	By law, the government could bail Aerolíneas Argentinas.
November 20, 2008	Nationalization of AFJP (Private Pension Funds)	The private Pension Funds System was changed into a Public Pension Funds system.
January 8, 2010	BCRA resignation president	Martin Redrado, President of the central bank (BCRA) resigned after refusing to transfer reserves to the Treasury to pay debt.
March 2, 2010	BCRA reserves international	DNU (Decreto de Necesidad y Urgencia) 2010/09 authorized the transfer of USD6.5bn of international reserves to pay debt.
January-May, 2011	Fines to consulting firms	Secretary of Internal Commerce accused consulting firms of providing false information on inflation and applied fines up to ARS500.000.
November 1, 2011	Exchange rate restrictions	Exchange rate purchases have to be authorized by AFIP. Only 40 percent of wages could be used for exchange rate purchases and (reduced to 25 percent in May 2012).
February 1, 2012	Advance imports Affidavit on	All imports must request the approval of an “Advance Affidavit on Imports (DJAI, for its acronym in Spanish).
March 22, 2012	BCRA charter reform	The reform allows the utilization of international reserves by the Treasury.
May 4, 2012	Expropriation of YPF	Expropriation of 51 percent of the shares belonging to the Spanish firm Repsol.
July 5, 2012	Further Exchange rate restrictions	Exchange rate purchases for savings are forbidden. AFIP authorizes purchases only for travel and requires devolution of the currency in case the trip is cancelled.

Source: IERAL of the Mediterranean Foundation, based on news articles and staff compilations.

Country Risk

Country risk (as measured by the Emerging Markets Bond Index sovereign credit spreads) is a further indicator of the micro- and macro-related default risks perceived by financial investors (as well as an indicator of the cost of finance, as elaborated on below). While until the beginning of 2007 Argentina's country risk had approached that of macroeconomically stable emerging markets such as Brazil, that trend reversed since the controversy surrounding INDEC and deepened markedly during the explosion of the 2008–09 global financial crisis, when spreads approached 2000bp. The calming down of global financial markets and some stabilization in domestic policies caused spreads to drop to below 500bp by January 2011 but, since then, Argentina's country risk has decoupled markedly from that of other emerging markets, with a preelection peak of 1018bp on October 3, 2011 and a more recent peak of 1249bp on June 6, 2012, topping that of any other country in the EMBI.

Figure A.1: Soaring Country Risk



Source: Ambito.com.

Depreciation Risks

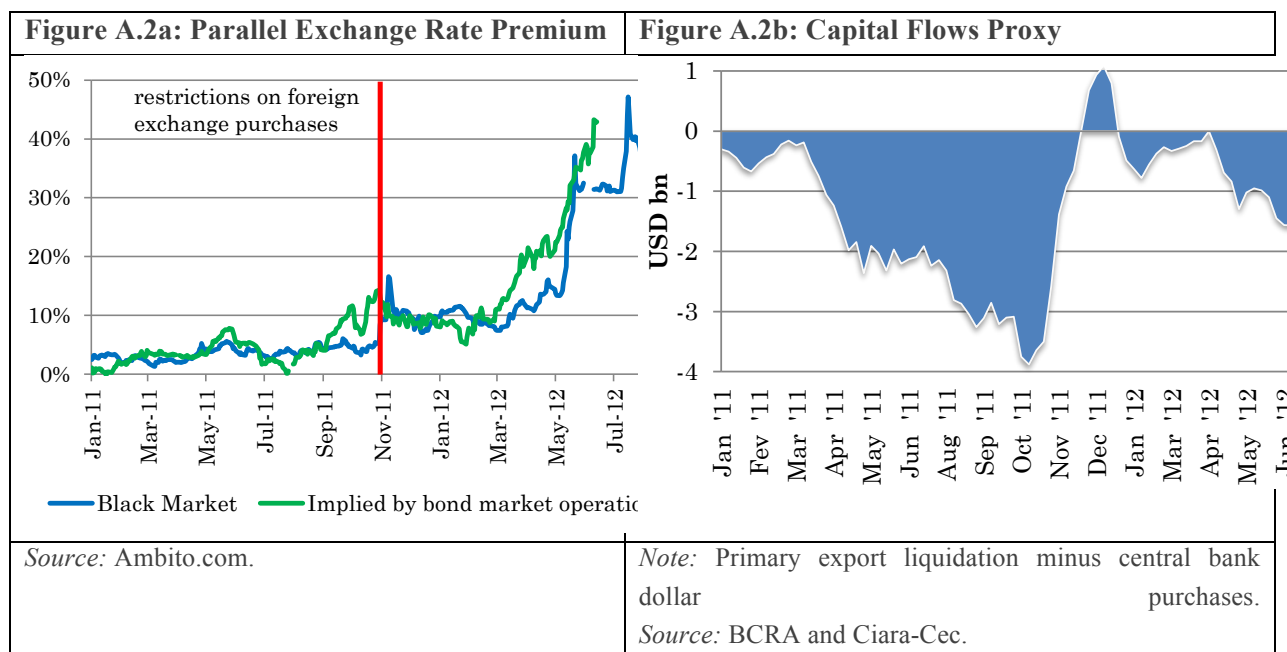
Since the government imposed restrictions on foreign exchange purchases (October 31, 2011) and modified for the second time the charter of the central bank (March 22, 2012), there has been a significant decline in the public's trust in the local currency, manifest in several exchange rate indicators exposing heightened micro- and macro-related appropriability risks.

First, depreciation expectations reflected in 6-month and 12-month forward rates have increased somewhat (Table A.5). Second, the relevance of the official exchange rate market has declined anyway, as evidenced by the shrinkage of traded volumes. Meanwhile, the parallel exchange rate premium has boasted a distinctively upward trend (Figure A.2a). Finally, reinforcing the case of decreased trust in the currency, there has been a jump in capital outflows (Figure 2b) accompanied by increased demand for safety boxes in financial institutions and wait times of up to four years, according to anecdotal evidence. In the same vein, a journalistic article on March 26, 2012 in *El Cronista* reported an increase in the waiting time to purchase home safety boxes.

