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ECONOMIC GROWTH IN THE SOUTHERN CONE

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I. Introduction

This paper examines the growth experiences of Argentina, Brazil, Chile, Paraguay and Uruguay (in the rest of the paper referred as “Southern Cone countries”). The analysis sheds light on the strengths and weaknesses of long-run growth of these countries by identifying similarities and differences with other countries and assesses their economic performance on that comparative basis.

During the past four decades, the Southern Cone countries, like many other countries in Latin America, went through several episodes of economic crises, political instability, external shocks, and social unrest. In the same period, they also experienced episodes of economic stabilization, political reorganization and structural reforms. A cursory look at some basic development indicators suggests a positive net result (see table 1). Generally speaking, income per capita increased as well as health and education indicators, while the underlying economic structure turned more integrated to global trade and there were improvements in institutional quality and macroeconomic management (as measured by a composite index of institutions and inflation levels, respectively). However, how satisfactory are these achievements?

In order to analyze how satisfactory the development process in the Southern Cone countries has been over the past 40 years it is important to make comparisons with relevant countries. To tackle this issue, we focus on the per-capita economic growth rate and its contributing factors, comparing the experience in Southern Cone countries with that of benchmark countries, namely a typical country of the rest of Latin America (LAC), of the rest of the world outside Latin America (ROW) and of its subset of developed countries (DEV).

We found that, in the period 1960-99, Southern Cone countries experienced faster growth than the typical LAC country. However the favorable comparisons end here. In fact, their growth was slower than that of the typical ROW country, and in particular of the typical DEV country, thus producing a widening of the income-per-capita gap between Southern Cone countries and developed countries. The key to these differences is productivity, not factor accumulation. It was productivity growth the driver that contributed the most to the better performance of the Southern Cone countries relative to the rest of Latin America, but, interestingly, it was precisely

productivity growth what accounts for their slower growth relative to outside Latin America. Concerning productivity growth, one-eye Southern Cone countries are kings in the land of blind Latin America. Finally, we provide some econometric evidence suggesting that the better (worse) institutional quality of the Southern Cone countries relative to LAC (ROW) was an important factor behind these differences in productivity growth.

The rest of the paper is organized as follows. Section II describes the economic performance of the Southern Cone countries during the last four decades and compares these performances with the experience of the benchmark countries and Section III conducts accounting exercises in order to examine the contributions of various factors to the differences in performance observed in Section II. Section IV develops an econometric model to explore the role of policy and institutional variables as drivers of these contributions. Finally, Section V concludes.

II. Performance

In order to compare the Southern Cone countries with benchmark countries we use a sample of 68 countries¹, of which 15 are from LAC and 53 from ROW (20 of them belong to DEV). In constructing the benchmarks, we use simple (un-weighted) averages across countries in the control group to account for the growth experience of the typical country in it. A detailed list of the country groupings is shown in Appendix A. Our summary measure of economic performance is the growth rate of real (PPP-adjusted) GDP per capita. The data is taken from the Penn World Table 5.6 and supplemented by other sources described in Appendix A.

Growth rates of GDP per capita for the Southern Cone countries during the last four decades shown in figure 1 reveal a number of features. First, all the Southern Cone countries experienced progress during the overall period and, with the exception of Argentina during the eighties, none of them exhibited significant losses in any of the four decades. Second, the patterns of performance over time were similar across countries: medium to strong economic growth during the sixties and seventies, des-acceleration during the eighties, and recovery during the nineties. However, one noticeable difference is that while Argentina, Chile and Uruguay experienced their best growth performance in the nineties, Brazil and Paraguay saw their best performance in the

seventies. In other words, Argentina, Chile and Uruguay do better over time while Brazil and Paraguay do worse.

Southern Cone countries compare favorably with the rest of Latin America in terms of trends in per-capita growth performance (as measured by decade averages); see figure 2. Southern Cone countries performed significantly better than the typical country in the rest of Latin America during the eighties and nineties (with the exception of Argentina during the eighties) and did not do significantly worse during the sixties and seventies (with the exception of Uruguay during the sixties). Accordingly, relative to LAC, all of the Southern Cone countries ended up in a better position by the late nineties than where they started at the beginning of the sixties (see table 2).

Growth performance relative to countries outside the Latin American region, however, is very different. Compared to ROW (figure 3), most of the relative growth rates are negative. The exceptions essentially coincide with the very best decades of each one the Southern Cone countries identified above: the seventies for Brazil and Paraguay, and the nineties for Argentina, Chile and Uruguay. Overall, when we consider the entire 1960-99 period, each and every one of the Southern Cone countries saw its income per capita decline with respect to ROW including Brazil and Chile despite their stellar performances in the 1970s and 1990s, respectively. In particular, the substantial income per capita gap of Southern Cone countries with respect to the US and to the typical developed country (shown in table 3) widened further in each one of them during the past 40 years. The Southern Cone became “relatively” poorer by international standards.

What were the main factors accounting for the better performance of the Southern Cone countries relative to Latin America and their worse performance relative to the rest of the world? Do Southern Cone countries differ in this respect or they all tell the same story? In the next section we perform growth accounting exercises to help answering these questions.

¹ Maximum set for which complete information was available.

III. Accounting for Performance

In this section we perform growth accounting exercises based on a Cobb-Douglas production function. Let Y represent domestic output, K physical capital, L labor force, h the average quality of the labor force (scaled in such a way that hL measures human capital in units of unskilled labor), and A total factor productivity or TFP (that is the combined productivity of physical and human capital)²:

$$(1) \quad Y = K^\alpha \cdot (h \cdot L)^{1-\alpha} \cdot A$$

The production function can be written in terms of number of workers as follows:

$$(2) \quad \frac{Y}{L} = \left(\frac{K}{L} \right)^\alpha \cdot h^{1-\alpha} \cdot A$$

In order to account for the growth rate in per capita terms, we can express (2) in terms of the entire population, rather than labor force. Let P be total population. We can use the following relationship:

$$(3) \quad \frac{Y}{P} = \frac{L}{P} \cdot \frac{Y}{L}$$

to express (2) in income per capita terms:

$$(4) \quad \frac{Y}{P} = \frac{L}{P} \cdot \left(\frac{K}{L} \right)^\alpha \cdot h^{1-\alpha} \cdot A$$

In terms of growth rates this is expressed as follows:

² In this specification, total factor productivity excludes the effect of changes in the skill level of the labor force, which is captured by h and accounted as factor accumulation of human capital.

$$(5) \quad \left(\frac{\hat{Y}}{\hat{P}}\right) = \left(\frac{\hat{L}}{\hat{P}}\right) + \alpha \cdot \left(\frac{\hat{K}}{\hat{L}}\right) + (1 - \alpha) \cdot \hat{h} + \hat{A}$$

The output and population data are taken from the Penn World Table 5.6. The capital stock series are taken from Easterly and Levine (2001) which in turn the authors updated from the Penn World Table 5.6. The labor input is measured by the labor force. This data is taken from the World Development Indicators of the World Bank. (Alternatively, factor inputs could be measured to the extent to which they are actually utilized in production, i.e. labor input could be measured by employment, excluding the unemployed, and capital input could be measured according to its actual utilization rate. Appendix B describes how this alternative choice of measurement would amount to a more narrow definition of productivity and shows that the use of employment as labor input would not qualitatively change the interpretation of our findings).

