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## macroeconomía del desarrollo

# **E**conomic growth in Latin America in the late 20<sup>th</sup> century: evidence and interpretation

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## Contents

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<b>Abstract</b> .....	5
<b>I. Introduction</b> .....	7
<b>II. The empirical evidence and stylized facts on economic growth</b> .....	9
<b>III. Growth cycles</b> .....	13
<b>IV. Sources of growth</b> .....	17
<b>V. Growth episodes</b> .....	31
<b>VI. On the determinants of TFP growth in Latin America</b> .....	35
<b>VII. Conclusions and final remarks</b> .....	39
<b>Bibliography</b> .....	41
<b>Serie macroeconomía del desarrollo: issues published</b> .....	43

## Tables

Table 1	Average per capita GDP growth rates.....	10
Table 2	Changes in economic performance in Latin American economies.....	12
Table 3	Growth crisis in Latin America and reference group.....	15
Table 4	Growth accounting for Latin American economies.....	20
Table 5	Private and public investment in Latin America.....	22
Table 6	Growth accounting for reference group economies.....	25
Table 7	Growth episodes in Latin America and other countries.....	32
Table 8	Growth cycles in Latin America and other countries.....	33
Table 9	Correlation of TFP growth and other variables in Latin American Countries.....	36
Table 10	Granger causality tests panel data for 12 Latin American countries.....	38

## Figures

Figure 1	Histograms of annual GDP growth rates.....	11
Figure 2	Real per capita GDP and long run trends.....	19
Figure 3	Real per capita GDP and long run trends.....	21
Figure 4	Real GDP per working-age person and total factor productivity.....	23
Figure 5	GDP per working-age person and total factor productivity.....	27
Figure 6	Movements towards efficiency frontiers.....	28
Figure 7	Real GDP per working-age person and total factor productivity detrended by 2% ...	29

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## Abstract

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The 1980s and 1990s have been decades of instability and slow growth for most of the Latin American region. There are exceptions, however. Chile and the Dominican Republic grew rapidly in the last decade or so although in recent years both economies, for different reasons, have entered in cycles of more sluggish growth.

The purpose of this paper is to advance our understanding of the growth patterns of the Latin American economy in the final decades of the 20th century. We focus on the analysis of medium-to-long run growth, as opposed to the standard discussion of the determinants of high frequency fluctuations (business cycles), and disentangle the contribution of factor accumulation and total factor productivity. While business cycles are of interest for stabilization policies, growth cycles tend to be related to different variables from those that determine short-run growth, such as investment, human capital formation and the adoption of technology.

We also want to understand the spells of prosperity and stagnation in several important economies of the region, as well as identify stories of growth decline and divergence in recent decades. The role of factor accumulation and total factor productivity growth performance are investigated in the paper, as well as the role of terms of trade shocks and capital inflows, changes in the quality of the labor force and macroeconomic instability on total factor productivity growth (TFP) and GDP growth.



## I. Introduction

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Economic growth in Latin America in the last 30 years or so has been modest (in per capita terms) and volatile. This period has witnessed cycles of prosperity, stagnation, and negative growth. The last third of the 20th century was also characterized by shifting patterns of capital flows, recurrent terms of trade shocks, substantial economic reforms and a rapidly changing global economy. In this context understanding economic growth as a smooth process around a secular trend is a far departure from reality. On the contrary, the growth process of Latin America in this period is better characterized by a complex interaction of shifting growth trends, superseding with complex cycles of variable intensity and duration. Besides, at national level, a wide variety of growth stories are detected. It is not uncommon to find in the last 30-40 years, several episodes of prosperity of near a decade followed by protracted stagnation or outright growth meltdown in several countries of the region.

The growth regimes of recent decades have in the background the large shocks of the 1970s, 1980s and 1990s and the early 21<sup>st</sup> century. In the 1970s, the region was able to "sort-out" the global shocks of the 1970s (the collapse of Bretton Woods exchange rate parities and the two oil-price shocks) through abundant and cheap external borrowing that proved to be temporary; then it came the debt crises of the 1980s followed by a period of slow and unstable growth and macroeconomic instability. In the early to mid 1990s the region adopted market-oriented policies and enjoyed a new cycle of easy external borrowing. In spite of a cyclical recovery and one-time efficiency gains, sustained growth proved again to be elusive. After the Asian and Russian crises, Latin America has entered into a cycle of

sluggish growth that has lasted more than half a decade. Thus, large external shocks, important changes in the global economy, and internal policy transformations have dominated the growth process of the last 30 or 40 years in Latin America.

The 1980s and 1990s have been decades of instability and slow growth for most of the Latin American region. There are exceptions, however. Chile and the Dominican Republic grew rapidly in the last decade or so although in recent years both economies, for different reasons, have entered in cycles of more sluggish growth.

The purpose of this paper is to advance our understanding of the growth patterns of the Latin American economy in the final decades of the 20th century. We focus on the analysis of medium-to-long run growth, as opposed to the standard discussion of the determinants of high frequency fluctuations (business cycles), and disentangle the contribution of factor accumulation and total factor productivity. While business cycles are of interest for stabilization policies, growth cycles tend to be related to different variables from those that determine short-run growth, such as investment, human capital formation and the adoption of technology.

We also want to understand the spells of prosperity and stagnation in several important economies of the region, as well as identify stories of growth decline and divergence in recent decades. The role of factor accumulation and total factor productivity growth performance are investigated in the paper, as well as the role of terms of trade shocks and capital inflows, changes in the quality of the labor force and macroeconomic instability on total factor productivity growth (TFP) and GDP growth.

The paper is organized in six sections. Section II analyzes the main stylized facts of economic growth in the last 40 years in Latin America. Section III identifies medium term growth cycles as deviations from trend growth that can cumulate for decades. Section III examines growth crises in Latin America. Section IV carries-out a source of growth exercise for 12 Latin American economies discussing the behavior of TFP growth and factor accumulation comparing it to a reference group of six economies in Asia and Europe. Section V constructs several episodes of “sustained growth” and “sustained decline” in Latin America in the 1960-2002 period. Section VI analyzed the role of several external variables, macroeconomic factors and factor quality in driving TFP growth and GDP growth. Section VII concludes.



## II. The empirical evidence and stylized facts on economic growth

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We study the growth record of twelve Latin American economies (representing nearly 90 percent of Latin American GDP) over a period of 42 years, running from 1960 to 2002.<sup>1</sup> In Table 1 we present the main indicators of long-run growth for these countries. From this evidence, we highlight three stylized facts.

*Stylized fact 1:* there is substantial heterogeneity and volatility in long run growth

What is remarkable of the Latin American growth experience in this period is the variability and volatility in growth patterns, across countries and over time. In fact, the average rate of growth of per capita GDP for the 12 countries in the 1960-2002 period was 1.6 percent. This rate is similar to the 1.7% level computed for the world by Maddison (2003) but below the 2 percent average rate of growth of the U.S. in the 20th century documented in Kehoe and Prescott (2002). This suggests that in the last four decades Latin America has lagged behind world economic growth.<sup>2</sup> Given the unequal distribution of income in Latin American economies, an average rate of growth of GDP per capita of 1.6 percent in the last 42 years makes the pace of poverty reduction very slow.

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<sup>1</sup> These economies are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Mexico, Peru, Uruguay and Venezuela.

<sup>2</sup> Using the median for comparison, instead of the average, does not change the results.

In addition, there is substantial heterogeneity in growth experiences across Latin American economies. As depicted in Table 1, five of these economies have grown well below the 2% benchmark in the 1960-2002 period. The dismal performance of Argentina, Bolivia, Peru, Uruguay and Venezuela is apparent. While only two economies exhibit vigorous growth rates –Chile and the Dominican Republic– the remaining countries show that they have merely kept the pace of growth of the more developed economies.

**Table 1**  
**AVERAGE PER CAPITA GDP GROWTH RATES**  
*Average annual GDP Growth rates (%)*

	1960-2002	1960-1980	1981-2002
<b>Argentina</b>	0.9	2.6	-0.6
<b>Bolivia</b>	1.0	2.3	-0.3
<b>Brazil</b>	2.2	4.6	0.1
<b>Chile</b>	2.5	1.6	3.2
<b>Colombia</b>	1.8	2.6	0.9
<b>Costa Rica</b>	2.0	3.1	0.9
<b>Dominican Republic</b>	3.2	4.7	3.0
<b>Ecuador</b>	2.0	5.4	-0.2
<b>Mexico</b>	2.1	3.7	0.6
<b>Peru</b>	0.7	1.8	-0.2
<b>Uruguay</b>	0.8	1.5	0.1
<b>Venezuela</b>	0.1	1.6	-1.3
<b>Unweighted Average</b>	<b>1.6</b>	<b>3.0</b>	<b>0.5</b>

**Source:** own elaboration based on data from ECLAC.

*Stylized fact 2: There was a substantial slowdown in economic growth after 1980.*

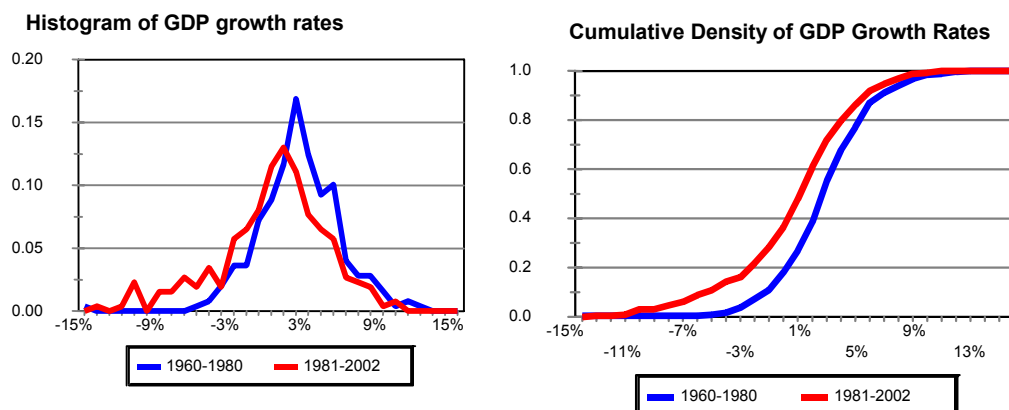
In terms of growth patterns, we should distinguish two sub-periods in the sample: 1960-1980 and 1981-2002.<sup>3</sup> The (unweighted) average rate of growth of per capita GDP in the 1960-1980 period was 3.0 percent for the 12 countries, significantly higher than that in the period 1981-2002 of 0.5 percent. In turn, the standard deviation of growth rates was 3.7 in the period 1960-80 and 4.7 in 1981-2002. This shows an important result: after 1980, economic growth has become slower and more volatile than in the two previous decades. This change in the growth pattern of the Latin American region verifies at any growth rate, as displayed in the histogram of growth rates for the 12 countries in the 1960-80 and 1981-2002 periods in Figure 1. The modest growth performance of Latin America in the period 1981-2002 can be appreciated in the shifting of the distribution to the left. It also shows when comparing the cumulative densities of growth rates for both sub-periods. These cumulative densities show that the probability of having less than zero growth for any given country in the period 1960-80 is close to 30 percent compared close to 50 percent in the period 1981-2002. The figure also shows that there is stochastic dominance: economic growth was slower in the 1981-2002 period, for any level of GDP growth.