Table A.5: ARS Spot and Forward Rates

	Spot	Forward		Depreciation rate	
		6 months	12 months	6 months	12 months
Feb-11	4.04	4.21	4.45	4.2%	10.1%
Mar-11	4.06	4.23	4.46	4.2%	9.8%
Apr-11	4.08	4.24	4.48	3.8%	9.8%
May-11	4.11	4.28	4.52	4.1%	10.0%
Jun-11	4.12	4.29	4.54	4.0%	10.2%
Jul-11	4.14	4.32	4.58	4.2%	10.6%
Aug-11	4.18	4.38	4.64	4.8%	11.0%
Sep-11	4.24	4.47	4.79	5.4%	13.0%
Oct-11	4.24	4.46	4.81	5.2%	13.4%
Nov-11	4.27	4.50	4.89	5.5%	14.5%
Dec-11	4.30	4.54	4.92	5.6%	14.4%
Jan-12	4.33	4.52	4.89	4.3%	13.0%
Feb-12	4.36	4.55	4.91	4.3%	12.6%
Mar-12	4.37	4.58	4.92	4.7%	12.7%
Apr-12	4.40	4.63	4.96	5.2%	12.7%
May-12	4.47	4.69	5.07	4.9%	13.4%
Jun-12	4.52	4.90	5.27	8.4%	16.6%
Jul-12	4.58	4.92	5.45	7.3%	19.0%
Aug-12	4.61	5.09	5.64	10.4%	22.3%

Source: Ambito.com.



Finance

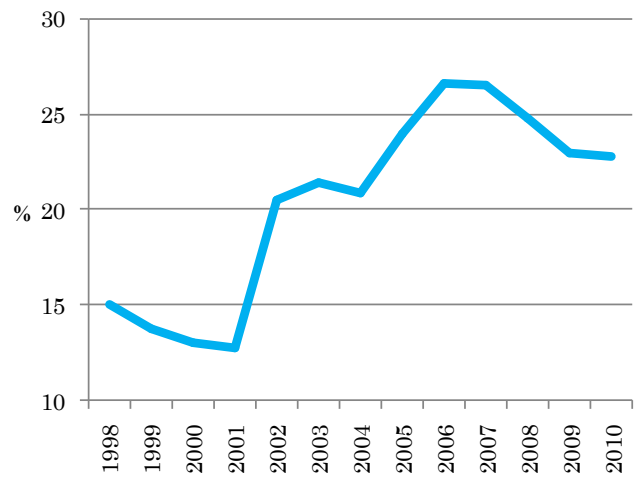
Financing does not appear to be a binding constraint to growth in Argentina. Admittedly, although the saving rate has improved markedly since the past decade, it has declined in the past few years (Figure A.3) and remains fairly modest compared with that of high-growth countries (Figure A.4). This is aggravated by the fact that an important portion of these savings, as mentioned above (Figure A.2b), flees the country. Meanwhile, domestic financial intermediation is limited and access to international finance is constrained and expensive. However, prevailing domestic rates are low to negative in real terms. This suggests that regardless of whether access to finance may seem weak, there is an even weaker *demand* for financing—in our view largely due to the appropriability issues described above.

Indeed, firms in Argentina tend to finance their investment projects with retained earnings, resorting to the financial system to fund mostly only working capital. The is consistent with a rather short sighted investment strategy that hinders growth, yet is not rooted in financial, but rather appropriability, culprits, in our view. Summing up, we agree with the conclusion of Sánchez and Butler (2007) that finance is a “latent” binding constraint, as it could rapidly become binding if appropriability improved and demand for financing increased as a

consequence, although solving appropriability issues might also greatly improve intermediation and access to international finance.

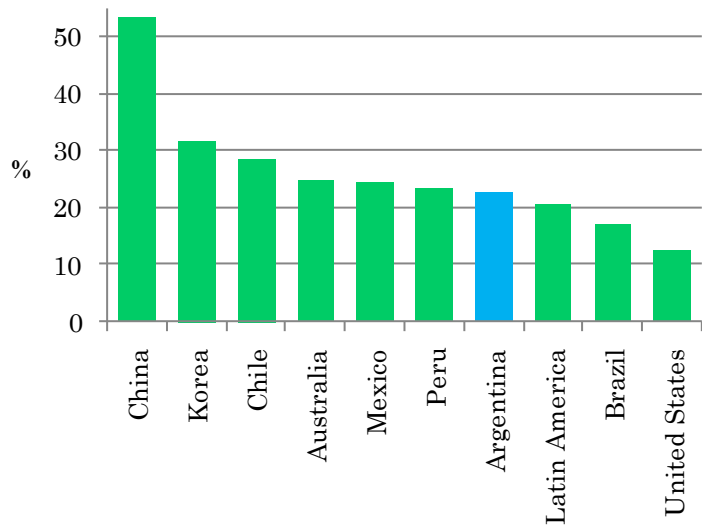
Domestic Savings

Figure A.3: Argentina’s Gross National Savings (% of GDP)



Source: IMF.