We follow Hall and Jones (1999) and consider h to be relative efficiency of a unit of labor with E years of schooling. Specifically, the function takes the form:

$$(6) \quad h = e^{\phi(E)}$$

where the derivative $\phi'(E)$ is the return to schooling estimated in a Mincerian wage regression. We take Hall and Jones approach and assume the following rates of return for all the countries: 13.4% for the first four years, 10.1% for the next four years, and 6.8% for education beyond the eighth year. Average quality of the labor force h results from applying (6) to the average years of schooling of the labor force. Finally, we consider a capital share α of 1/3. Sensitivity analysis, however, showed no qualitative differences in the results when we use capital shares of 0.4 or 0.5.

The contributions of the various components in (5) to account for the overall effects on income per capita Y/P help identify the proximate drivers of growth. The first component, L/P , measures the labor participation rate, i.e. the labor force as a proportion of total population.³ The second component refers to capital intensity K/L and measures the effect of physical capital

³ A more detailed analysis can decompose this component into a demographic factor, dealing with the fraction of the population of working age, and a behavioral factor concerning their participation rate in the labor force (i.e., the fraction of the able who are willing to work).

accumulation. The third component refers to labor skills h and measures the effect of human capital accumulation. The combined effect of these three components can be interpreted as the effect of factor accumulation, respectively of labor force size, physical capital intensity, and skill level of the labor force. Finally, the last component \mathcal{A} is obtained as a residual once the effect of the rest of the observable variables on to income per capita Y/P , that is the effect of factor accumulation, is accounted for. This last component thus measures the effect of total factor productivity or TFP.

TFP turns out to be key to explain some of the observed trends in the evolution of income per capita, so it is important to be precise about how to interpret our estimations of it. Evidently, our measure of TFP in part reflects technology available. However, this is not the interesting aspect of the interpretation of this measure because our main findings are based on gaps resulting from comparisons across countries, which in principle could benefit equally from technological progress thus rendering no effect on these gaps. Apart from technology, our measure of TFP also incorporates the degree to which available factors of production, both physical and human capital, are utilized. This is so because we chose to account for all available capital, i.e. including unutilized physical capital and unemployed labor, so that any waste in these resources available to market forces due to non-utilization gets reflected into a lower TFP. The use of this more encompassing measure of TFP is very important to explain cyclical variations driven by factor utilization rates, but once again is unimportant in the long run (see Appendix B). In the long-run our preferred interpretation of TFP to explain gaps between countries, especially changes in these gaps, is that of distortions in the workings of the economy that drives aggregate efficiency below the technological frontier even if each firm is technologically efficient at the micro level (Parente and Prescott, 2002).

In all the Southern Cone countries TFP explains a large portion of the annual variability of GDP per capita. Table 4 reports the variance decomposition over time for each of the countries. The measure indicates what part of the variation in the rate of economic growth is accounted for by variations in TFP growth and variations in everything else, referred to as factor growth.⁴ For all the countries, TFP growth accounts for most of the variability in the growth of per capita output.

⁴ $VAR(\hat{y}) = VAR(\hat{TFP}) + VAR(\hat{factors}) + 2\{COV(\hat{TFP}, \hat{factors})\}$

For the case Uruguay, the contribution of TFP even exceeds 100% which implies that TFP was more volatile than output during this period. These results go in line with previous findings for other regions in that factor growth is much more stable than productivity and output growth (see table 4 and also Easterly and Levine, 2001).

Although TFP is the dominant driver underlying the variability of the annual growth rate in all the Southern Cone countries, its importance is minor or null for explaining long run growth rates. As shown in figure 4, factor accumulation (resulting from labor participation rates, worker's skills and physical capital intensity) is the main driver explaining growth in all the Southern Cone countries during the 1960-99 period. Average TFP growth during the period was somewhat substantial only in Chile and Brazil, but even in these countries its contribution relative to factor accumulation was quite minor. Nevertheless, averaging over decades does leave an important role for TFP growth rates in explaining overall growth in some decades for some countries, for example relatively fast TFP growth in Argentina and Uruguay underpinning overall growth in the 1990s despite its overall irrelevance over the forty-year period (see figure 5).

The fact that all the Southern Cone countries (except Chile) experienced negative growth rates of TFP during the eighties is somewhat puzzling. This is very hard to explain as a technology reversal. In Appendix B we argue that our measure of productivity is associated with a broad definition of efficiency because it also captures changes in input utilization. Figure B.1 shows, however, that the reductions in the utilization of labor account only for a small part of the fall in productivity during the eighties. Still a very large portion of the decline in productivity remains unexplained. As we argue before, another alternative is to consider a rise in the level of distortions which would hinder the level of efficiency with which the economy operates. The decrease in aggregate efficiency goes directly into the productivity measure because this is calculated as a residual from the aggregate production function.

In order to examine the factors that could account for faster growth of the Southern Cone countries relative to the rest of Latin America during the 1960-99 period we compare their underlying contributing factors to growth performance (table 5). Here the rest of Latin America refers to the non-weighted average (of the growth rates of output and the growth rates of the contributing factors) of the additional 15 Latin American countries of the sample, which we

interpret as the typical country in the rest of Latin America. In all cases the productivity growth gap is positive. In fact, it is precisely productivity growth the main advantage in the Southern Cone countries relative to the rest of Latin America (except Paraguay where it was the accumulation of capital). Besides faster productivity growth, the Southern Cone countries gained ground in Latin America in physical capital deepening (except Uruguay) and lost ground in skills (except Argentina).

The next step is to examine the factors underlying the slower growth of the Southern Cone countries relative to the rest of the world (table 6). Here the rest of the world refers to the non-weighted averages of the 53 non-Latin American countries of the sample (see Appendix A for a detailed list of countries). The lack of TFP growth was very important to account for the slower growth of the Southern Cone countries with respect to the rest of the world during the 1960-99 period. In fact, it was the dominant factor to account for the growth gap in all the countries.

What appeared to be a strong point in the performance of Southern Cone countries within Latin America turns out to be a weak one in a world perspective. Total factor productivity growth in the Southern Cone countries compared favorable to the rest of Latin America only because of its dismal (negative) productivity performance. The Southern Cone countries fell behind in the world because of low total productivity growth. The only important gains relative to the rest of the world appear to be just Paraguay's physical investment (in hydroelectric dams) and higher labor participation in Brazil and Chile. When we compare the Southern Cone countries with developed countries (table 7) the findings are similar: the growth gap opened mainly due to the opening of the productivity gap, despite some closing of the workers' skill gap.

IV. Explaining Productivity Growth

We found that productivity is the main factor accounting for the slower growth of the Southern Cone countries relative to the rest of the world and, at the same time, it is also the factor that accounted for the faster growth of these countries relative to the rest of Latin America. Therefore, we are interested in explaining what drives productivity. For this reason, we performed Barro-style regressions not only to the growth rate of per capita output but also to its

components: factor growth and TFP growth. The econometric model in this section is explained in more detail in Blyde and Fernandez-Arias (2004).