Two caveats are in order here. First, the deceleration in per capita growth rates observed in Latin America in the 1980-2002 period also coincides with slower per capita growth in the world economy in the same period. Yet, the decline in per-capita GDP growth in Latin America is much larger than that of developed economies: in the US, per capita GDP growth declined from 1.7% per year in the 1960-1980 period to 1.1% in the 1981-2002 period. Second, as mentioned before, the growth deceleration is not uniform across countries. For example Chile and Dominican Republic accelerated per capita growth in the 1980-2002 period, in contrast with the other 10 countries that decelerated their rate of growth in the period 1980-2002.<sup>4</sup>

<sup>3</sup> Setting the break at 1980 is to some extent arbitrary but practical for comparison. In some countries, GDP decline started slightly before 1980 (as early as 1975). For no country the break occurred after 1981.

<sup>4</sup> The 1981-2002 period is also quite heterogeneous: average per capita GDP grew at 1.1% in the 1990s while it was negative in the 1981-1990 period (-0.3%).

Figure 1  
HISTOGRAMS OF ANNUAL GDP GROWTH RATES



Source: authors elaboration.

With the only exception of Chile, growth rates in all Latin American economies in the 1981-2002 period were lower than that of the 1960-1980 period. In some countries the rapid growth of the 1960s and 1970s was followed by a period of very slow growth. For example, in Brazil, Ecuador, and Mexico, GDP growth rates in the 1981-2002 were one fourth of their 1960-1980 levels. In five countries average per-capita GDP growth rates have been negative for the last 20 years (Argentina, Bolivia, Ecuador, Peru, and Venezuela), leading to complete stagnation if not outright decline. Other economies saw a marked reduction in their growth rates but managed to expand per-capita GDP albeit modestly (e.g., Colombia or Costa Rica).

*Stylized Fact 3: There are important changes in the relative growth performance between countries.*

It is interesting to note that there was an important change in the growth performance across countries between 1980-2002 and 1960-80. Relatively rapid growers, defined as those countries with annual rates of growth in per capita GDP above 3 percent in the period 1960-80, included six countries: Brazil, Mexico, Costa Rica, Colombia, Dominican Republic, and Ecuador (see Table 2).<sup>5</sup> In contrast, the most rapid growers in the 1960-1980 period, Mexico and Brazil, –also the largest Latin American economies– became slow growers in the 1980-2002 period, registering annual rates of growth of GDP per capita between 0 and 1 percent in that period. Interestingly these results are not driven only by their record during the “lost decade” of the 1980s: Brazil average rate of growth per capita in the 1990-2002 period was 0.4 percent. The rate of growth of GDP per capita of Mexico was 1.3 percent, higher than Brazil, in the same period.

Modest growers in 1960-1980 –annual rates of growth of GDP per capita of in the range 1 to 2 percent– were Chile, Peru, Venezuela and Uruguay. In contrast, Chile in the period 1980-2002 became the only “rapid grower”, according to our definition, registering annual rates of growth in GDP per capita above 3 percent.<sup>6</sup> In the period 1980-2002 a handful of economies shrunk, experiencing average negative growth rates per capita. These economies are Argentina, Bolivia, Peru, and Venezuela (see Table 2).

<sup>5</sup> See ECLAC (2002) for an analysis of the Latin American economy in a longer perspective.

<sup>6</sup> See Solimano (1996), Loayza and Soto (2002), Schmidt-Hebbel (1997) for analyses of the growth process in Chile in the 1990s and before.

**Table 2**  
**CHANGES IN ECONOMIC PERFORMANCE IN LATIN AMERICAN ECONOMIES**  
*Countries where real per capita income grew*

	<b>less than zero</b>	<b>0% to 1%</b>	<b>1% to 2%</b>	<b>2% to 3%</b>	<b>above 3%</b>
<b>1960-1980</b>			Chile Peru Uruguay Venezuela	Argentina Bolivia	Brazil Costa Rica Colombia Dom. Rep. Ecuador Mexico
<b>1980-2002</b>	Argentina Bolivia Peru Venezuela	Brazil Colombia Costa Rica Ecuador Mexico Uruguay		Dom. Rep.	Chile

**Source:** Own elaboration based on data by ECLAC.

### III. Growth cycles

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Let us turn now to growth cycles. How to define a growth cycle is not a simple matter. Analytically, the study of economic growth processes has been conducted at three levels: (i) long-run or steady-state growth, this is a time span of 50 years or more; (ii) medium run growth dynamics, comprising periods of 10 to 30 years and (iii) short run (high frequency) fluctuations of growth, say business cycles of up to 4 years.<sup>7</sup>

The actual time series of GDP growth, in turn, reflect a complex interaction of trend and cyclical growth of different frequencies. We will be interested here in detecting cycles of prosperity and cycles (or phases) of slow growth or stagnation that last a substantial time period, say a decade or more. Again our focus is on growth cycles rather than on business cycles, although high frequency cycles may be correlated with medium-run growth cycles (see Fatás, 2002).

We will use a criterion for identifying growth cycles based on comparing the dynamics of actual per capita GDP growth relative to a long run growth trend. Assuming away changes in the capital–output ratio we shall assume that trend growth in GDP per working age person as driven by the evolution of knowledge useful in production.<sup>8</sup> Trend growth will be assumed to be exogenous.

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<sup>7</sup> See Pritchett (2000) and Comin and Gertler (2003) on volatility of growth and decomposition of growth series. Earlier literature dealt with overlapping of cycles of different frequency and duration. Schumpeter (1939) for example identified at least 3 cycles: a short-term cycle of no more than 4 years (Kitchen Cycle), a medium-run cycle of over 10 years (Juglar cycle) and a long-run cycle of approximately 50 or 70 years (Kondratieff cycle).

<sup>8</sup> See Solow (1956) and Kehoe and Prescott (2002).

Also knowledge is postulated to grow smoothly over time at a constant rate given by the rate of the GDP per capita of the industrial leader, the United States, which as said before, grew at 2 per cent per year in the 20<sup>th</sup> century.<sup>9</sup> Of course an individual country's trend growth may differ from that number but it is still a good reference point to judge long run growth performance and also deviations from trend. In a subsequent we will identify "growth episodes" of persistent or sustained growth and also sustained decline. We will also compare the growth performance of the Latin American economies with a reference group of a set of economies outside the region.

For the time being, we will assume that if actual GDP growth per capita (or per working age person) is above its trend rate of growth we shall identify it as a boom or a period of prosperity. Conversely if growth is below trend for at least decade we shall identify it as a period of growth slowdown or a stagnation phase. Large deviations from trend can occur and be persistent over time. Some authors have even defined as "great depressions" -in a modern meaning of the term, different from the classical definitions used to describe 1930s type of depressions- as a period in which output per working age population fell 20 percent below trend (with at least 15 percent taking place in a decade, see Kehoe and Prescott, 2002).

Figure 2 shows the evolution of GDP per capita for each of the 12 countries considered, normalizing the data using 1960=100. There is a wide variety of paths in per capita GDP in the last 40 years for different countries. Countries such as Brazil, Mexico and Dominican Republic grew above the 2 percent trend for several years . However, Mexico and Brazil start a protracted period of slow GDP per capita growth in the early 1980s. Dominican Republic accelerates its growth rate above trend more sharply since the early 1990s.

A country that was above the trend of 2 percent growth for a decade (or more) was Ecuador in the 1970s where the country experienced a boom of very rapid growth, led essentially by the oil sector. Chile's GDP per capita fell below the line of trend growth for almost 20 years since the early 1970s to the early 1990s; however, due to the rapid growth process initiated in the mid to late 1980s Chile's growth crosses and surpasses the 2 percent trend line in the early 1990s.

A group of Latin American countries experienced a long cumulative slowdown in which actual GDP per capita deviated from trend growth. That cumulative deviation from trend lasts for a quarter century. These economies have suffered "great depressions" in the Kehoe and Prescott (2002) definitions. The group includes Argentina, Bolivia, Peru, Uruguay, and Venezuela. We already had shown that these economies experienced *negative* average GDP growth per capita in the 1980-2002 period.

Argentina's GDP per capita started to fall below trend growth in the late 1970s, there were cyclical growth accelerations (e.g. in the first half of the 1990s) without returning back to the trend in a sustained way. Uruguay, in turn, has diverged from the international trend since the early the early 1960s, with growth accelerations in the mid-1970s and early 1990s followed by a sharp decline in the early 2000s. Bolivia's growth started to decline relative to trend since the late 1970s. Economic growth in Venezuela, an oil exporter country, started to depart from the international trends since the mid-1970s likewise Peru. Clearly, the growth record of these countries is very meager as measured relative to trend growth accumulating a cycle of growth slowdown for more than two decades in a few cases.