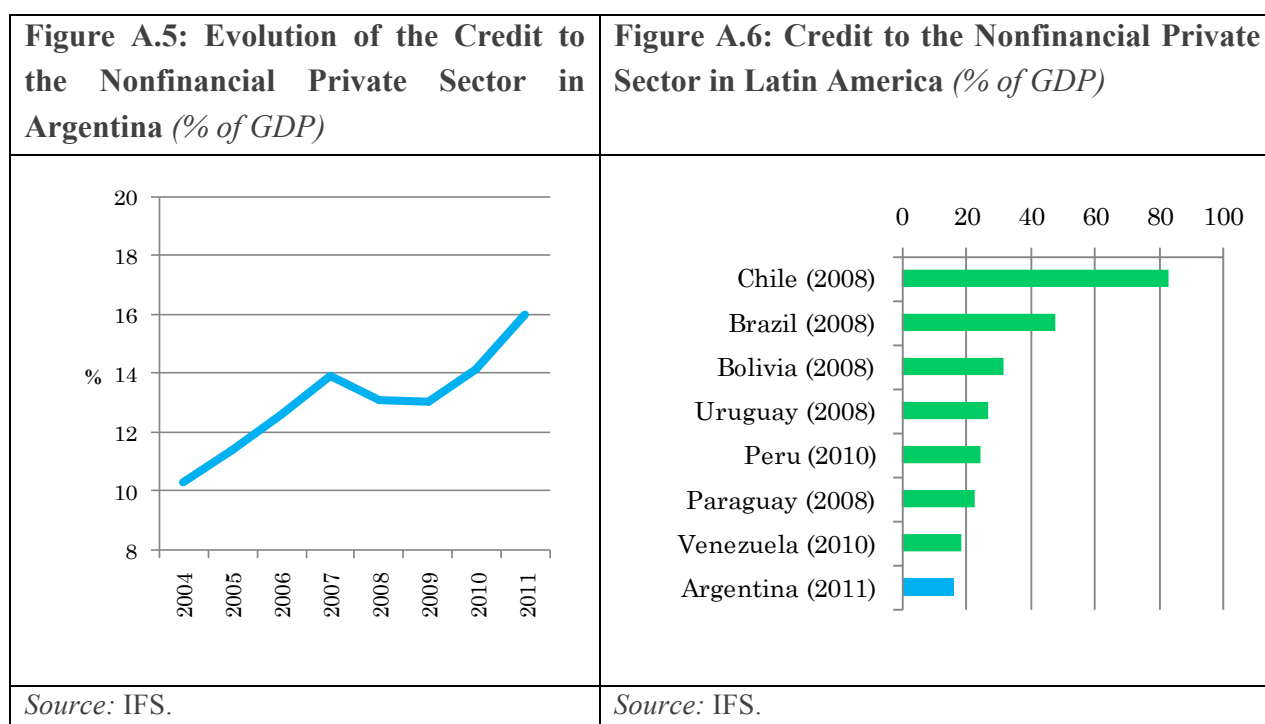
Figure A.4: Gross National Savings, 2010 (% of GDP)



Source: IMF.

Financial Intermediation

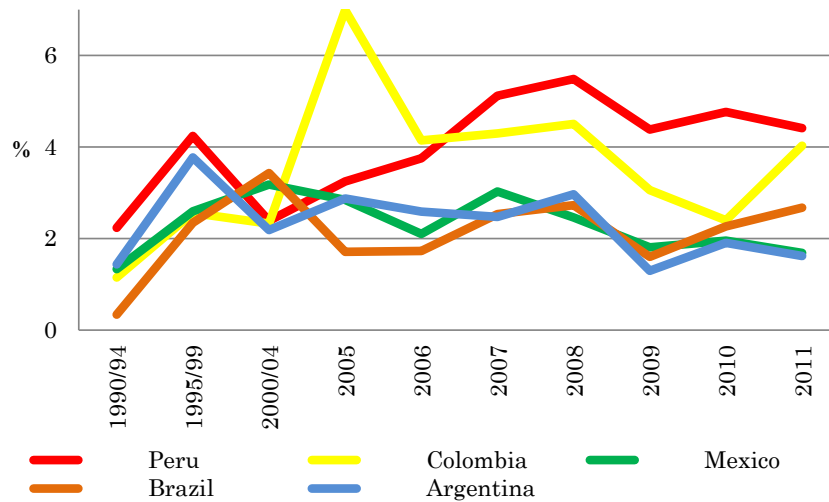
The size of the banking credit to the nonfinancial private sector in Argentina has declined as a percentage of GDP, and is low compared with that ratio in other Latin American economies, not to speak of developed countries (Figures A.5 and A.6).



International Finance

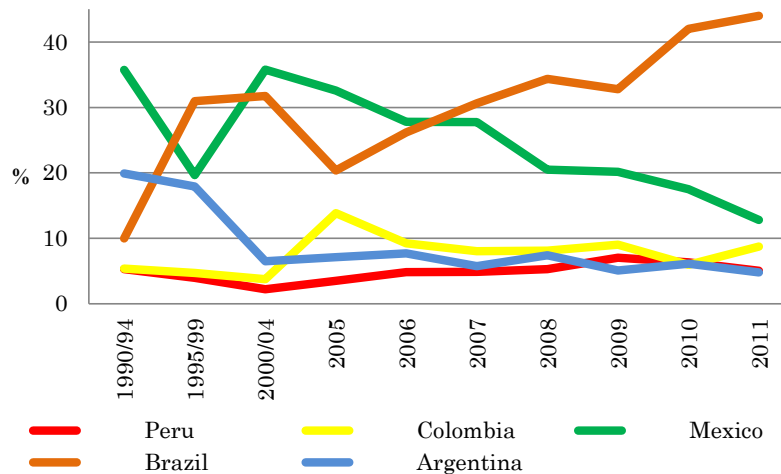
As illustrated above, access to international finance is constrained by a very elevated sovereign risk premium, which of course also affects the rates at which private agents can borrow or issue internationally. Moreover, FDI flows to Argentina have declined over the past few years (as a percentage of GDP) and lie well below the ratios observed for other countries in Latin America (Figures A.7 and A.8).

Figure A.7: FDI Flows (% of GDP)



Source: UNCTAD, CEPAL, IMF.

Figure A.8: FDI Flows (% of as Latin America total)

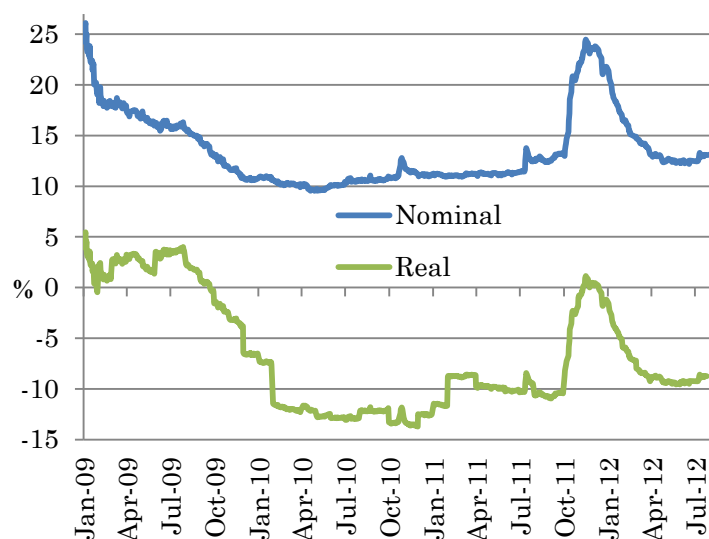


Source: UNCTAD, CEPAL, IMF.