The explanatory variables used for all the regressions are: Education (Log of average years of secondary schooling in the male population over age 25); Life expectancy (Log of average years of life expectancy at birth); Infrastructure (Log of electricity produced); Openness (Structure-adjusted trade volume as % of GDP)⁵; Inflation (Log of inflation rate); Overvaluation of Exchange Rate (Overvaluation of the real effective exchange rate); Credit to Private Sector (Log of credit to private sector as % of GDP); Government Consumption (Log of government expenditure as % of GDP); Terms of Trade Shocks (Growth rate of terms of trade); Institutions (First principal components of the International Country Risk Guide variables). We also control for cyclical reversion to the long run trend (see Loayza, Fajnzylber and Calderón, 2002). Finally, we proxy technology diffusion by including the imports of machinery and equipment (Log of machinery and equipment as % of GDP). Tables 8 and 9 provide a complete definition of all the variables as well as their descriptive statistics and correlations for the sample of 73 countries during the period 1985-99 for which relevant information is available.

The results from the econometric exercises are shown in table 10. Potential endogeneity is controlled using instrumental variable (IV) estimation based on lagged values. The main result from the statistical analysis is that long-run productivity growth is affected by trade policy and by institutions (as measured by the International Country Risk Guide, ICRG, which combines risk of repudiation of contracts by government, risk of expropriation, corruption, rule of law and bureaucratic quality). More open economies and economies with good institutions seem to experience faster productivity growth (besides the short-run cyclical factor). We did not find statistically significant evidence that economic policies other than those related to openness have an effect on productivity growth in the long-run for a given institutional setting.⁶

⁵ The idea of adjusted trade volume is taken from Pritchett (1996) and is measured as the residual of the following equation: $TRADE_i((M+X)/Y)_i = a + b*LPOB_i + c*LAREA_i + d*LGDP_i + e*LGDP_i*LGDP_i + f*OIL_i + g*LANDLOCK_i + E_i$. The measure indicates the amount by which a country's trade intensity exceed (or falls short) of that expected for a country with similar characteristics.

⁶ It is worth noting that the results of these econometric exercises are only informative, in the sense that they describe broad trends that may inform the comparison of alternative economic policies but clearly cannot

Finally, we use the estimated equation of TFP to determine the role of the explanatory variables in explaining the TFP growth gap of Southern Cone countries relative to the typical country inside and outside Latin America between 1985 and 1999, which was shown to be the key for its relative performance in growth per capita over the past forty years (see figures 6 and 7). In these simulations we re-estimated the TFP growth equation retaining only the statistically significant explanatory variables (cycle, openness and institutions).

Figure 6 shows the differences in the contributions of openness and institutions to TFP between the Southern Cone countries and the rest of Latin America during the 1985-99 period. According to the model, the relatively better performance of all the Southern Cone countries during this period was mainly the result of their better institutions. The exception is Paraguay, in which the main contributing factor was openness. In Chile the relatively large contribution from openness also added to the better performance, but the main contributing factor was institutions.

In figure 7 we do the same comparison with respect to the rest of the world. According to the model, the relatively worse performance of all the Southern Cone countries with respect to the rest of the world was the result of lack of openness and worse institutions. Although lack of openness contributed to the relative worse performance (the exception is Paraguay), the main factor was the worse institutional quality of the Southern Cone countries.

The results from figures 6 and 7 imply that the relatively better (worse) institutional quality of the Southern Cone countries with respect to LAC (ROW) might have played a central role behind their relatively better (worse) performance in terms of productivity.

The above results are averages over the period. However, how is the situation evolving over time?. In order to answer this question, we repeat the exercises shown in figures 6 and 7 but divide the entire period in two sub-periods: 1985-90 and 1995-99. Figure 8 shows the case in which Latin America is the benchmark. The average result applies to both sub-periods, but, it is interesting to note that the relative disadvantage arising from the lack of openness is more pronounced in the second period (except for Paraguay) while the relative advantage arising from

substitute for detailed country analysis. In particular, institutions that work in one country might not work in another country if certain idiosyncratic aspects are not taken into account.

the better institutions is less pronounced in the second period (except for Argentina and Paraguay).

Figure 9 shows the case with respect to the rest of the world. Again, the previous average still applies to both sub-periods, but the relative disadvantage from the lack of openness increased in the second period (except for Paraguay) and the relative disadvantage from the worse institutions decreased in the second period (except for Brazil).

Therefore, between 1985-90 and 1995-99, there is convergence in terms of institutions and divergence in terms of openness. In fact, on the one hand, the institutions of the typical Latin American country moved closer to those the Southern Cone countries while the institutions of the Southern Cone countries moved closer to those of the typical country from the rest of the world. On the other hand, the relative disadvantage in terms of openness of the Southern Cone countries increased, both with respect to the typical Latin American country and also with respect to the typical country from the rest of the world.

V. Final Remarks

In this paper we have provided an overview of the growth experience of the Southern Cone countries during the last four decades. Among the main findings of the paper is that the lack of TFP growth, not lower investment, was the main factor to account for the slower growth of the Southern Cone countries with respect to the rest of the world during the 1960-99 period. However, when comparing the Southern Cone countries with the rest of Latin America, we found that, on the contrary, not only these countries performed better than the rest of the region during the same period but that it was precisely productivity growth the factor that contributed the most to this outcome. Given the dismal performance of Latin America's productivity, however, the latter comparison would be misleading and would hide the Achilles' heel of growth in the Southern Cone.

Econometric results showed that limited openness and, especially, poor institutions were important factors explaining the shortfall of TFP growth in the Southern Cone countries relative to the rest of the world. What to expect in the future?. If the past is an indication, it is important

to note that the general trend between 1985-1999 suggests that the institutional gap is gradually closing but that the gap in openness is not. The overall trend is mixed with no evidence of convergence of TFP growth.

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Table 1: Basic Indicators (averages over decades)

	Real GDP per capita in 1985 international dollars				Life expectancy at birth, total years				Years of education in pop of age 15 and higher			
	1960s	1970s	1980s	1990s	1960s	1970s	1980s	1990s	1960s	1970s	1980s	1990s
Argentina	4831	5952	5617	5864	66	68	70	72	5.5	6.4	7.3	8.5
Brazil	1946	3335	4091	4204	56	60	64	66	3.0	3.1	3.5	4.4
Chile	3240	3461	3705	5541	59	65	71	75	5.2	5.8	6.7	7.2
Paraguay	1273	1670	2183	2200	65	66	67	69	3.7	4.4	5.3	6.1
Uruguay	3831	4281	4514	5435	68	69	71	73	5.3	6.0	6.7	7.3
Latin America	2125	2706	2777	2835	56	61	65	68	3.1	3.8	4.7	5.4
Developed	6958	9794	11948	14250	71	73	75	77	7.1	7.8	8.7	9.4
Rest of the World	2437	3426	4147	4791	58	61	65	67	3.3	4.3	5.3	6.3

	Trade volume (% of GDP)				Inflation (%)				1st principal component of ICRG variables			
	1960s	1970s	1980s	1990s	1960s	1970s	1980s	1990s	1960s	1970s	1980s	1990s
Argentina	13	13	15	17	22	133	566	253	--	--	-1.1	0.6
Brazil	13	17	18	18	49	34	321	824	--	--	0.5	1.1
Chile	28	38	52	59	27	175	21	12	--	--	0.3	1.0
Paraguay	30	34	48	84	4	11	20	16	--	--	-1.7	0.0
Uruguay	28	34	42	43	51	59	58	49	--	--	-0.6	0.2
Latin America	37	44	48	57	11	30	240	164	--	--	-1.3	-0.2
Developed	47	55	61	64	4	10	10	7	--	--	3.0	3.4
Rest of the World	55	67	72	78	4	11	14	10	--	--	1.0	1.6

Sources: Penn World Tables, World Development Indicators (WB), International Country Risk Guide (ICRG).