The empirical evidence shows also a high frequency of "growth crisis" in Latin America, particularly in the 1980-2002 period. A "growth crisis" is defined here as any year in which the rate of growth of GDP is negative. Table 3 presents the crisis accounting results. It is striking that in the 12 Latin American countries the average number of years of growth crisis was 12 years (11.9) in the

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<sup>9</sup> The actual trend in per-capita GDP in the US and other developing economies in 1960-2002 period is sometimes depicted as comprising two regimes: one for the 1960-1980 period of around 2.3% per year and one for the remaining period of 1.7% per year. For the purposes of our study, this break is inconsequential and we, thus, use a 2% benchmark.

period 1960-2002. That is, one crisis every three years. In turn, the frequency of growth crisis was almost twice as much in the 1980-2002 than in the 1960-80 period. The higher simultaneous concentration of growth crisis in several Latin American countries took place in 1981-83, the years of the onset of the debt crisis of the 1980s.

**Table 3**  
**GROWTH CRISIS IN LATIN AMERICA AND REFERENCE GROUP**

	Number of years with negative GDP growth rates			Percentage of crisis in total period
	1960-1980	1981-2002	1960-2002	
<b>LATIN AMERICAN COUNTRIES</b>				
<b>Argentina</b>	6	11	17	41.5
<b>Bolivia</b>	4	10	14	34.1
<b>Brazil</b>	3	9	12	29.3
<b>Chile</b>	6	3	9	22.0
<b>Colombia</b>	0	7	7	17.1
<b>Costa Rica</b>	2	8	10	24.4
<b>Dom. Republic</b>	4	4	8	19.5
<b>Ecuador</b>	2	8	10	24.4
<b>Mexico</b>	0	8	8	19.5
<b>Peru</b>	5	10	15	36.6
<b>Uruguay</b>	6	9	15	36.6
<b>Venezuela</b>	6	12	18	43.9
<b>Average</b>	<b>3.7</b>	<b>8.3</b>	<b>11.9</b>	<b>29.3</b>
<b>REFERENCE GROUP</b>				
<b>Korea</b>	2	1	3	7.3
<b>Thailand</b>	0	2	2	4.9
<b>Philippines</b>	0	7	7	17.1
<b>Ireland</b>	1	2	3	7.3
<b>Spain</b>	2	2	4	9.8
<b>Turkey</b>	5	6	11	26.8
<b>Average</b>	<b>1.7</b>	<b>3.3</b>	<b>5.0</b>	<b>12.3</b>

**Source:** Own elaboration based on ECLAC and IMF data.

Also in 2001-2002 there is a high concentration of growth crisis. The country with the highest frequency of growth crisis in the last four decades is Venezuela (18 years) followed by Argentina (17 years), Peru (15 years) and Uruguay (15 years). The country with the lowest frequency of growth crisis is Colombia (7 years); in that country all the crisis took place in the 1980-2002 period. This evidence points out the volatility of the growth process in Latin America, particularly since 1980. Some of these crisis episodes were triggered by common external shocks like the debt crisis of the early 1980s. However, internal policies and country-specific volatility (inflation, fiscal deficits, currency volatility) are ingredients observed in certain periods in Argentina and Venezuela. These developments have to be correlated with the growth record of these two economies.

Summing up, the evidence presented here indicates that the growth slowdown of the last two decades in Latin America has been accompanied by a high frequency of growth crises around a low

mean growth rate. Of course the defining parameters of the contours of growth paths (mean and variance) vary from country to country.

*Comparison with Reference Group*

The growth performance of Latin America can be seen in comparative perspective to the reference group of six European and Asian economies: Korea, Thailand, Spain, Ireland, the Philippines and Turkey. Using the 2 percent benchmark of trend growth for GDP per capita starting in 1960=100, it is noteworthy that several of these countries already in the 1960s surpassed the trend and grew much faster over sustained periods of time. This was the case of Korea, Thailand, Spain and Ireland, although the different countries have their own growth cycles. Still the tendency in these economies was to depart in a sustained way from the international growth trend. However, it is fair to say that Philippines and Turkey have growth paths that resemble more the Latin American record. The Philippine stays over the trend in the 1960s until the mid 1970s when growth accelerates to decline and stagnate after the early 1980s when the country was hit by the debt crisis. Turkey in turn, shows a highly cyclical path of growth (at high frequencies) around the trend punctuated by crisis in the late 1970s and in the early 2000s.

Differences in growth performance between Latin America and these economies can be gauged by the following simple calculation, that identifies in which year the level of GDP per capita of each of the reference group economy reaches the average index of GDP per capita of the 12 Latin American economies by the end of 2002 (see upper line in Figure 3). Korea reached that level in the early 1980s, Thailand in about 1990, Spain in 1997, Ireland in 1996. Turkey and Philippines do not reach the same level in the sample period of the experiment.

To put in perspective the high frequency of growth crises in Latin America we replicate the crisis accounting exercise for the reference group. In these countries the average number of years with negative growth rates is five years, less than half as much the average number of growth crises in the 12 Latin American countries in the 1961-2002 period. The countries with the highest incidence of growth crisis are Turkey and the Philippines, again with the highest number of growth crises taking place in the 1980-2002 period.



## IV. Sources of growth

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In this section we compute the sources of growth for the 12 Latin American economies as well as for the six other economies that which we use as reference group. We decompose GDP growth into factor accumulation and TFP growth.

### *The Measurement of Total Factor Productivity*

In order to measure total factor productivity (TFP) in each country we assume that GDP is produced according to the following Cobb-Douglas production function:

$$GDP_t = A_t \mu_t K_t^\alpha e_t L_t^{1-\alpha}$$

where  $e_t$  is an indicator of the efficiency of hours worked,  $L_t$ , and  $\mu_t$  is the occupation rate of capital,  $K_t$ . Parameter  $A_t$  is an indicator of the technical efficiency in the use of factors. In this paper we define TFP to encompass not only technical efficiency but also the efficiency of labor and the degree of use of the capital stock. Consequently, in our view several elements could affect factor productivity beyond the technical ability to mix inputs and generate goods. For example, government regulation leading to lower product with same use of inputs is interpreted as declining TFP.

To compute TFP we need to build capital series. For eight countries –Argentina, Bolivia, Chile, Colombia, Costa Rica, Mexico, Peru, and Venezuela– we use the capital series provided by Hofman (2003). For all other countries, we cumulate investment,  $I_t$ , according

to the perpetual inventory method and an annual depreciation rate,  $\delta$  of 5%:<sup>10</sup>

$$K_{t+1} = (1 - \delta)K_t + I_t$$

In addition, we need an estimate for the share of capital in GDP,  $\alpha$ . National income accounts indicate that the share of labor compensation in GDP valued at factor prices (GDP at market prices minus indirect taxes) is small in Latin American economies relative to, say, that in the OECD countries. We choose a higher value of the labor share for growth accounting 0.65 –corresponding to  $\alpha=0.35$ – for two reasons. First, measured labor compensation in developing countries fails to account for the income of most self-employed and family workers, who make up a large fraction of the labor force. Gollin (2002) shows that, for countries where there is sufficient data to adjust for this measurement problem, the resulting labor shares tend to be close to the value in the United States, 0.70. Second, a high capital share implies implausibly high rates of return on capital.<sup>11</sup> The results are largely unaffected by the choice of this parameter.

Given our choice of  $\alpha$  and the computed capital series, we calculate *TFP*, as follows:

$$TFP_t = \frac{GDP_t}{K_t^\alpha L_t^{1-\alpha}}$$

In order to eliminate transient phenomena, we focus on long-run changes in TFP and GDP and, hence, concentrate in decades rather than year-to-year variations. Table 4 presents the results of this growth accounting exercise for our sample of 12 Latin American economies.

The decline in growth is to some extent the result of changes in factor accumulation. The evidence in Table 4 suggests there was a decline in capital accumulation in the last 20 years in all Latin American economies except Chile, but the magnitude of the effect is relatively small and, hence, cannot be the driving force for the differences in the growth performance of Latin American economies. On average, lower capital accumulation accounts for only 0.6 percentage points or roughly one third of the drop in GDP growth. Nevertheless, the impact in some countries has been much larger: in Brazil, Mexico, and Venezuela it accounts for around 1.5 percentage points, while in Argentina it accounts for one percentage point. Yet, in these cases lower capital accumulation still represents only one third of the total fall in GDP growth. On the other hand, the contribution of capital accumulation in more successful economies (such as Chile and the Dominican Republic) remained unchanged in the entire period, suggesting also a minor role for capital accumulation in determining the differences in long run growth.

An additional look at the role of capital accumulation is provided in Table 5. It can be seen that the decline in the contribution of capital to growth is, in general, not the result of lower investment rates in the private sector.<sup>12</sup> Only in Bolivia and Ecuador there is a one-percentage point drop in private investment as share of GDP. Public investment, on the other hand, reduced in seven of the 12 countries, in particular in Argentina.

This evidence, which suggests that there may be an important role for public investment as a source of growth, is consistent with the results of Calderón and Servén (2003) derived from growth regressions. Nevertheless, the mechanics of the contribution of public investment to growth may not be easy to disentangle: a lower public investment rate is not always associated with slow growth, while a higher one does not signal for faster growth. In Chile, public investment declined by 2.5 percentage points in the last 20 years, but was amply compensated by a substantial increase in

<sup>10</sup> For these countries, we assume the capital-output ratio to be 3 in 1950. This assumption is inconsequential for the qualitative results of the analysis.

<sup>11</sup> With  $\delta=0.65$  as suggested by national accounts and a capital/GDP ratio of 2.8 (the mean for all Latin American economies in the 1960-2002 period), the real interest rate should be above 23% per year.

<sup>12</sup> Private investment figures are taken from IFC (2002) and includes investment by decentralized, public firms.

private investment. On the other hand, in Colombia public investment expanded by almost two percentage points, yet the rate of growth in per capita GDP declined from 5.3% in the 1960-1980 period to less than 3% in the 1981-2002 period.