Prevailing Rates in the Domestic Financial Market

Despite the evidence of limited financial intermediation and poor access to international finance, the interest rates prevailing in Argentina are low, speaking for subdued *demand* for financing, rather than a binding constraint on the supply side.

Figure A.9: Nominal and Real Overdraft Interest Rates (up to AR\$10mn)



Source: BCRA and provincial statistic institutes for the inflation metrics.

Infrastructure

Sánchez and Butler (2007) found infrastructure in the areas of transportation and energy to represent a binding constraint to investment in Argentina. Limited improvement since the publication of their work, combined with significant economic dynamism, suggests that their conclusion remains valid.

Transportation and Logistics

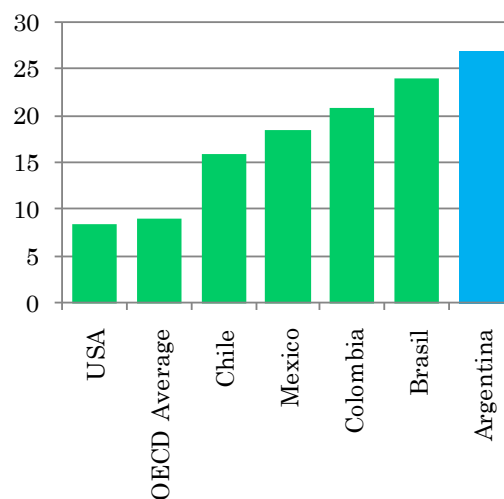
In general, Latin America shows poorly in international indexes measuring transportation and logistic costs. The World Bank Survey on Competitiveness shows that, on average, 36.7 and 23.1 percent of firms in Latin America view electricity and transportation, respectively, as an important constraint to their growth, while these shares drop to 6.1 and 7.4 percent in the OECD. Argentina does poorly even within Latin America, with the share of firms worried about these constraints at 43.3 percent and 26.1 percent, respectively. Furthermore, the recent evolution of this indicator has been negative (Table A.6).

Table A.6: World Bank Survey on Competitiveness: Infrastructure

	Percentage of firms that considered electricity as a major constraint		Percentage of firms that considered transport as a major constraint	
	2006	2010	2006	2010
Argentina	31.2	43.3	17.3	26.1
Chile	44.3	30.1	14.4	27.2
Mexico	25.8	46.7	4.0	26.2
Peru	29.6	14.8	13.1	15.0
Uruguay	43.0	33.7	15.0	18.6
Brazil	-	41.8	-	30.2
Latin America	-	36.7	-	23.1

Source: World Competitiveness Indicators, World Bank.

Deficient infrastructure is often correlated with elevated logistics costs. In a 2008 study, Guasch and Schwartz found that, indeed, logistics costs in Latin America ranged between 16 and 27 percent of the product value, compared with the 9 percent OECD average. At 27 percent, Argentina's estimation topped that of all the countries studied (Figure A.10).

Figure A.10: Logistics Costs, 2004 (% product value)

Source: Guasch and Schwartz (2008).

Now, high logistics costs can be traced to many factors, including the distance to main markets, the composition of exports, and infrastructure deficiencies in the areas of transportation and ports. While Argentina's logistics costs may certainly be influenced by its geography and demographics, complementary indicators speak for deficiencies in the provision of transport infrastructure—a widespread problem in the region. For example, Argentina has 0.03 km of paved roads per square kilometer, a number that compares favorably with that of other Latin American countries such as Brazil (0.01), Chile (0.02), Peru (0.01), or Colombia (0.02), but which remains well below that of other economies with extensive territories, like the United States (0.45) or even China (0.21) (Table A.7).

Table A.7: Roads (*last data point available*)

	Roads per square km		Roads paved, in percent of total roads		Paved roads per square km
Argentina	0.08	(2003)	30.0	(2003)	0.03
Brazil	0.21	(2004)	5.5	(2000)	0.01
Chile	0.11	(2000)	20.2	(2008)	0.02
China	0.40	(2008)	53.5	(2008)	0.21
Colombia	0.15	(2008)	14.4	(1999)	0.02
Bolivia	0.06	(2004)	7.0	(2004)	0.00
Costa Rica	0.75	(2008)	25.3	(2008)	0.19
Ecuador	0.18	(2007)	14.8	(2007)	0.03
Honduras	0.12	(2000)	20.4	(2001)	0.02
Hong Kong	1.96	(2008)	100.0	(2008)	1.96
Mexico	0.19	(2008)	35.3	(2008)	0.07
Paraguay	0.07	(2000)	50.8	(2001)	0.04
Peru	0.08	(2007)	13.9	(2006)	0.01
United Kingdom	1.73	(2008)	100.0	(2008)	1.73
United States	0.71	(2008)	67.4	(2008)	0.48
Latin America	0.16	-	21.6	-	0.03

Source: WDI.

Meanwhile, Argentina has 0.009 railways per square kilometer (0.007 in use), more than any other country in Latin America (Table 8). It ranks 82nd in terms of quality of its railway system, out of the 139 countries considered in the WEF Indicators, slightly better its overall

ranking (87th). However, in contrast with what happens in developed countries, the freight transportation system is very reliant on trucks (75 percent of freights) as opposed to trains (18 percent), suggesting that the country can hardly take pride on its railway system (Table A.9).

Table A.8: Railways per Square km

	2006	2010
Argentina	0.013	0.009
Brazil	0.003	0.004
Chile	0.008	0.007
China	0.007	0.007
Mexico	0.014	0.014
Peru	0.002	0.002
United States	0.025	0.025

Source: WDI.

Table A.9: Share of Each Means of Transportation in the Transport of Freights

	Ship	Truck	Railway
Argentina	7%	75%	18%
Canada	34%	11%	55%
Holland	72%	17%	11%
France	18%	28%	54%
Germany	31%	15%	54%
United States	25%	28%	47%

Source: Minister of Agriculture.