ICRG variables: rule of law, corruption, bureaucratic quality, risk of expropriation and risk of repudiation of contracts

Figure 1

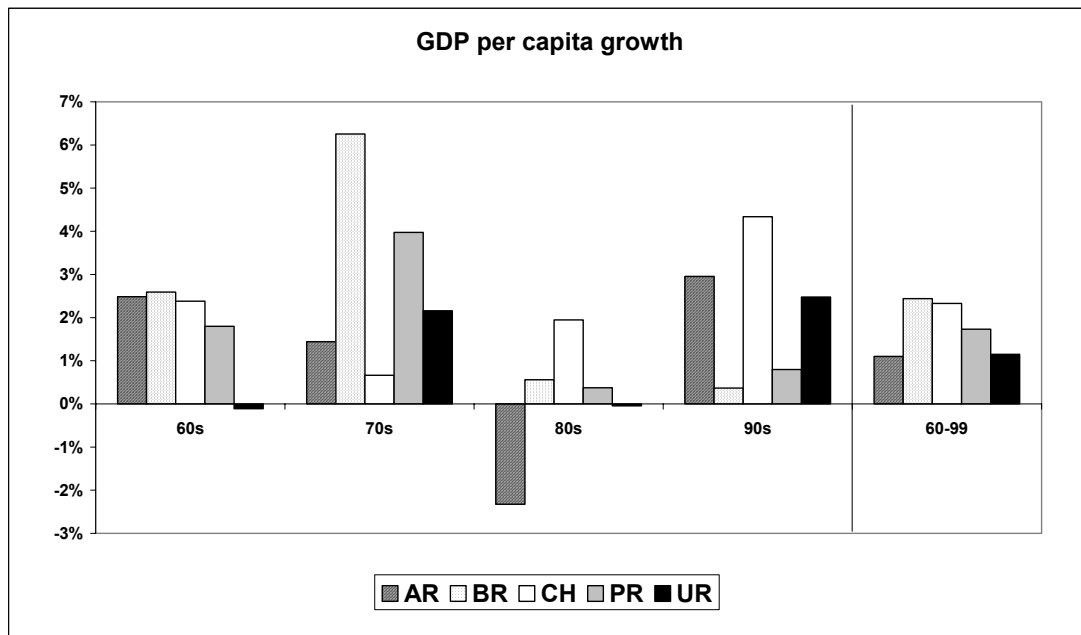
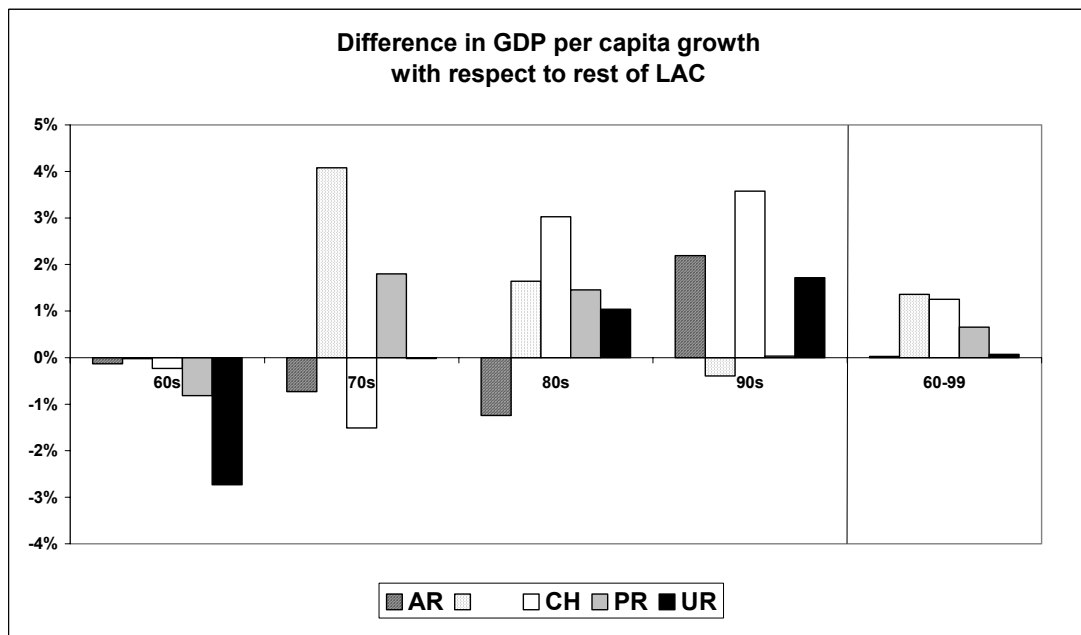


Figure 2

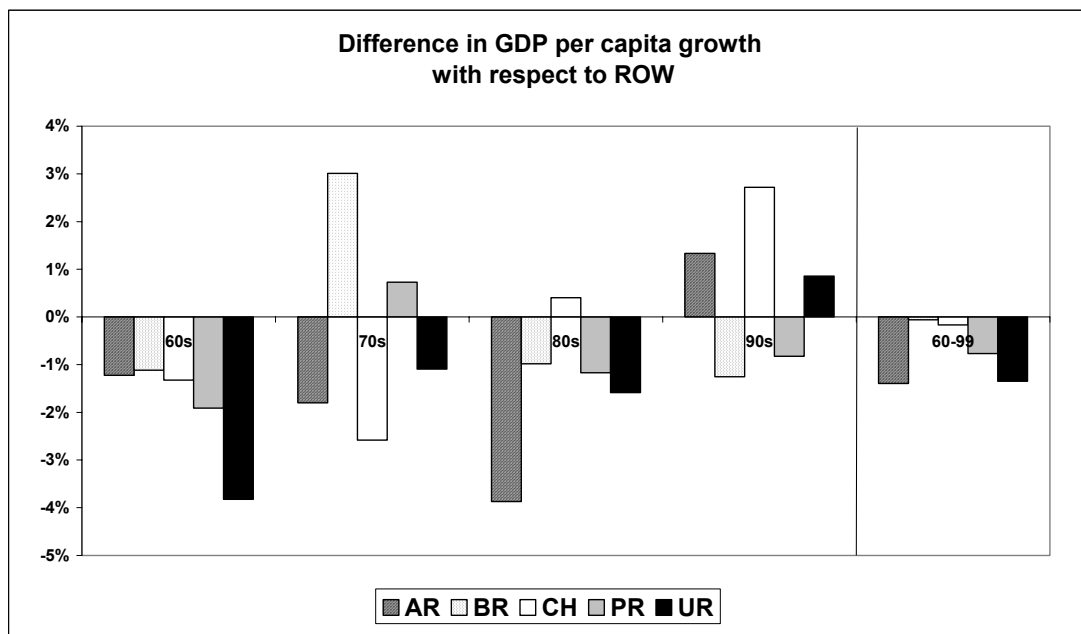


**Table 2: Income per capita
(with respect to rest of LAC)**

	60-62	97-99
ARGENTINA	2.58	2.59
BRAZIL	1.05	1.75
CHILE	1.68	2.62
PARAGUAY	0.68	0.87
URUGUAY	2.21	2.37

Based on real GDP per capita in 1985 international dollars (PPP)