Figure 2

**REAL PER CAPITA GDP AND LONG RUN TRENDS (1960=100)**

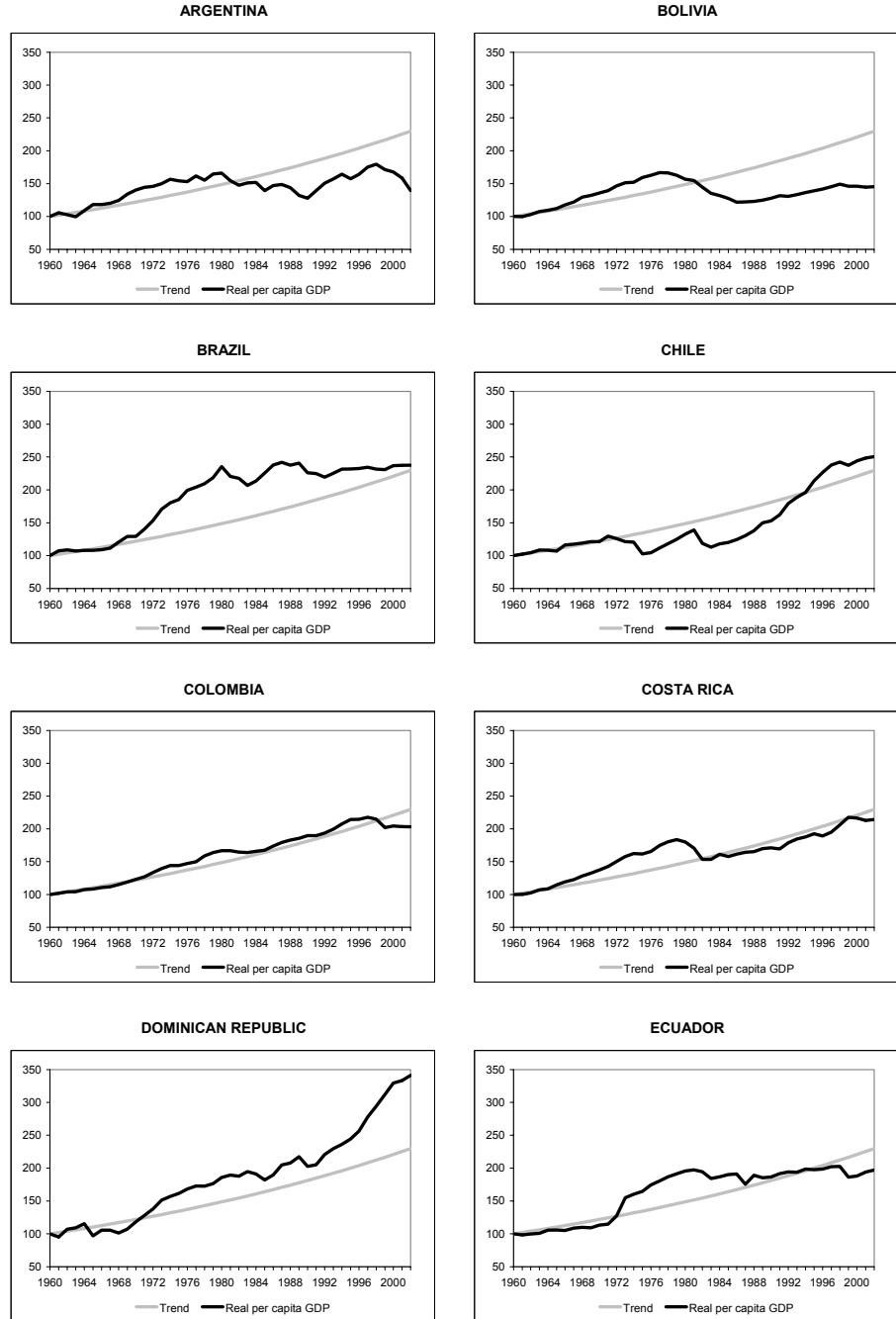
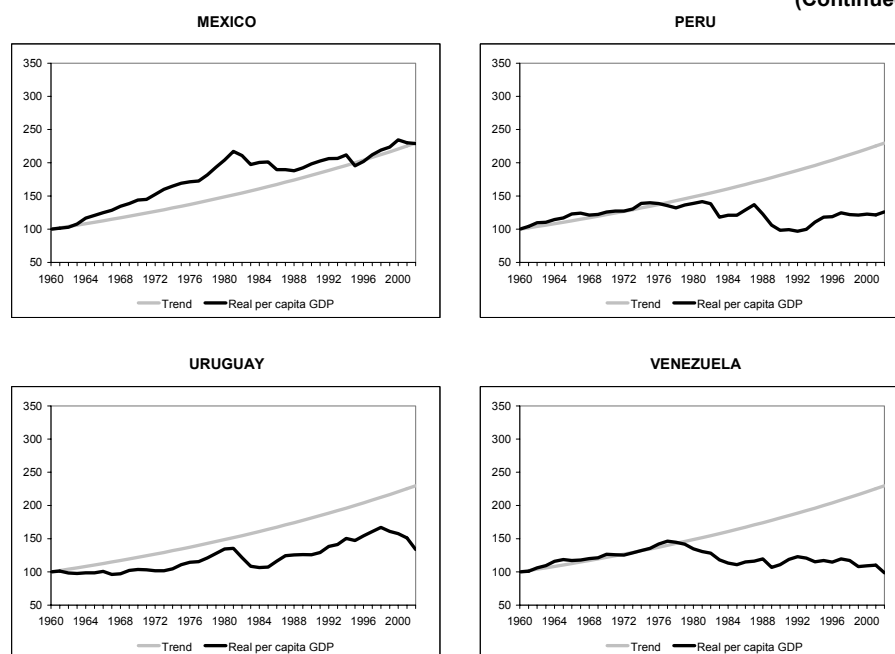


Figure 2  
(Continued)



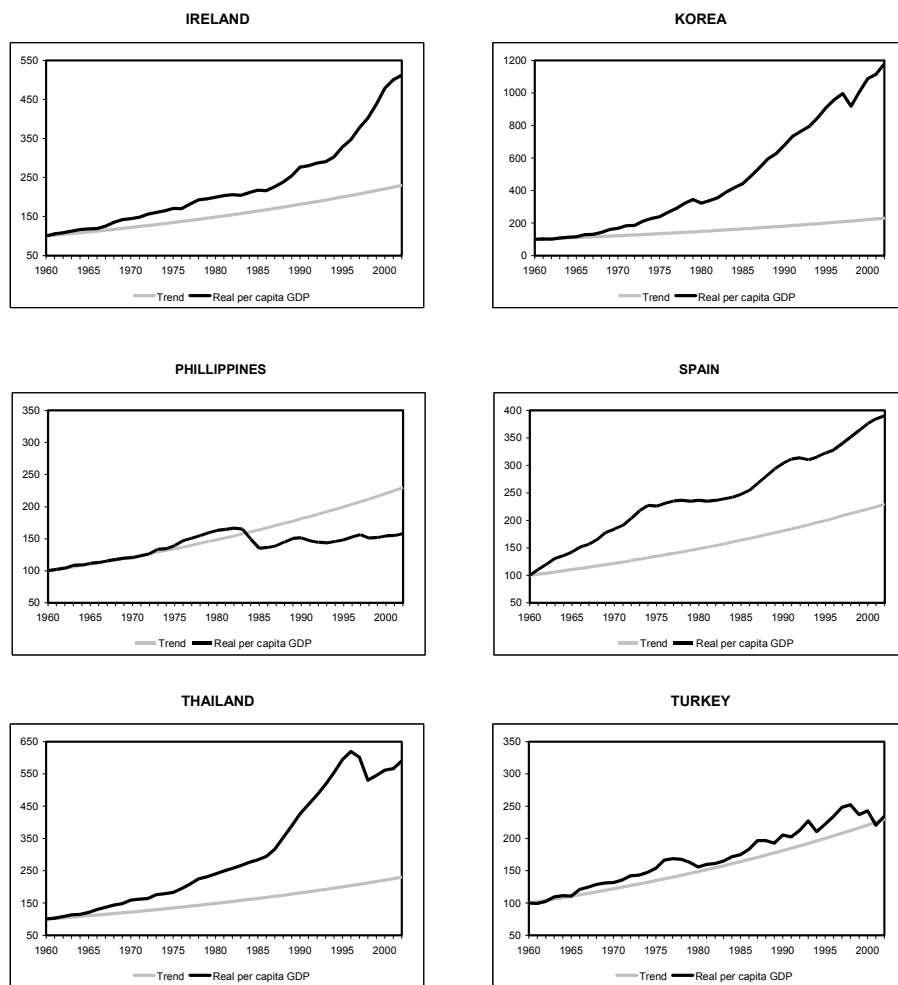
Source: A. Solimano and R. Soto (2003), op. cit.

Table 4  
GROWTH ACCOUNTING FOR LATIN AMERICAN ECONOMIES

		GDP growth (%)	Annual contribution to GDP growth				GDP growth (%)	Annual contribution to GDP growth			
			Labor	Capital	TFP			Labor	Capital	TFP	
Argentina	1960-2002	2.4	0.5	1.2	0.7	Dominican Republic	1970-2002	5.6	2.3	1.6	1.7
	1960-1980	4.2	0.8	1.6	1.8		1970-1980	7.3	2.3	1.7	3.4
	1981-2002	0.8	0.3	0.8	-0.3		1981-2002	4.9	2.3	1.6	1.0
Brazil	1960-2002	4.3	1.8	2.2	0.4	Ecuador	1965-2002	4.6	2.0	1.5	1.2
	1960-1980	7.2	2.1	3.1	2.0		1965-1980	8.4	1.8	1.7	4.8
	1981-2002	1.8	1.5	1.4	-1.1		1981-2002	2.1	2.1	1.3	-1.3
Bolivia	1960-2002	3.3	1.6	1.1	0.6	Mexico	1960-2002	4.5	1.9	2.1	0.6
	1960-1980	4.7	1.3	1.2	2.2		1960-1980	6.8	2.0	2.7	2.1
	1981-2002	2.0	1.8	1.0	-0.8		1981-2002	2.5	1.7	1.5	-0.8
Chile	1960-2002	4.1	1.4	1.3	1.4	Peru	1960-2002	3.1	1.8	1.5	-0.1
	1960-1980	3.5	1.1	1.1	1.3		1960-1980	4.6	1.6	1.8	1.1
	1981-2002	4.7	1.7	1.5	1.5		1981-2002	1.8	1.9	1.1	-1.3
Colombia	1960-2002	4.1	1.6	1.4	1.0	Uruguay	1960-2002	1.5	0.3	0.3	0.9
	1960-1980	5.3	2.1	1.4	1.8		1960-1980	2.2	0.8	0.3	1.1
	1981-2002	2.9	1.2	1.4	0.3		1981-2002	0.8	-0.2	0.3	0.7
Costa Rica	1960-2002	4.9	2.3	1.9	0.7	Venezuela	1960-2002	3.0	2.1	1.3	-0.5
	1960-1980	6.2	2.4	2.4	1.4		1960-1980	5.1	2.7	2.1	0.3
	1981-2002	3.7	2.1	1.5	0.1		1981-2002	1.0	1.7	0.7	-1.3

Source: own elaboration based on the methodology in text and data from ECLAC.