Judging by the investment and amortization figures of listed transportation companies, the prospects of an improvement in transportation infrastructure appear dim. Indeed, since the publication of Sánchez and Butler (2007), these firms have not invested enough to cover amortizations, implying that there has been a reduction in the stock of transportation infrastructure, and strengthening the binding constraint that this represents for growth.

Table A.10: Investment-Amortization Ratio of Listed Firms (*transportation*)

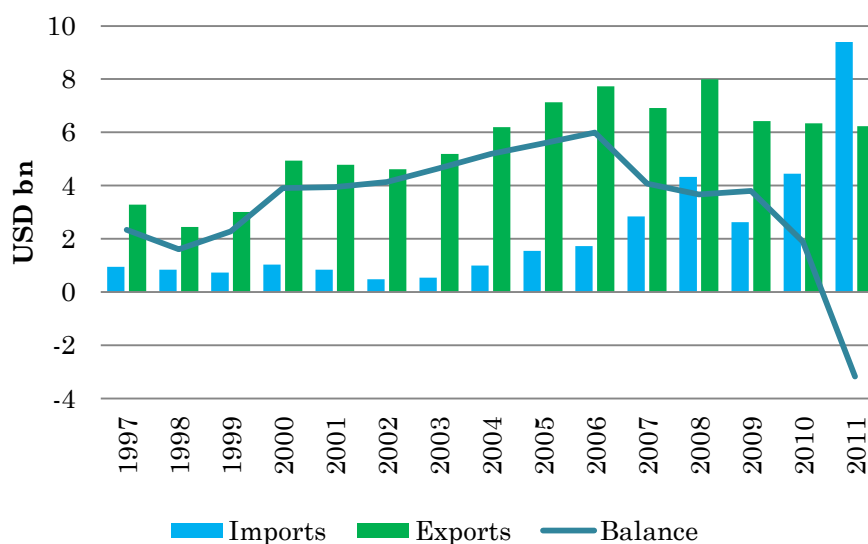
2005	2006	2007	2008	2009	2010	2011
11.9	22.5	9.9	11.7	8.2	13.7	22.6

Source: Económica.

Energy

In the past few years, Argentina has had a rapidly deteriorating energy trade balance, turning from a surplus to a deficit of US\$3.2 billion in 2011, which is expected to increase in 2012 (Figure A.11). Underlying this dynamics is high economic growth combined with heavily subsidized consumption, especially in the subsector of electricity (both for individuals and firms). Table A.11, for example, shows that Argentinean firms pay only 0.03USD/Kwh, equivalent to 17 and 42 percent, respectively, of what Brazilian and American firms pay.

Figure A.11: Energy Trade Balance



Source: INDEC

Table A.11: Industrial Energy Price (in USD per kWh)

	2009	2010
Argentina	0.05	0.03
Brazil	0.16	0.18
Chile	0.13	0.14
Mexico	0.09	0.10
USA	0.07	0.07

Source: SIEE – OLADE, March 2012 and www.electricchoice.com.

Of course, this pricing policy would not in itself represent a severe constraint for firms, were it not for the fact that it has led to remarkable bottlenecks in the provision of both gas and electricity. Regarding gas provision, while a few years ago the main bottleneck resided in transportation, this was somewhat solved by the incorporation of a relevant gas-pipe to the system, leaving production as the main bottleneck, particularly after the output drop of some fields. Regarding electricity, the key bottlenecks are in transportation and distributions, particularly in the regions of Central Litoral, NOA, and NEA; and in Buenos Aires (Montamat, 2012).

Information and Telecommunications

Argentina performs relatively well in the sub-sectors of information and telecommunications infrastructure, showing even a competitive advantage in these areas. The penetration of Internet and mobile phones is elevated and the cost of broadband access is similar to the Latin American average. However, the country does not perform as well in terms of the availability of personal computers, lagging not only OECD and USA levels, but also the Latin American average.

Table A.12: Information and Telecommunications Technology

	Mobile cellular subscriptions (per 100 people)		Telephone lines (per 100 people)		Internet users (per 100 people)		Personal computers (per 100 people)
	2005	2010	2005	2010	2005	2011	2005
Argentina	57.2	141.8	24.4	24.7	20.0	66.0	9.0
Brazil	46.4	104.1	21.4	21.6	14.1	39.0	16.1
Chile	64.9	116.0	21.1	20.2	42.8	59.2	14.1
Uruguay	34.9	132.2	30.3	28.6	20.9	56.1	13.6
USA	72.0	90.2	59.0	48.7	58.1	90.2	78.0
Latin America	43.4	98.2	-	-	15.1	41.1	11.5
OECD		102.4	-	-	52.3	69.3	63.1

Source: WDI, World Bank.

Table A.13: Cost of Internet Access, 2008 *(in USD per month)*

Fixed broadband Internet access tariff (USD per month)	
Argentina	38.4
Brazil	47.3
Chile	53.0
China	18.5
Colombia	36.3
Bolivia	33.5
Costa Rica	17.0
Ecuador	39.9
Hong Kong	25.4
Mexico	37.0
Paraguay	35.0
Peru	36.4
United Kingdom	29.4
United States	15.0
Uruguay	24.3
Latin America	36.2

Source: WDI, World Bank.

Listed firms in the telecommunications sector show that investment lagged amortization every year except for 2011, which could compromise this relatively better-off sub-sector. While investment rebounded as of 2011, it remains relatively sluggish and it remains to be seen whether the pick-up is long-lived.

Table A.14: Investment-Amortization Ratio of Listed Firms (*telecommunications*)

2005	2006	2007	2008	2009	2010	2011
38.9	52.2	66.4	93.1	88.7	95.0	115.4

Source: Economática.