Figure 3



**Table 3: Income per capita
(with respect to DEV)**

	60-62	97-99
ARGENTINA	0.76	0.43
BRAZIL	0.31	0.29
CHILE	0.49	0.43
PARAGUAY	0.20	0.14
URUGUAY	0.65	0.39

Based on real GDP per capita in 1985 international dollars (PPP)

Table 4: Variance Decomposition Over time

1961-1999	Contribution of:		
	g(TFP)	g(f)	cov[g(TFP), g(f)]
ROW	93.28%	14.34%	-7.62%
DEV	88.63%	11.89%	-0.52%
Argentina	98.17%	1.92%	-0.10%
Brazil	98.17%	3.60%	-1.77%
Chile	89.78%	4.26%	5.96%
Paraguay	87.32%	7.82%	4.86%
Uruguay	112.37%	6.21%	-18.58%

Figure 4

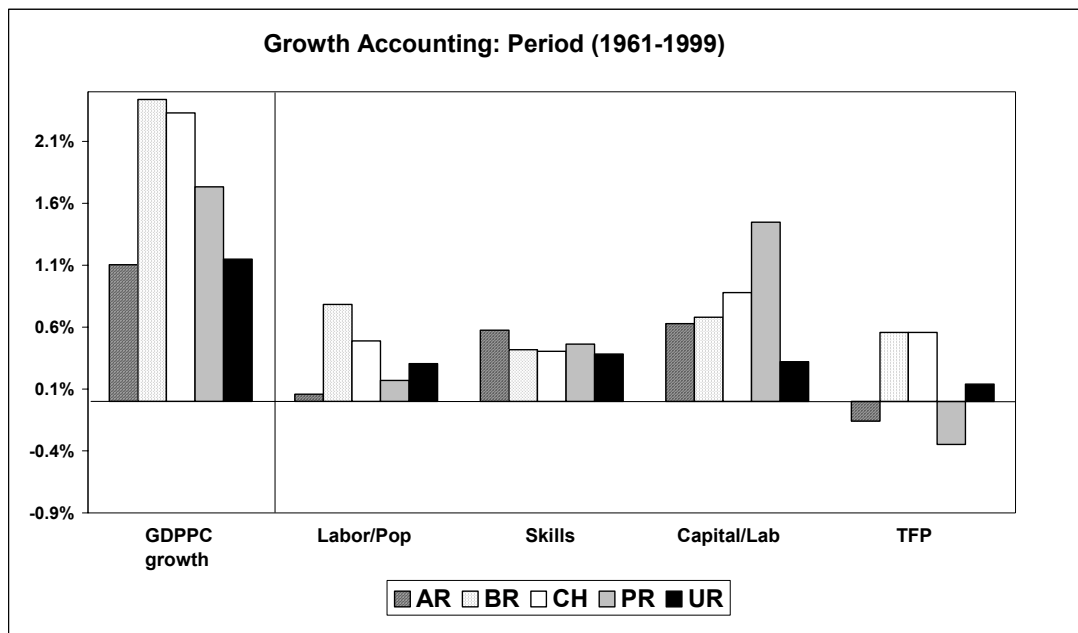


Figure 5

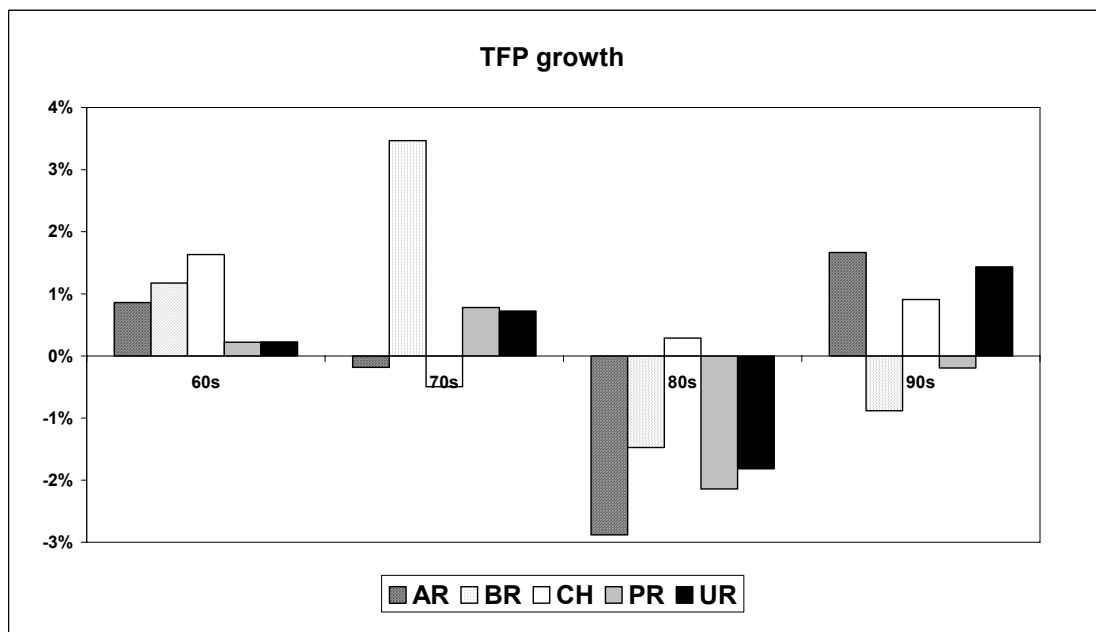


Table 5: Difference in growth with respect to rest of LAC (1961-99)

	GDP per-capita Growth	Labor/Pop	Skills	Capital/Labor	TFP
Argentina	0.02%	-0.40%	0.04%	0.16%	0.23%
Brazil	1.36%	0.33%	-0.12%	0.21%	0.94%
Chile	1.25%	0.03%	-0.13%	0.41%	0.94%
Paraguay	0.65%	-0.29%	-0.08%	0.98%	0.04%
Uruguay	0.07%	-0.15%	-0.16%	-0.14%	0.53%

Table 6: Difference in growth with respect to ROW (1961-99)

	GDP per-capita Growth	Labor/Pop	Skills	Capital/Labor	TFP
Argentina	-1.39%	-0.19%	0.05%	-0.27%	-0.98%
Brazil	-0.06%	0.54%	-0.11%	-0.22%	-0.27%
Chile	-0.17%	0.24%	-0.12%	-0.02%	-0.27%
Paraguay	-0.77%	-0.07%	-0.07%	0.55%	-1.17%
Uruguay	-1.35%	0.06%	-0.15%	-0.58%	-0.68%

Table 7: Difference in growth with respect to DEV (1961-99)

	GDP per-capita Growth	Labor/Pop	Skills	Capital/Labor	TFP
Argentina	-1.52%	-0.36%	0.20%	-0.30%	-1.07%
Brazil	-0.19%	0.37%	0.05%	-0.25%	-0.35%
Chile	-0.30%	0.07%	0.03%	-0.05%	-0.35%
Paraguay	-0.90%	-0.25%	0.09%	0.51%	-1.25%
Uruguay	-1.48%	-0.11%	0.01%	-0.61%	-0.77%

Table 8: Descriptive Statistics (1985-1999)