**Figure 3**  
**REAL GDP PER CAPITA AND LONG RUN TRENDS (1960=100)**



Source: authors elaboration.

**Table 5**  
**PRIVATE AND PUBLIC INVESTMENT IN LATIN AMERICA**  
*(as percentage of GDP)*

		Private Investment	Public Investment	Total Investment			Private Investment	Public Investment	Total Investment
<b>Argentina</b>	1970-2000	14.8	5.2	<b>20.0</b>	<b>Dominican Republic</b>	1970-2000	15.4	6.6	<b>21.9</b>
	1970-1980	14.1	8.8	<b>23.0</b>		1970-1980	15.2	6.5	<b>21.8</b>
	1981-2000	15.2	3.2	<b>18.4</b>		1981-2000	15.4	6.6	<b>22.0</b>
<b>Bolivia</b>	1970-2000	7.1	7.5	<b>14.6</b>	<b>Ecuador</b>	1970-2000	12.3	7.5	<b>19.8</b>
	1970-1980	7.9	8.9	<b>16.7</b>		1970-1980	13.0	8.3	<b>21.3</b>
	1981-2000	6.7	6.7	<b>13.4</b>		1981-2000	11.8	7.1	<b>18.9</b>
<b>Brazil</b>	1970-2000	15.5	5.7	<b>21.2</b>	<b>Mexico</b>	1970-2000	13.8	6.0	<b>19.9</b>
	1970-1980	14.8	7.0	<b>21.8</b>		1970-1980	12.8	7.9	<b>20.7</b>
	1981-2000	15.9	5.1	<b>21.0</b>		1981-2000	14.4	5.0	<b>19.4</b>
<b>Chile</b>	1970-2000	12.5	6.1	<b>18.6</b>	<b>Peru</b>	1970-2000	15.6	5.3	<b>20.9</b>
	1970-1980	7.4	7.7	<b>15.1</b>		1970-1980	15.3	5.5	<b>20.8</b>
	1981-2000	15.3	5.2	<b>20.6</b>		1981-2000	15.8	5.2	<b>21.0</b>
<b>Colombia</b>	1970-2000	10.2	7.0	<b>17.2</b>	<b>Uruguay</b>	1970-2000	8.9	4.4	<b>13.3</b>
	1970-1980	10.3	5.8	<b>16.1</b>		1970-1980	8.6	4.6	<b>13.2</b>
	1981-2000	10.2	7.6	<b>17.8</b>		1981-2000	9.1	4.3	<b>13.4</b>
<b>Costa Rica</b>	1970-2000	15.0	6.0	<b>19.6</b>	<b>Venezuela</b>	1970-2000	NA	NA	<b>NA</b>
	1970-1980	15.3	7.0	<b>22.3</b>		1970-1980	NA	NA	<b>NA</b>
	1981-2000	14.8	5.5	<b>18.2</b>		1981-2000	9.1	8.9	<b>18.0</b>

**Source:** own elaboration based on data from IFC (2002) and IMF *International Financial Statistics* (various issues).

The contribution of labor to GDP growth has been quite stable in almost all countries and, as such, cannot be an important explanation for either the slower growth of the last two decades, nor for the different growth path of Latin American economies. On average, changes in labor account for a mere 0.3 percentage point of the decline. Nevertheless, for some economies (notably Brazil and Colombia) the demographic transition induced a significant reduction in GDP growth. Uruguay is the only extreme case where the absolute reduction in total population (probably linked to massive emigration) implied a negative contribution of labor to economic growth.

Given that changes in the contribution of labor and capital do not seem to be an important source of changes in growth rates, one has to conclude that most of the decline in GDP growth rates should be linked to declining TFP. In fact, in every period and country TFP has been the main determinant of GDP growth.<sup>13</sup> In the 1960-1980 period, TFP grew at roughly the same path of developed economies (1.5 to 2 per year) in most countries, with the only exception of Chile, Peru, and Uruguay, where productivity grew somewhat slowly. Two economies, Ecuador and the Dominican Republic, exhibit very high TFP growth rates. In the 1981-2002 period, however, productivity growth disappeared in almost all economies. TFP growth was negative in seven of the 12 countries (Argentina, Bolivia, Brazil, Ecuador, Mexico, Peru, and Venezuela) and close to zero

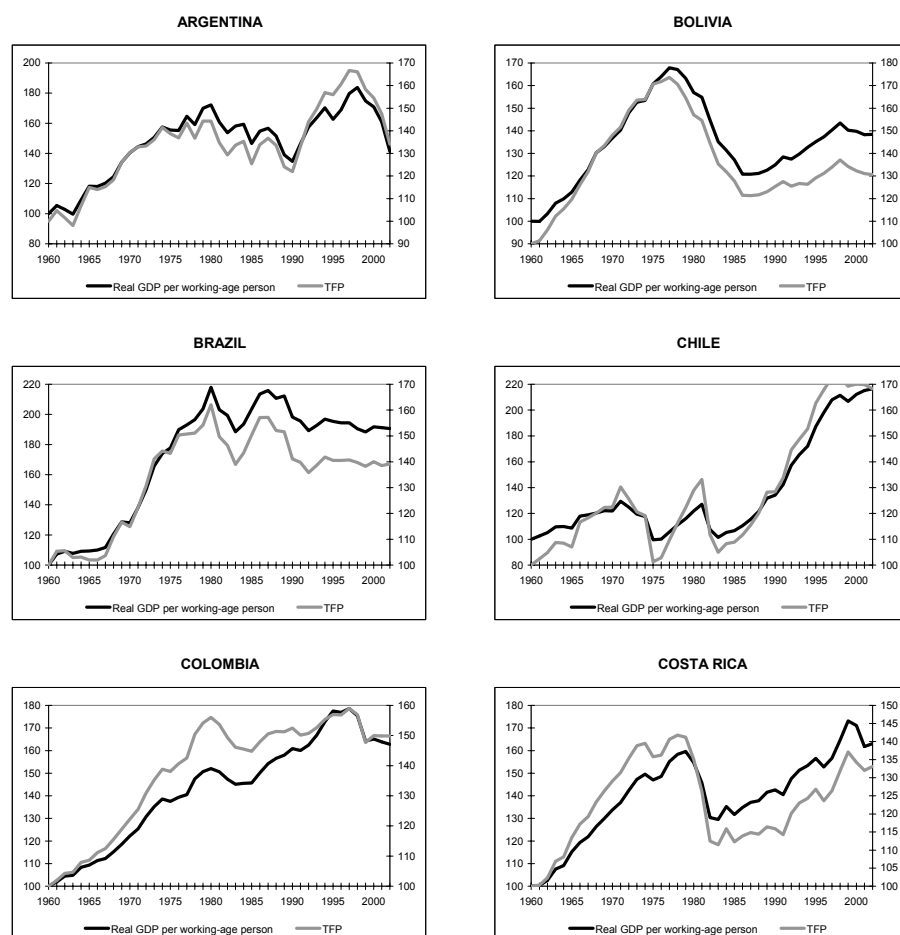
<sup>13</sup> This need not be the case. From equation (1) GDP growth per working-age person can be expressed as  $G\hat{D}P_t - \hat{N}_t = \hat{A}_t + \alpha\hat{\mu}_t + \alpha\hat{K}_t + (1-\alpha)\hat{e}_t + (1-\alpha)\hat{L}_t - \hat{N}_t$ , where  $N_t$  is working-age population (i.e., between 15 and 65 years of age). Hence GDP per working-age person grows as a result of increases in productivity, capital utilization, capital accumulation, more efficient workers and more hours worked, and it decreases with higher working-age population growth.

in Colombia and Costa Rica. Only in Chile and the Dominican Republic, TFP growth has been positive and significant, leading to rising per capita GDP.