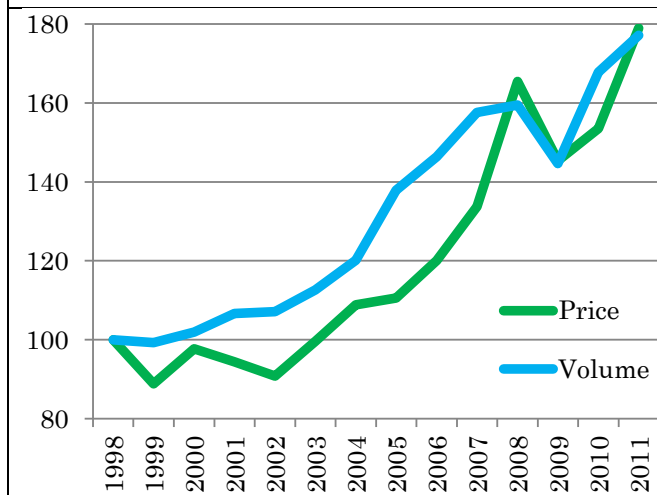
Structural Transformation of Exports

Binding constraints to growth may also apply to a second growth driver apart from private investment, which is the structural transformation of exports (and, more generally, of the overall production structure) towards growth-enhancing activities. Like in the case of private investment, these activities may be constrained by poor access to finance or low private returns, which in turn can be subdued because social returns are low (in this case due to poor opportunities for structural transformation) or because there is limited appropriability of these returns due market or government failures.

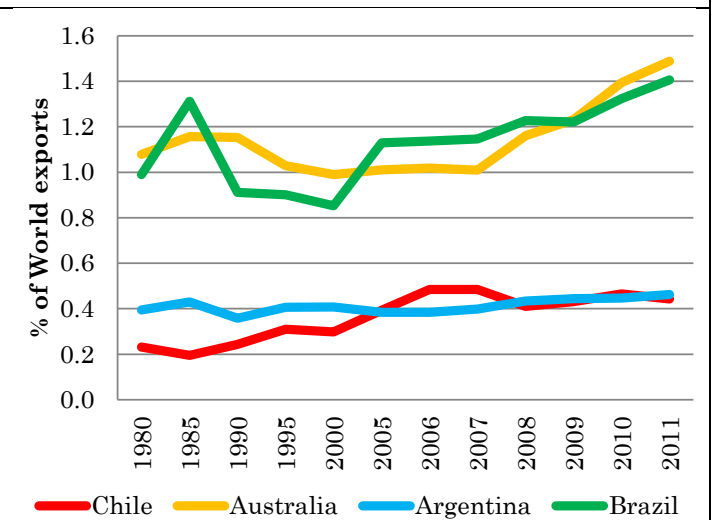
Like in the case of private investment, financing does not appear to be the main hurdle facing the structural transformation of exports, even though it could become of more important if the other constraints were relaxed. Meanwhile, opportunities for export transformation do not appear low, either. Thus, what appears to be constraining the structural transformation of exports is again low appropriability, in this case not only due to government but also market failures. Sánchez and Butler (2007) had already highlighted market failures as the main binding constraint for the structural transformation of exports. Since the publication of their work, government failures affecting the structural transformation of exports in particular (e.g., recent trade and FX policies) have become similarly stringent, in our view.

Export Growth in Argentina

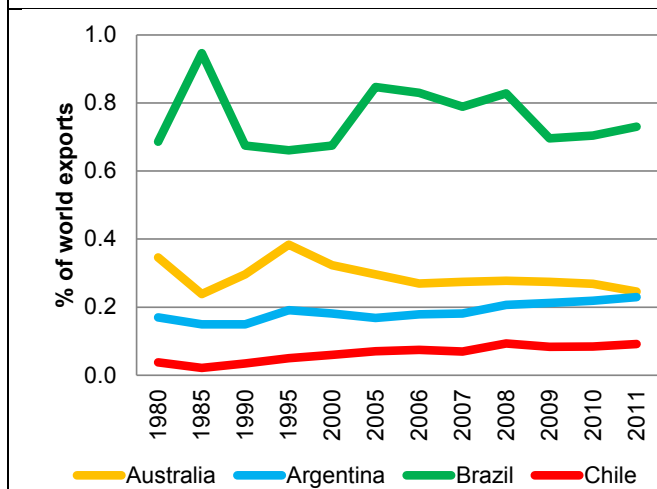
Recent export growth in Argentina has been aided significantly by export prices (Figure A.12) and, unlike that of other resource-abundant countries, it has not led the country to increase its share in global exports (Figure A.13). Admittedly, comparable resource-abundant countries have not done too well in terms of manufacturing exports (or high-tech exports within this group), either (Figure A.14 a and b).

Figure A.12: Export Growth in Argentina (1998=100)

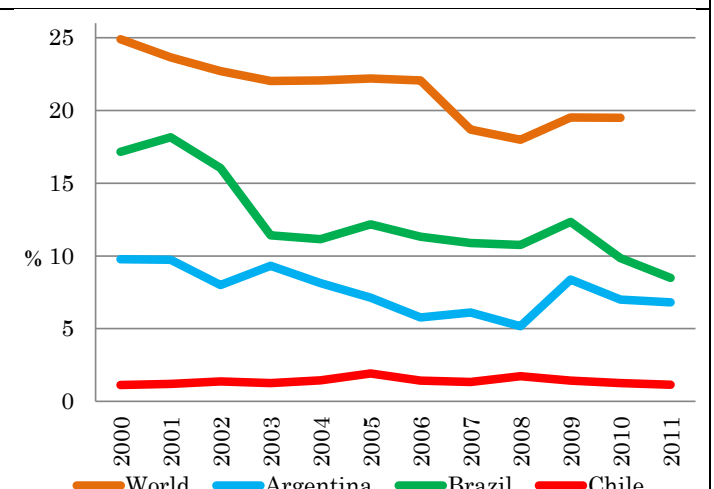
Source: INDEC

Figure A.13: Participation in Global Exports

Source: WTO

Figure A.14a: Participation in Global Manufacturing Exports

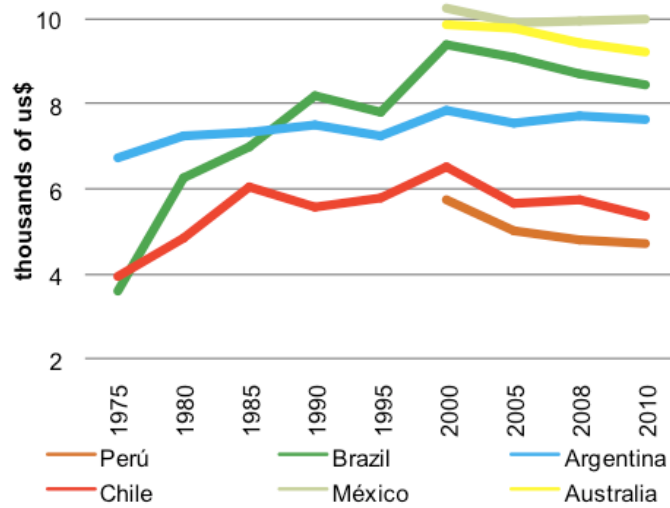
Source: WTO.