Variable	Description	Obs	Mean	Std. Dev	Min	Max
GRGDPPC	Growth rate of GDP per capita	219	0.015	0.026	-0.083	0.089
GRA	Growth rate of TFP	219	0.002	0.021	-0.071	0.061
GFAC	Growth rate of factors	219	0.013	0.011	-0.017	0.057
LGDPPC	Initial GDP per capita (in logs)	219	8.275	1.015	6.233	9.854
LGAPA	Initial productivity level (in logs)	219	5.442	0.401	4.313	6.156
LFAC	Initial factor level (in logs)	219	2.833	0.692	1.180	3.948
CYCLEY	Cyclical reversion in output: initial GDP per capita gap relative to trend (in logs)	219	-0.023	0.066	-0.240	0.276
CYCLEA	Cyclical reversion in productivity: initial productivity gap relative to trend (in logs)	219	-0.022	0.058	-0.217	0.230
CYCLEF	Cyclical reversion in factors: initial factor gap relative to trend (in logs)	219	0.000	0.030	-0.080	0.117
LSHYRM	Education: ave. years of sec. and higher schooling in male pop with 25+ (in logs)	210	0.653	0.718	-1.370	1.895
LLIFEE	Life expectancy at birth, years (in logs of [years/100])	219	-0.405	0.164	-1.058	-0.220
LELEC	Infrastructure: Electricity produced -kwh per capita- (in logs)	201	7.357	1.658	1.695	10.208
OPEN	Openness: structure-adjusted	216	0.078	0.417	-0.511	2.400
LINFLA	Inflation (in log of [1 + infla/100])	220	0.212	0.528	0.003	3.543
LOXR	Overvaluation of the real exchange rate (log of index)	207	4.592	0.372	3.561	5.561
LCREDIT	Credit to private sector / GDP (in logs)	217	-0.977	0.848	-3.631	0.712
LGOV	Government consumption / GDP (in logs)	218	-1.965	0.390	-3.133	-1.113
LMACHIN	Imports of machinery and equipment / GDP (in logs)	219	-2.925	0.677	-5.171	-0.346
GTOT	Growth rate of terms of trade	211	0.002	0.047	-0.328	0.301
ICRG	First principal components of ICRG variables	213	0.333	1.849	-4.121	3.075

Table 9: Correlations
(1985-1999)

	GRGDPPC	GRA	GFAC	LGDPCC	LGAPA	LFAC	CYCLEY	CYCLEA	CYCLEF	LSHYRM	LLIFEE	LELEC	OPEN	LINFLA	LOXR	LCREDIT	LGOV	ICRG
GRGDPPC	1																	
GRA	0.888	1																
GFAC	0.596	0.159	1															
LGDPCC	0.273	0.233	0.180	1														
LGAPA	0.256	0.192	0.215	0.901	1													
LFAC	0.257	0.235	0.140	0.964	0.752	1												
CYCLEY	-0.271	-0.426	0.161	0.175	0.203	0.141	1											
CYCLEA	-0.089	-0.295	0.324	0.152	0.180	0.120	0.827	1										
CYCLEF	-0.366	-0.297	-0.267	0.035	0.042	0.027	0.494	0.029	1									
LSHYRM	0.288	0.264	0.157	0.838	0.665	0.864	0.100	0.081	-0.008	1								
LLIFEE	0.322	0.208	0.327	0.869	0.775	0.841	0.046	0.083	-0.067	0.741	1							
LELEC	0.239	0.203	0.159	0.922	0.803	0.906	0.120	0.110	0.012	0.797	0.826	1						
OPEN	0.280	0.192	0.265	-0.001	0.016	-0.011	0.036	0.041	-0.013	-0.033	0.014	-0.023	1					
LINFLA	-0.232	-0.196	-0.155	-0.163	-0.128	-0.169	-0.234	-0.224	-0.041	-0.170	-0.134	-0.156	-0.202	1				
LOXR	-0.187	-0.117	-0.196	0.172	0.159	0.164	0.049	0.008	0.057	0.083	0.087	0.136	-0.208	0.116	1			
LCREDIT	0.230	0.134	0.259	0.681	0.531	0.707	0.232	0.238	0.010	0.571	0.560	0.634	0.219	-0.238	0.179	1		
LGOV	0.003	0.100	-0.169	0.479	0.392	0.486	0.150	0.137	0.035	0.419	0.324	0.459	-0.067	-0.197	0.250	0.460	1	
ICRG	0.325	0.307	0.162	0.855	0.700	0.868	0.210	0.224	-0.044	0.767	0.702	0.829	0.101	-0.302	0.181	0.702	0.561	1
GTOT	-0.108	-0.107	-0.046	-0.093	-0.115	-0.071	-0.091	-0.059	-0.055	-0.127	-0.012	-0.076	0.002	0.031	0.089	-0.029	-0.076	-0.064
LMACHIN	0.283	0.193	0.269	0.172	0.144	0.172	-0.003	0.040	-0.059	0.166	0.209	0.177	0.741	-0.239	-0.125	0.242	0.181	0.249

Table 10: Dependent Variable in Growth Rates

	5-year period (1985-1999)		
	GDPPC	FACTORS	TFP
Log of Initial Level	-0.0098 (1.44)	-0.0191 (3.93)**	-0.0059 (0.89)
Cyclical Reversion	-0.1218 (4.91)**	-0.0545 (2.31)**	-0.1285 (5.16)**
Education	0.0071 (1.51)	0.0034 (1.41)	0.0049 (1.26)
Life Expectancy	0.0780 (2.87)**	0.0664 (5.53)**	0.0230 (1.10)
Infrastructure	-0.0028 (0.98)	-0.0011 (0.87)	-0.0016 (0.66)
Openness	0.0113 (1.66)*	-0.0025 (0.78)	0.0116 (1.90)*
Inflation	0.0006 (0.08)	0.0050 (1.37)	-0.0033 (0.52)
Overvaluation of Exchange Rate	-0.0116 (2.22)**	-0.0068 (2.67)**	-0.0044 (0.97)
Credit to Private Sector	0.0030 (0.88)	0.0075 (4.23)**	-0.0027 (0.91)
Government Consumption	-0.0076 (1.21)	-0.0110 (3.62)**	0.0030 (0.54)
Imports of Machinery and Equipment	-0.0006 (0.17)	0.0037 (1.94)*	-0.0034 (0.99)
Terms of Trade Shocks	-0.0582 (1.87)*	-0.0191 (0.42)	-0.0351 (1.29)
First Principal Components of Institutional Var.	0.0054 (2.04)**	0.0026 (1.91)*	0.0035 (1.71)*
Obs	173	173	173
R2	0.41	0.38	0.32