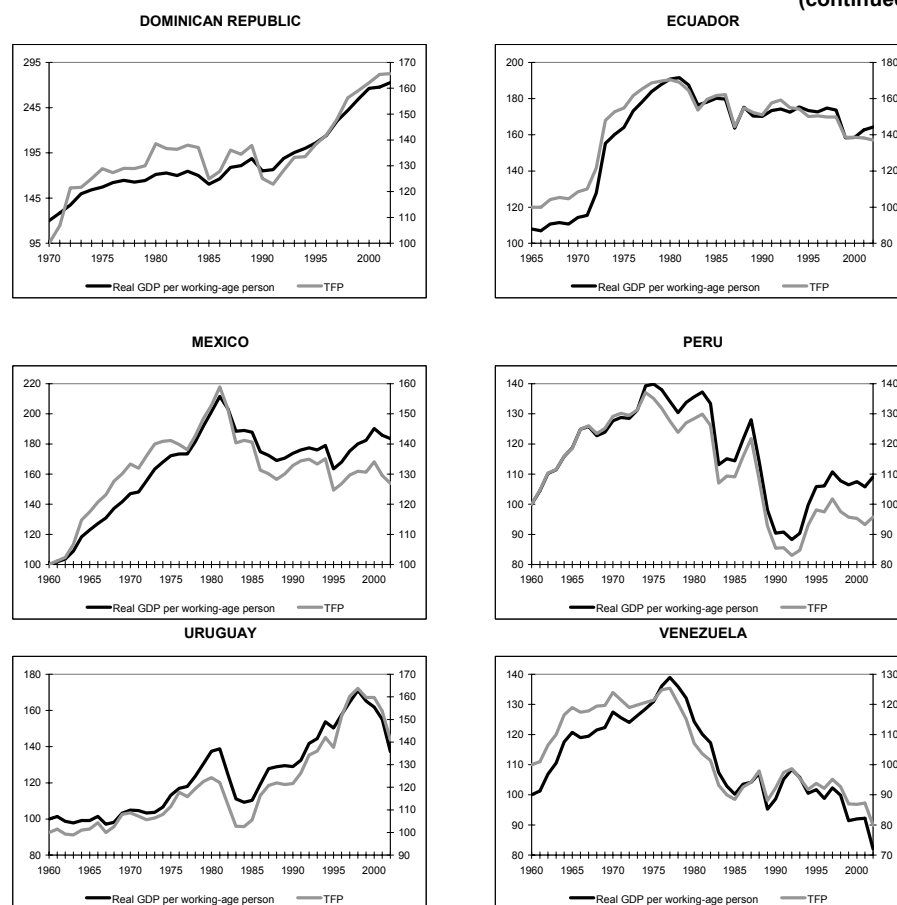
Our results are consistent with those obtained a decade ago by Elías (1992). In a comparative study of the sources of growth for seven Latin American economies, he estimates an average rate of growth of TFP of 1.4 percent and an average rate of growth of GDP of 5 percent in the 1940-1980 period.<sup>14</sup> Then, less than 30 percent of GDP growth in that period would be explained by TFP growth. In addition, the decade-average calculations of TFP growth by country from the 1940s to the 1980s show a pattern of declining TFP growth over time in that period in each of the seven countries.

The study by Hofman (2000) calculates TFP growth rates in the sub-periods 1950-73 and 1973-80, 1980-89 and 1989-94 for six Latin American economies (Argentina, Brazil, Chile, Colombia, Mexico and Venezuela). This study also shows decreasing average TFP growth rates for the six Latin American countries through these several sub-periods. On average, TFP growth was 2.5 percent in 1950-73, 1.1 percent in 1973-80, -0.9 percent in 1980-89 to recover to 1.8 percent in 1989-94.

**Figure 4**  
**REAL GDP PER WORKING-AGE PERSON AND TOTAL FACTOR PRODUCTIVITY (1960=100)**  
*Capital share 0.35*



<sup>14</sup> Countries are Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela.

Figure 4  
(continued)

Source: Andrés Solimano and Raimundo Soto (2003).

The substantial impact of TFP on economic growth does not only occur in the very long run. Figure 4 shows that change in TFP have a striking similarity with those of per-working age GDP in the short run. Thus, it is safe to conclude that most of the evolution of GDP growth is the result of changes in the efficiency and rate of utilization in the use of capital and labor. From figure 4 it is also noticeable the dissimilar path of TFP between countries in the last four decades. In most of the economies, TFP and per-working age person GDP increased markedly between 1960 and the late 1970s. The only exceptions are Chile, the Dominican Republic, and Uruguay, where growth was only moderate. After 1980, there is remarkable recovery in TFP and GDP growth in Chile and Dominican Republic, while in Uruguay growth comes to an abrupt end in the late 1990s. On the contrary, in Bolivia, Ecuador, Peru and Venezuela TFP and per-working age person GDP plummeted: by 2000, TFP levels were as low as in the mid-1960s if not outright lower. In this sense, the last four decades have been almost lost in these countries. Two countries deserve special attention for the contrasting experience before and after 1980: growth was vigorous and substantial in the 1960s and 1970s in both Mexico and Brazil. In contrast, in the last two decades both economies stagnated.

#### *Are Latin America countries different from other economies?*

The above growth accounting exercise suggests that, if one is to model long-run growth in Latin America, TFP ought to be a very important part of the analysis. This is also the case for other economies in the world. We use as reference group the cases of three East Asian economies (Korea, The Philippines, and Thailand) and three European economies (Ireland, Spain, and Turkey) in the 1960-2002 period. These countries are at different stages of development, located in very different



areas of the world (and thus facing different business opportunities), and endowed with dissimilar amounts of factors and resources. Hence, they provide an adequate counterpoint to the experience of Latin American countries.

Table 6 presents the corresponding growth decomposition. It can be seen that in both East Asian and European economies, growth experiences have been quite different between countries, but in all of them long-run growth is largely determined by TFP. The so-called East Asian “miracles” (represented here by Korea and Thailand) show that in the substantial increase in GDP, factor productivity account for around 40%. Likewise in Ireland and Spain, where TFP largely determines economic growth even when one takes into account the significant contribution of employment to fueling growth. The remaining two reference countries are cases of sluggish economic growth and, to a large extent, come in close resemblance of the Latin American experience. In Turkey and The Philippines, GDP growth was faster in the 1960-1980 period than afterwards and, in both countries, economic growth was largely determined by changes in TFP. The experience of both successful and unsuccessful economies suggests that, in terms of economic growth, Latin American economies are not different from other countries.

Our results are in line with those from other studies. A recent IMF study of TFP growth in nine Asian economies shows a range of estimates annual values of TFP growth rates that goes from 3.4 percent in Korea to 1.7 percent in the Philippines. Thailand has a TFP growth rate of 3.7 percent.<sup>15</sup> Other studies for a smaller sub-sample of countries show somewhat different values but within this range. In general, most of these Asian economies show a higher TFP growth rates than for the Latin American economies we are studying. In turn, Philippines is “closer” to Latin American values for TFP growth. For East Asian economies in general, TFP explains between 44-47 percent of total output growth in the period 1960-95. This shows the importance of productivity growth, rather than capital accumulation, in driving economic growth, although this may not be the story for other Asian economies.

**Table 6**  
**GROWTH ACCOUNTING FOR REFERENCE GROUP ECONOMIES**  
(Porcentajes)

		Average of Annual Growth Rates (%)			Average Annual Contribution to GDP Growth (%)		
		GDP	Labor	Capital	Labor	Capital	TFP
<b>Korea</b>	1960-2002	7.9	2.6	7.2	1.7	2.5	3.7
	1960-1980	8.5	2.9	5.5	1.9	1.9	4.6
	1981-2002	7.4	2.2	8.7	1.4	3.1	2.9
<b>Thailand</b>	1960-2002	6.7	2.4	6.9	1.6	2.4	2.7
	1960-1980	7.5	3.0	6.6	1.9	2.3	3.3
	1981-2002	6.0	1.9	7.2	1.3	2.5	2.2
<b>Philippines</b>	1960-2002	3.9	2.5	3.6	1.6	1.3	1.0
	1960-1980	5.4	2.6	3.6	1.7	1.3	2.5
	1981-2002	2.5	2.5	3.6	1.6	1.3	-0.4
<b>Ireland</b>	1960-2002	5.0	0.7	3.9	0.5	1.4	3.1
	1960-1980	4.5	-0.1	3.7	-0.1	1.3	3.3
	1981-2002	5.4	1.5	4.0	1.0	1.4	3.0
<b>Spain</b>	1960-2002	4.1	0.8	3.9	0.5	1.4	2.2
	1960-1980	5.5	0.5	4.5	0.4	1.6	3.6
	1981-2002	2.8	1.0	3.4	0.7	1.2	0.9
<b>Turkey</b>	1960-2002	4.4	2.1	4.4	1.4	1.5	1.5
	1960-1980	4.8	1.5	2.0	1.0	0.7	3.1
	1981-2002	4.1	2.6	6.5	1.7	2.3	0.1

Source: Own elaboration based on IMF data.

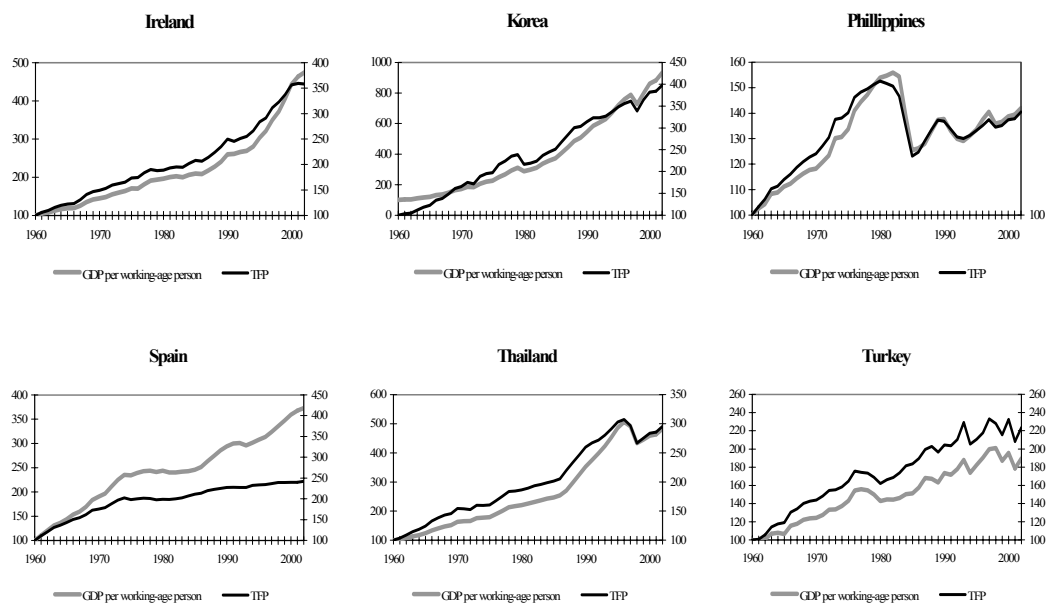
<sup>15</sup> Countries are Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand, and China for the period 1960-1995 (Iwata et al., 2003).