Figure A.14b: High-tech Exports (% of manufacturing exports)

Source: WITS.

Moreover, analyzing export sophistication using the methodology of Hausmann, Hwang and Rodrik (2005), we find that Argentina's export sophistication metric is lower than its GDP per capita, having barely increased since 1975, while that of Brazil and Chile improved greatly during the same time span. In particular, Brazil's export sophistication grew from being just

Figure A.15: Export Sophistication (*GDP per capita-equivalent*)

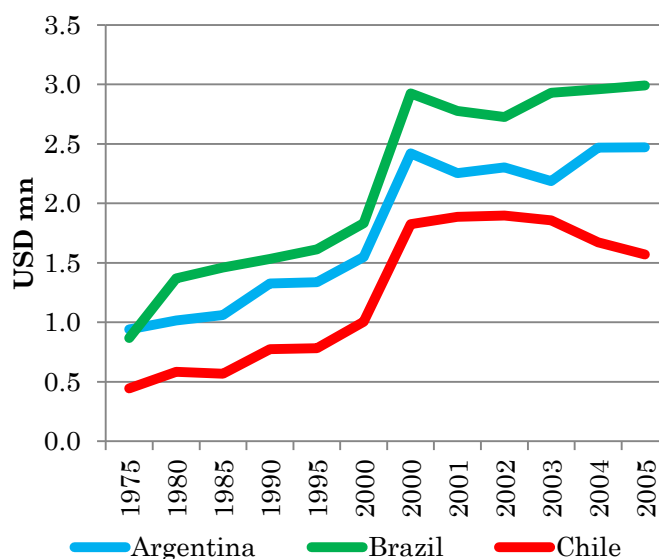


Source: Hausmann, Hwang and Rodrik (2005) and updated values.

Accumulated Capabilities

The structural transformation of exports in Argentina is not being constrained by a lack of opportunities thereof. Indeed, to assess these opportunities Hausmann and Klinger (2006) have measured the option value for structural transformation or “open forest” facing an economy, taking into account the value of “nearby” products vis-à-vis each country’s current export structure as well as the potential cost of developing them or “distance.” As already highlighted by Sánchez and Butler (2007), Argentina’s open forest is fairly encouraging and its evolution has resembled that of Brazil and Chile (Figure A.16). This open forest should have been a driver for increasing export sophistication in Argentina but, as shown above, it has not been the case. Thus, we attribute this to a problem of appropriability.

Figure A.16: The “Open Forest” Before the Economy



Source: Haussmann and Klinger (2006).

Market Failures

Specifically, Sánchez and Butler (2007) highlighted market failures specifically as the culprit of slow export transformation (both due to information or coordination externalities). To reach this conclusion, they relied on the diffusion pattern of new exports, finding that the most successful new export products were: (1) those for which firms could protect themselves from competition (suggesting the presence of information externalities); or (2) those developed by a large firm that could self-provide industry-specific public goods or vertically integrate production (suggesting the presence of coordination externalities). Overall, there was little diffusion of the discoveries. They found a strong, and under some specifications, statistically significant negative relation between diffusion and new exports, meaning that new exports are poorly diffused. We do not have evidence that this has changed.

Government Failures

Like in the case of private investment, since the publication of Sánchez and Butler (2007), micro and macro risks associated with government failures have become a more binding constraint to export transformation, too. On the micro side, trade and FX policies become much more restrictive while, on the macro side, the real exchange rate has become much less competitive and its future appears compromised by soaring inflation. Regarding trade and FX policy, although there have been barely any tariff changes (just an increase from 0 to 14 percent in the tariff for those capital goods also produced domestically), a number of measures have accentuated an anti-export bias, either affecting exporters directly or indirectly through import

restrictions. First, since the beginning of 2002 exporters have been mandated to sell the FX gains from their exports in the official exchange market, within 60 to 360 days of shipping depending on the product. This deadline was shortened in 2003, 2009, and, most recently, in May 2012, to just 15 days for most products.

Second, on January 23, 2004, the administration began to introduce non-automatic import licenses for some products (LNA for their acronym in Spanish), the number of which increased markedly since then. At present, between 12 and 14 percent of imports (USD8.8-10bn) are imported under the LNA regime.

Third, on October 31, 2011 the government applied restrictions to the purchase of FX. This created a gap between the official and parallel exchange rates, which exporters cannot benefit from given their obligation to sell their FX proceeds in the official exchange market.

Fourth, on February 1, 2012 the Federal Administration of Public Revenues (AFIP for its acronym in Spanish) established the obligation for all importers to provide, prior to placing the order form, the approval of an “Advance Affidavit on Imports” (DIAI, for its acronym in Spanish).

Fifth, anecdotal and journalistic evidence indicates that, since early March, the administration has exerted some pressure on importing firms in certain sectors, with the view of reducing the trade deficit stemming from these sectors. Importing firms are invited to export as much as they plan to import and/or submit deficit-reduction plans as a condition to get the necessary import permits or to have their DIAI approved. Among the first sectors affected by this policy were those of automobile and pharmaceutical production and according to some reports (e.g., Global Trade Alert) by mid-2011 similar restrictions applied to producers of light electronics and toys.

Finally, Global Trade Alert (from the UK-based Center for Economic Policy Research) has recently ranked Argentina as the country that has implemented the largest number of protectionist measures worldwide. Specifically, Argentina has implemented a whopping 191 protectionist measures, more than the rest of Latin America combined (170).