t-statistics in parentheses

Year controls not shown

** Significant at 5 percent level; * Significant at 10 percent level

Figure 6

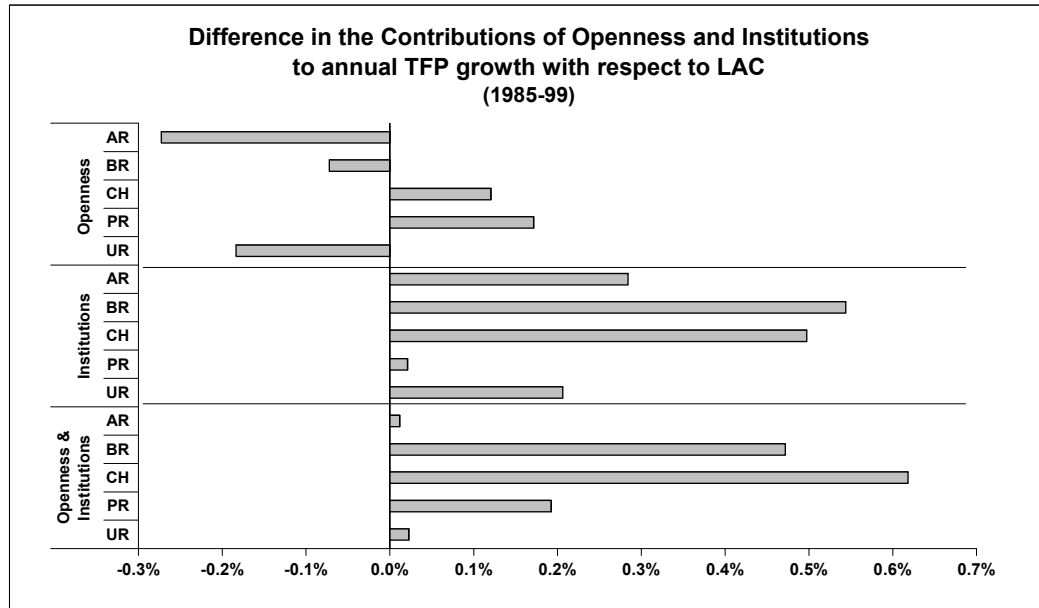


Figure 7

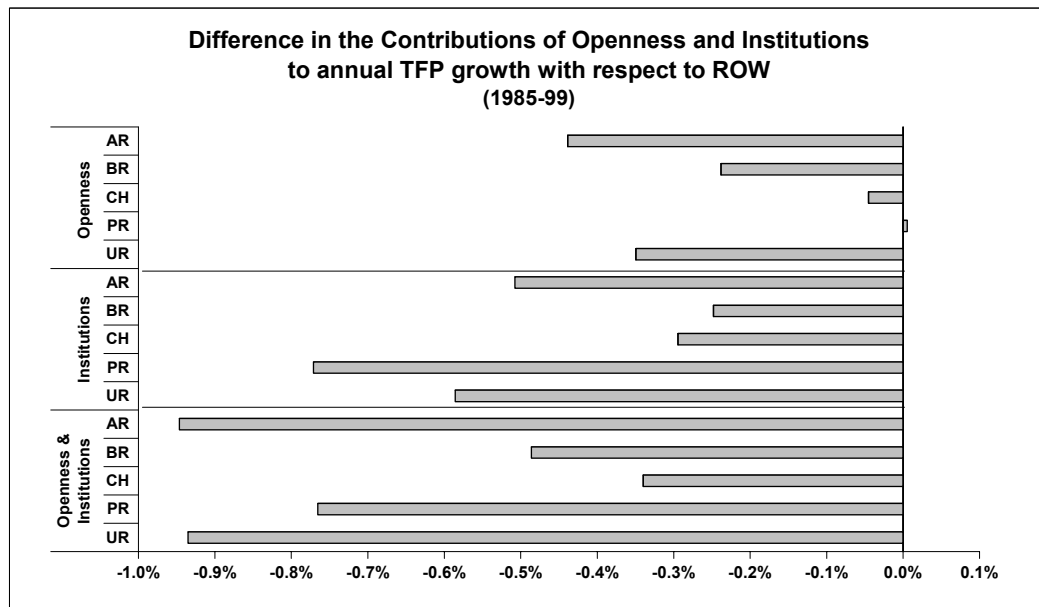


Figure 8

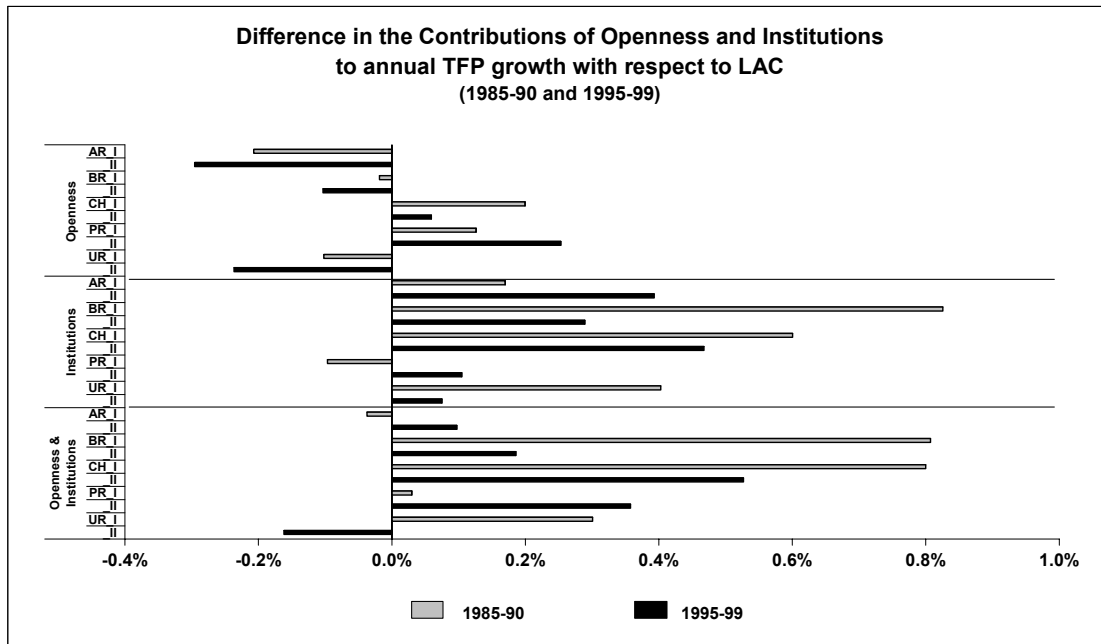
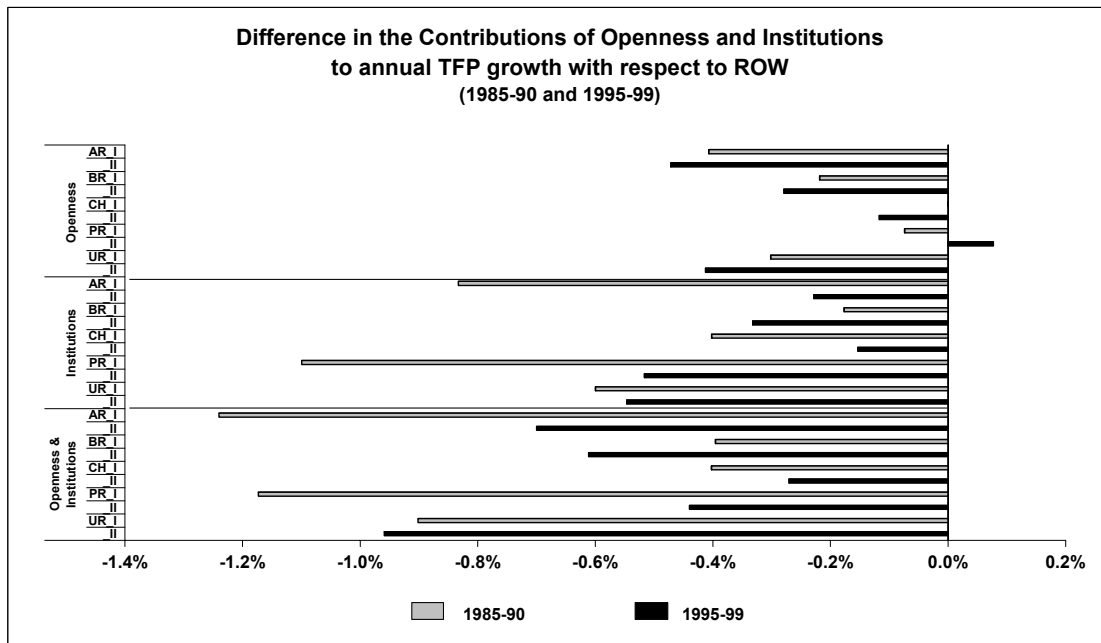


Figure 9



Appendix A

Groups of Countries:

Southern Cone Countries: Argentina, Brazil, Chile, Paraguay and Uruguay.