Figure 3 shows the evolution of long-term per capita GDP in the six reference countries against the 2 growth rate with which we compared Latin American economies. It can be seen the remarkable growth of per capita GDP in Korea and Thailand, as well as their ability to recover from deep recessions such as the 1982 and 1998 crises. The horizontal dotted line serves as a comparison with the experience of the most successful Latin American Economy in terms of growth, Dominican Republic, in which per capita GDP tripled in the 1960-2002 period. Growth in two European economies –Ireland and Spain– proceeded at a slower, yet sustained, pace, leading to increase per capita GDP by around 400 in the last forty years. In Turkey per capita GDP grew close to world trend since the 1960s. Deviations from the 2 trend have been mostly transitory. The case of Philippines, on the other hand, replicates the Latin American standard: the economy grew at world trend in the 1960s and 1970s, but fell into stagnation after 1980.

The more important comparison of the growth record of Latin America is against developed economies. Average productivity levels in developed economies can be considered as reflecting the economic “frontier” that describes the most efficient transformation of factors and resources into goods and services. Less-developed economies, on the other hand, operate with lower productivity levels and, hence, locate in interior points within that frontier. Increases in productivity can be attained in two forms: (1) by allowing the economy to move towards the economic frontier, and (2) by the continuous displacement of such frontier. The latter is largely determined by technological progress and human knowledge. In figure 6 there is a schematic representation of the mechanism. At time  $t$ , an economy is located at point A. The line EF0 represents the expected balanced growth path for a given technology and knowledge level. A movement from A towards a point in the EF0 frontier is an improvement in productivity that can be obtained by relocating resources from less productive toward more efficient uses. The line EF1 represents a new, more efficient balanced expected growth path. Moving from any point in EF0 towards a point in the EF1 curve is a net improvement in productivity.

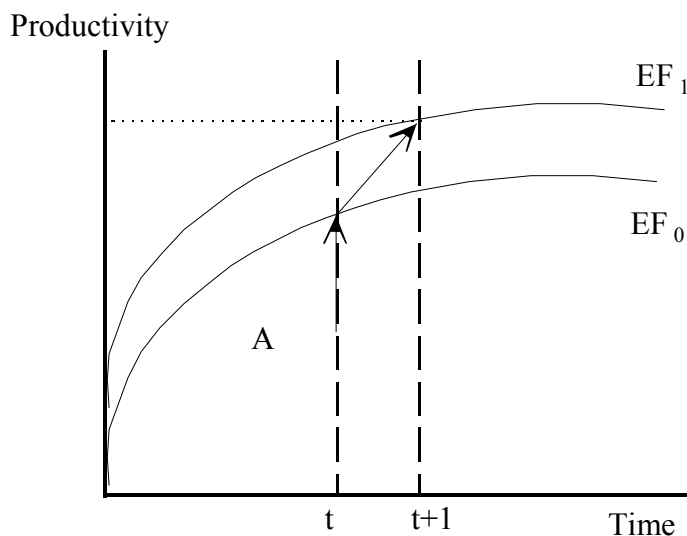
We proxy the movements of the economic frontier in developed economies using TFP in the US. This eliminates aggregation and comparability problems that would otherwise appear when dealing with the group of OECD countries. In the 1960-2002 period, TFP growth in the US have been around 1.4 per year and per capita GDP around 2. This is consistent with a balanced growth path. We thus, de-trend GDP per working-age person and TFP by these two values.

**Figure 5**  
**GDP PER WORKING-AGE PERSON AND TOTAL FACTOR PRODUCTIVITY (1960=100)**



Source: Authors elaboration.

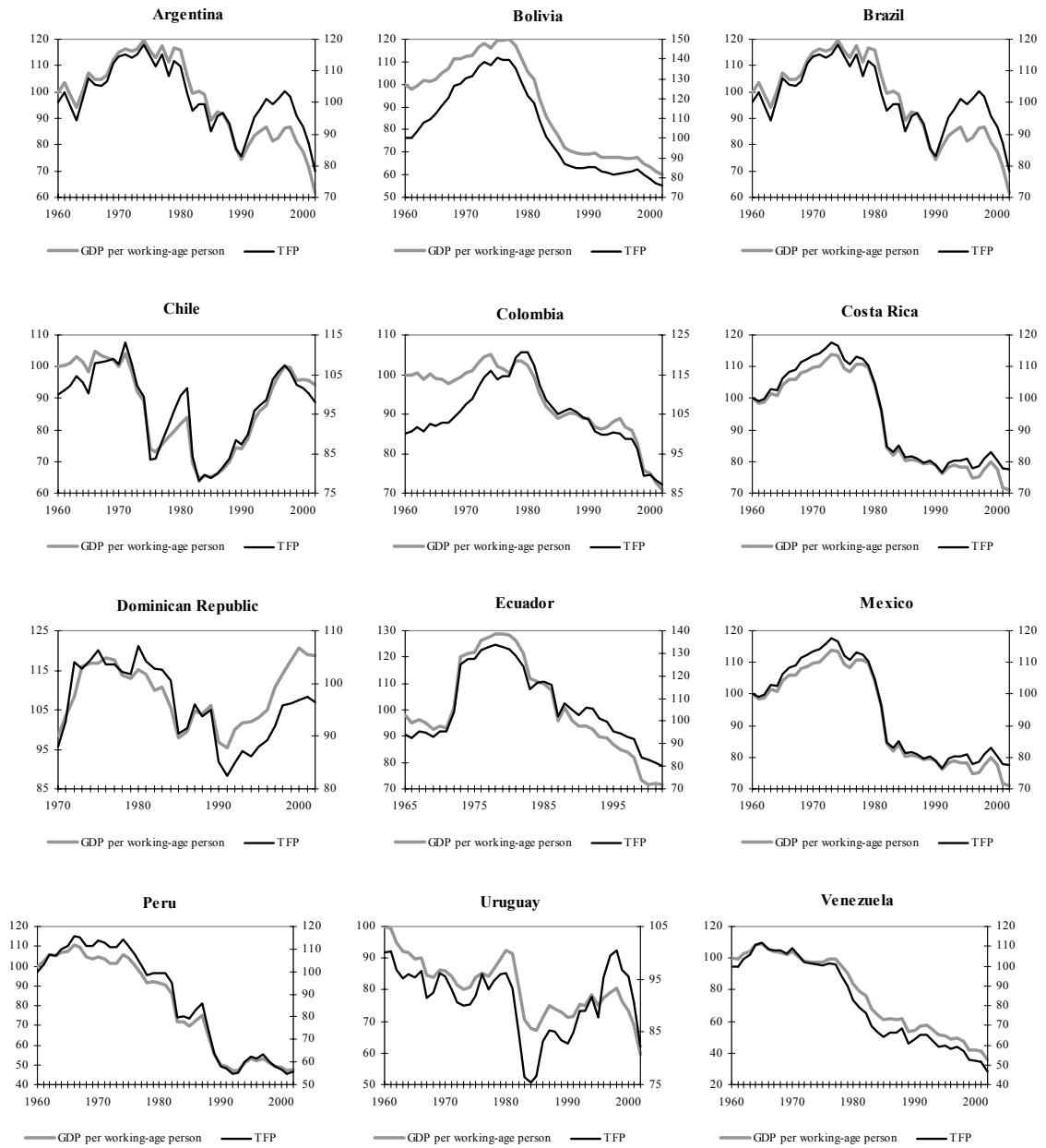
Figure 6  
**MOVEMENTS TOWARDS EFFICIENCY FRONTIERS**



Source: Economic Commission for Latin America and the Caribbean (ECLAC).

The results are presented in Figure 7. A gloomy picture emerges. The evolution of per-working age person GDP and TFP for Latin America shows that the region is being left increasingly behind. Only two economies manage to keep track of the expansion in the economic frontier—Chile and Dominican Republic—while the rest of the economies present a continuous decline. While this is suggestive of the especially bad record of growth in Latin America, another important implication is that it is relatively easy to increase per capita GDP and productivity if the necessary conditions for growth are implemented. Returning to figure 6, productivity gains are probably easier to obtain when moving from an inefficient point within the efficient frontier than when following the displacement of such frontier.

**Figure 7**  
**REAL GDP PER WORKING-AGE PERSON AND TOTAL FACTOR PRODUCTIVITY DETRENDED BY 2% (1960=100)**  
*Capital share 0.35*



Source: authors elaboration.



## V. Growth episodes

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Despite the negative picture of low growth that emerges from Latin American economies in the last four decades, an additional feature of the data holds the hope for renewed growth in the region. Throughout the years, several Latin American countries underwent phases of sustained growth. Likewise, other economies have gone for periods of protracted slow growth. Studying these episodes from a comparative point of view may provide evidence with regards to the main patterns of sustained growth.

In this paper, we define an episode of sustained growth as the case in which the rate of growth of per-capita GDP is above 2 every year for at least six consecutive years (to avoid pure spending booms, we couple this definition with a similar one for TFP at the 1.3 benchmark). Note that the definition does not consider sustained growth a period in which the average rate of growth of per-capita GDP is 2. Using this definition we identify eight sustained growth episodes in Latin America in the past four decades (see Table 7). Likewise, we identified five episodes in our reference group, two of them in Korea.

It can be seen that the growth cycles share some common characteristics. The average duration of the cycle (9.6 years) is much higher than the cutoff level of six years. In Latin America the duration is slightly less, reaching 9 years. Thus, growth cycles come in decades. However, the growth decades concentrate in the 1960s and 1970s. Only two economies benefit from growth decades after 1980: Chile and Dominican Republic. All other economies experienced growth cycles ending either in the mid-1970s or by 1980. In the reference group of countries, Ireland and Thailand have had growth cycles

recently while the Spanish boom was very long, covering the 1961-1974 period. Interestingly episodes of sustained growth take place in the 1960s (Mexico) and in the 1970s (Brazil) under import substitution regimes as well as in the 1990s after market-oriented regimes (Dominican Republic and Chile).<sup>16</sup>

The intensity of these growth cycles differs notoriously among countries. Among Latin American economies, the Chilean cycle brought about the highest cumulative per capita GDP growth with 91 in 11 years. On the other hand, the growth cycles of Bolivia, Costa Rica, and Mexico were among the mildest. Likewise in the reference group, the growth episodes in Spain and Thailand induced higher cumulative growth than that in Ireland.