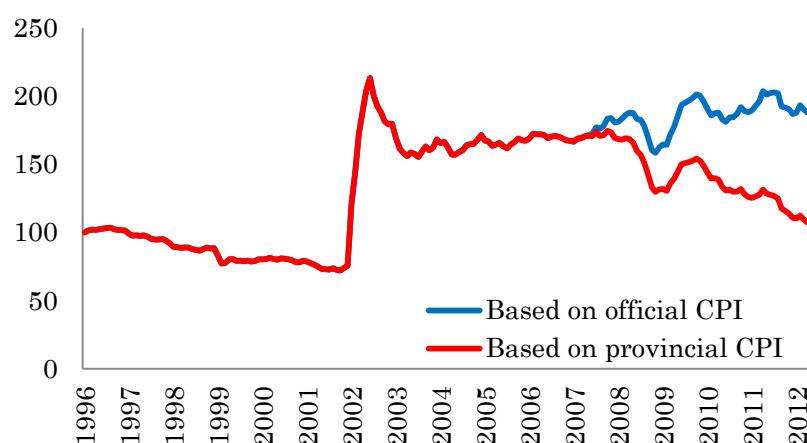
Table A.15: Number of Recent Protectionist Measures

Argentina	191
Russia	172
USA	106
India	101
China	100
Brazil	86
Mexico	23
Peru	18
Venezuela	11
Colombia	7
Ecuador	6
Paraguay	6
Uruguay	4
Bolivia	3
Dom. Rep.	3
Chile	2
Costa Rica	1

Source: Latin Business Chronicle analysis of [Global TradeAlert](#)/Centre for Economic Policy Research.

Regarding macroeconomic policy, the government's expansionary fiscal and monetary policies have continued to boost inflation, which combined with a fixed exchange rate in practice, has significantly eroded the competitiveness of the real exchange rate, which is 30 percent more appreciated than its 2002 value.

Figure A.17: Multilateral Real Exchange Rate (1996=100)



Source: IERAL based on MECON and provincial CPIs.

Research and Innovation Activities

A third important growth driver in an endogenous growth model consists of research and innovation activities. Sánchez and Butler (2007) found that the main binding constraint to these activities was low social returns resulting from a technological disengagement in the world frontier. Following up on their work, we conclude that this constraint has become more binding since the publication of their work and, as was the case for private investment and the structural transformation of exports, low appropriability resulting from government failures has grown in importance as well. Similarly, financing is likely also a “latent” binding constraint.

Research and Innovation Activities in Argentina

Although there has been some improvement in recent years, research and innovation activities remain limited in Argentina. Specifically, investment in R&D reached 0.6 percent of GDP in 2009, increasing from the levels of 2000 and 2005 but remaining below that of other countries in the region such as Brazil (1.19 percent) and well below that of the United States (3.04 percent).

Table A.16: Investment in R&D (as a percentage of GDP)

	2000	2005	2009
Argentina	0.44	0.46	0.60
Brazil	1.02	0.97	1.19
Colombia	0.11	0.14	0.16
Spain	0.91	1.12	1.38
United States	2.73	2.60	3.04

Source: RICyT.

Low Social Returns

In order to assess the scarcity of these activities, Sánchez and Butler (2007) evaluated their returns by running a panel regression of TFP growth at the industry level on R&D intensities by industry. They found the rate of return to be low, attributing this result to the economy's specialization in goods with a low technological frontier and overall disengagement from the world flows of technology. Moreover, they found social returns to be undermined by local inadequacies in the areas of human capital. Following up on their work, we assess the evolution of the indicators underpinning their conclusion over the past few years. In particular, we look at local human capital inadequacies, the origin of capital goods imports, FDI flows, and distance of the export basket to the global technological frontier.

- Local inadequacies in the area of human capital: To assess the scarcity of specialized human capital in these activities, Sánchez and Butler (2007) compared the compensation premium of those professionals employed in research and innovation activities in Argentina with the same premium in other countries. They found the premium to be 102 percent in Argentina, compared with 59 percent in China, 54 percent in Nicaragua, and negative premiums in Germany and the UK. Relying on the most recent household survey available for Argentina, we corroborate that the premium remains high, at 82 percent, indicating that the identified scarcity has barely improved over the past few years.
- Capital good imports: Regarding the origin of capital goods imports, Sánchez and Butler (2007) highlighted the relatively subdued share of imports coming from the United States and the European Union, which are the economic blocks considered to be at the technological frontier. Since the publication of their work, this combined share has even shrunk a little, with a significantly larger share of capital good imports coming from China. Moreover, recent trade policies are likely to have further compromised the Argentina's ability to import capital goods from knowledge-abundant countries.

Table A.17: Origin of Capital Goods Come (*% of total imports*)

	Brazil	USA	EU	China	Others
1998	17.8	29.2	28.2	2.9	21.9
2006	32.8	15.0	19.3	11.5	21.4
2011	26.5	13.0	20.5	21.7	18.4

Source: INDEC.

- Foreign Direct Investment: As shown in Figures A.7 and A.8 above, FDI flows remain below 2 percent of GDP in Argentina, well below the level of most other Latin American countries. Moreover, recent policy arbitrariness, and in particular the expropriation of Repsol-YPF, is likely to have further compromised FDI.
- Distance of the export basket to the global technological frontier: To assess the distance of the export basket to the global technological frontier, Sánchez and Butler (2007) compared the unit export price of goods exported by Argentina with the price of those very goods when exported by OECD countries. They found the ratio to be 0.80 in 2005. Replicating this exercise with 2010 data, we found the ratio to be 0.85, suggesting even less catch-up potential to the frontier with the current pattern of specialization.

Low Appropriability due to Government Failures

Regarding appropriability issues, on top of the micro and macro risks affecting overall economic activity, some indicators speak for appropriability problems particularly detrimental for research and innovation activities. In particular, Business Software Alliance has estimated the software piracy rate to be 70 percent in Argentina, above the Latin American average and well-above that of developed countries.

Table 18: Software Piracy Rate (*in percent*)

	2006	2007	2008	2009	2010
Argentina	75	74	73	71	70
Australia	29	28	26	25	24
Brazil	60	59	58	56	54
Chile	68	66	67	64	62
Bolivia	82	82	81	80	80
Latin America	66	65	65	63	64
European Union	36	35	35	35	35
World	35	38	41	43	42

Source: Business Software Alliance.

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