Rest of Latin America: Bolivia, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Venezuela.

Rest of the World: Australia, Austria, Belgium, Benin, Botswana, Cameroon, Canada, Cote d'Ivoire, Cyprus, Denmark, Egypt, Fiji, Finland, France, Germany, Ghana, Greece, Hong Kong, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kenya, Korea, Madagascar, Malawi, Malaysia, Morocco, Netherlands, New Zealand, Norway, Pakistan, Papua New Guinea, Philippines, Portugal, Senegal, Sierra Leone, Singapore, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Syria, Thailand, Togo, Tunisia, United Kingdom, United States, Zimbabwe.

Developed Countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom, United States.

Data Sources:

GDP	Penn World Tables 5.6, Easterly and Levine (2001), and World Dev. Indicators
Capital	Penn World Tables 5.6, Easterly and Levine (2001), and World Dev. Indicators
Labor force	World Development Indicators
Years of education	Barro and Lee data base
Life expectancy	World Development Indicators
Electricity consumption	World Development Indicators
Openness	Authors construction using WDI data
Inflation	Global Development Finance and World Development Indicators
Overvaluation of XR	Easterly and Levine (2001)
Credit to private sector	World Development Indicators
Government consumption	World Development Indicators
Imports of machinery	UN Commodity Trade Statistics Database
Terms of Trade	Global Development Finance and World Development Indicators
Institutional variables	International Country Risk Guide

Appendix B

The labor and capital data employed in the growth accounting exercises of this paper refer to the inputs that are “available” in the marketplace rather than the inputs “effectively used” in the economy. In this Appendix we explain how this is consistent with a broad definition of total factor productivity. Consider the following production function:

$$(1) \quad Y = K_u^\alpha \cdot (h_u \cdot L_u)^{1-\alpha} \cdot A_u$$

where K_u and $h_u L_u$ are the capital and labor inputs effectively utilized in the production process and A_u the corresponding observed productivity. Denoting the levels of available capital and labor inputs as K and hL respectively (L being unskilled labor and h its average skill level), we can use the following expressions:

$$K_u = K \cdot \frac{K_u}{K} \quad ; \quad L_u = L \cdot \frac{L_u}{L} \quad ; \quad h_u = h \cdot \frac{h_u}{h}$$

to rewrite equation (1) as follows:

$$(2) \quad Y = \left(K \cdot \frac{K_u}{K} \right)^\alpha \cdot \left(h \cdot \frac{h_u}{h} \cdot L \cdot \frac{L_u}{L} \right)^{1-\alpha} \cdot A_u$$

In growth rates, equation (2) becomes:

$$(3) \quad (\hat{Y}) = \alpha \cdot (\hat{K}) + \alpha \cdot \left(\frac{\hat{K}_u}{K} \right) + (1-\alpha) \cdot (\hat{h}) + (1-\alpha) \cdot \left(\frac{\hat{h}_u}{h} \right) + (1-\alpha) \cdot (\hat{L}) + (1-\alpha) \cdot \left(\frac{\hat{L}_u}{L} \right) + (\hat{A}_u)$$

From this expression, it can be seen that the growth rate of output depends on the growth rate of the available inputs and skills $(\hat{K}), (\hat{L}), (\hat{h})$, the growth rate of the utilization of these inputs and skills $(\hat{K}_u/K), (\hat{L}_u/L), (\hat{h}_u/h)$, and the growth rate of productivity (\hat{A}_u) .

The productivity variable in this specification is not affected by changes in factor utilization rates. This productivity variable only reflects changes in aggregate “technology” springing either from changes in efficiency at the micro level or from changes in the efficiency of the overall economic environment in which the production takes place. We like to think about efficiency, however, in a broader sense, taking into account the additional output that would be obtained if available inputs that are not channeled into the production process were utilized. We view idle input resources as a form of inefficiency and want to measure it accordingly. To achieve this, we want to measure total factor productivity relative to potential output under full utilization of inputs available in the marketplace.

For example, consider two economies, A and B, with the same endowments and technology. Country A, however, exhibits a larger unemployment rate. We like to think country A as being less efficient than country B because it produces less with the same amount of available resources. Growth accounting exercises based on the amount of inputs used (rather than the amount of inputs available) will conclude that the productivity of both countries is the same, therefore, failing to capture this type of inefficiency. The productivity variable will only capture this inefficiency if the growth accounting exercises are based on the amount of inputs available. To see this, consider the following production function:

$$(4) \quad Y = K^\alpha \cdot (h \cdot L)^{1-\alpha} \cdot A$$

Here, K and hL represent the levels of inputs of capital and labor “available” in the economy. Expressing equation (4) in growth terms and solving for the growth rate of productivity gives:

$$(5) \quad (\hat{A}^*) = (\hat{Y}) - \alpha \cdot (\hat{K}) - (1-\alpha) \cdot (\hat{h}) - (1-\alpha) \cdot (\hat{L})$$

Finally, using equation (3) to substitute for (\hat{Y}) in this expressions gives:

$$(6) \quad (\hat{A}) = (\hat{A}_u) + \alpha \cdot \left(\frac{\hat{K}_u}{K} \right) + (1-\alpha) \cdot \left(\frac{\hat{h}_u}{h} \right) + (1-\alpha) \cdot \left(\frac{\hat{L}_u}{L} \right)$$

Expression (6) shows that the growth rate of productivity (\hat{A}) , depends on the growth rate of “technological” change (\hat{A}_u) , and the growth rates of factor utilization of capital (\hat{K}_u/K) , labor (\hat{L}_u/L) , and skills (\hat{h}_u/h) . Therefore, for example, if an economy exhibits an increase in

the rate of unemployment, that is $(\hat{L}_u/L) < 0$, this will be captured as a lower productivity growth (\hat{A}) .

Understandably, there are changes in the utilization of inputs along the economic cycle. Economies tend to use more or less inputs depending on which phase of the cycle they are. Therefore, it would be misleading to judge an economy as less efficient just because it is in a lower part of the cycle. The issue of factor utilization becomes important only if there are differences in long-run trends. Consequently, in our growth accounting exercises we use 10-year averages to smooth out changes in the utilization of inputs due to the cycle.

Following equation (6), we used data on employment and labor force to measure the size of the contribution of the utilization of labor $(1 - \alpha) \cdot (\hat{L}_u/L)$, on the growth rate of productivity (\hat{A}) . We show that in general this contribution is rather small (see figure B.1). An immediate implication of the smallness of these contributions is that the results and conclusions of this paper, which is based on the analysis of decade averages, do not change qualitatively if we adjust for the rate of unemployment.

Figure B.1