**Table 7**  
**GROWTH EPISODES IN LATIN AMERICA AND OTHER COUNTRIES**

	Sustained growth Per capita GDP growth rates above 2 per year for 6 continuous years or more			
	Length of the cycle in years	Cumulative growth in per capita GDP (%)	Contribution of Total Factor Productivity (%)	Contribution of Capital and Labor (%)
<b>Bolivia 1965-1973</b>	9	34.8	36.7	-1.9
<b>Brazil 1971-1980</b>	10	67.7	32.5	35.2
<b>Chile 1986-1997</b>	11	91.1	55	46.5
<b>Colombia 1968-1974</b>	7	24.9	20	4.9
<b>Costa Rica 1965-1974</b>	10	41.9	23	18.9
<b>Dom. Republic 1992-2000</b>	9	51.1	29	22.1
<b>Ecuador 1972-1980</b>	9	53.6	40.1	23.5
<b>Mexico 1963-1970</b>	8	33.5	25	8.3
<b>Korea 1963-1971</b>	9	67.7	42.1	25.6
<b>1982-1991</b>	10	56.5	35.9	26.6
<b>Ireland 1994-2001</b>	8	64.5	39.6	34.9
<b>Spain 1961-1974</b>	14	112.4	81.9	40.5
<b>Thailand 1986-1996</b>	11	124.5	54.7	69.8

Source: authors elaboration.

A second distinctive feature shared by most of these growth cycles is that roughly 50 of the cumulative growth in GDP is due to equal increases in TFP and factor accumulation (e.g., Brazil, Chile, Costa Rica, Dominican Republic and all countries in the reference group except Spain). This type of growth cycle reflects a movement along the balanced growth path. On the contrary, the growth episodes in Bolivia and Colombia suggest that growth was largely due to TFP, which would be consistent with a movement from an interior point towards the efficient frontier more than a movement of such frontier.

In addition to cycles of sustained growth, the experience of Latin American countries suggests the existence of cycles of sustained decline, defined as a period in which per capita GDP

<sup>16</sup> See Solimano (1996), chapter 7.



growth is negative in each year for five consecutive years. Using this definition we identified five episodes: four in Latin America and one in The Philippines (see Table 8) . These episodes share an important feature: in every case, the major force behind the drop on per capita GDP has been a decline in TFP. In fact, in almost all cases the accumulation of capital and labor is positive, i.e., at the same time that the economy was increasing its effort –by accumulating factors– to grow, the efficiency in the use of the resources declined much more leading to negative growth.

Table 8  
**GROWTH CYCLES IN LATIN AMERICA AND OTHER COUNTRIES**

	Sustained decline per capita GDP growth less than 1% per year for 5 consecutive years or more			
	Length of the cycle in years	Cumulative growth in per capita GDP (%)	Contribution of total factor productivity (%)	Contribution of capital and labor (%)
<b>Bolivia 1978-1988</b>	11	-26.2	-29.9	3.6
<b>Peru 1988-1992</b>	5	-29	-31.8	2.7
<b>Uruguay 1981-1985</b>	5	-20.1	-15	-5.1
<b>Venezuela 1978-1985</b>	8	-24.2	-29.4	5.2
<b>Philippines 1981-1986</b>	6	-16.3	-20.2	3.9

**Source:** authors elaboration.



## VI. On the determinants of TFP growth in Latin America

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The determinants of TFP are quite difficult to grasp. As discussed in Prescott (1997), and also as shown in this paper, differences in physical and intangible capital cannot account for the large international income differences that characterize the world economy. As shown in the sections above, private saving and investment rates do not seem to be strongly correlated with such differences<sup>17</sup> and that differences in TFP and GDP growth across countries seems to be the rule rather than the exception. We lack a theory that can account for differences in TFP that arise for reasons other than growth in the stock of technical knowledge. Hence, we lack a theory of economic growth.

Nevertheless from an empirical point of view we can explore the role of variables that, according to other researchers, may have been important in determining the slow growth of Latin American economies.

We use our panel of the 12 Latin American countries in the 1960-2002 period and compute the sample correlation (and the standard deviations) of the first difference of the log of TFP in each country as calculated by equation (2) and its potential determinants. It is important to use the rate of rates of TFP since it is a non-stationary variable; using the level might lead to spurious correlation. Table 9 provides the results.

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<sup>17</sup> In a world of integrated capital markets the correlation between savings and investment is weaker as individuals can allocate savings beyond national boundaries. Domestic investment is not the only opportunity to allocate national savings in an open economy.

We first correlate TFP growth with transient phenomena, such as the business cycle, where we expect a significant correlation, as suggested by figure 4. We use as an instrumental variable of the business cycle the consumption of electricity per capita; given that this is a non-storable good; it is less likely to suffer from spurious correlation. Table 9 confirms the correlation in the entire sample and for the two sub-periods. However, the size of correlations also suggests that transient phenomena cannot account for a significant fraction of the movements in TFP.

Second, we consider the role of changes in the quality of labor. Since the latter are unobservable, they are included in our measure of TFP. We proxy such changes using formal education measures: primary education will unlikely be correlated to TFP because of its little variation in the sample of Latin American economies in the 1960-2003 period. Hence we use secondary education achievement and find a significant correlation for the first half of the sample but no correlation after 1980. One possible explanation for this result is that most countries have achieved already a similar level of secondary achievement so that differences among them cannot account for the differences in TFP growth.

**Table 9**

**CORRELATION OF TFP GROWTH AND OTHER VARIABLES IN LATIN AMERICAN COUNTRIES**

	1960-2002	1960-1980	1981-2002
<b>Business cycles</b> (growth in consumption of electricity per capita)	0.152 (0.032)	0.198 (0.043)	0.116 (0.044)
<b>Quality of the labor force</b> (growth in secondary education achievement)	0.157 (0.079)	0.314 (0.087)	-0.188 (0.150)
<b>International trade shocks</b> (changes in terms of trade)	0.032 (0.014)	0.031 (0.017)	0.033 (0.022)
<b>International financial flows</b> (changes in external debt as share of labor productivity)	0.006 (0.017)	0.035 (0.021)	-0.045 (0.029)
<b>Economic Instability I</b> (monthly inflation rate)	-0.0925 (0.026)	0.148 (0.075)	-0.122 (0.029)
<b>Economic Instability II</b> (standard deviation of the monthly inflation rate)	0.006 (0.027)	0.210 (0.097)	-0.008 (0.030)
<b>Economic Instability III</b> (standard deviation of the real exchange rate)	-0.029 (0.017)	0.014 (0.030)	-0.047 (0.022)

**Source:** own elaboration using data from ECLAC.

A small digression at this point seems to be necessary. We focus on zero correlations, rather than significant ones, to derive our conclusions because significant correlations can be spurious. On the contrary, lack of correlation cannot be a spurious result.

Third, we turn to foreign shocks as a major source of long-run differences in TFP growth and find no evidence of a significant impact of term neither of trade shocks nor of capital flows.<sup>18</sup> This does not mean that these variables do not play a role, only that they are not correlated with TFP growth in medium-to-long run horizons. Most certainly, these variables have short-lived effects on TFP, but they cannot account for the long-run differences observed among different economies.

Third, given that external fluctuations do not seem to play a significant role, we turn to domestic sources of fluctuations. We use an indicator of fiscal imbalances (the inflation rate) and two indicators of macroeconomic instability (the intra annual standard deviation of inflation and the real exchange rate). Inflation is a measure of the inability of the government to obtain direct financing for its expenditures. The results in Table 9 are somewhat surprising. In the 1981-2002 period we obtain the expected negative relationship between TFP and the inflation rate. For the

<sup>18</sup> Since the data of capital flows is of low quality (scarce and inconsistently defined among countries), we use as a proxy the change in the end of period stock of external debt, including both public and private foreign liabilities. To avoid scale problems we de-trend the values by average labor productivity. Similar results obtain if de-trended by GDP.

1960-1980 period we obtain a positive sign. An interpretation of this result is that in this period nominal interest rates were fixed at rather low levels in most countries: hence, higher inflation rates led to negative real interest rates that might have induced a lower cost of financing capital. This is also consistent with above optimal levels of capital accumulation (in certain sectors) observed in this period.

The two measures of macroeconomic instability also provide some interesting results. In the 1981-2002 there is no evidence of a negative relationship between TFP growth and the volatility of inflation, despite the fact that a number of high-inflation and hyper inflationary processes occurred in the region. In the 1960-1980 period, there is no evidence of a negative relationship between TFP growth and the volatility of the real exchange rate. This could reflect the fact that in that period Latin American economies were more closed to foreign competition and the importance of the real exchange rate was smaller in resource allocation. After reforms in the 1980s and 1990s, the expected negative correlation appears and the magnitude of the coefficient suggests that this could be an important determinant of TFP and GDP growth.

*On the causality of TFP and main macroeconomic variables*

While correlations are informative, they are limited to the instantaneous response of TFP to potential shocks in other variables. It would be reasonable to expect that the response take time to build up. Hence, we focus on Granger causality tests as a way to estimate in a dynamic setup the likely connection between TFP growth and other variables that are deemed important in the economic literature.

Granger causality tests are defined as follows: variable  $x$  will Granger-cause variable  $y$  if the  $\theta$  coefficients are not zero in the following regression

$$y_t^i = \phi(L)y_{t-1}^i + \theta(L)x_{t-1}^i + \varepsilon_t^i$$

The test is run both ways, i.e., we test causality from  $x$  to  $y$  and viceversa. We also focus on non-causality (non-significant parameters) as more informative than causality, since the latter is subject to spurious correlation problems, and we use first-differenced data in logs to avoid unit roots. The results for the 1960-1980 and 1981-2002 periods are presented in Table 10.

Within external factors, it can be seen that there is no causality from terms of trade shocks to TFP changes in neither of the subperiods. Likewise, and as expected, there is no evidence of reverse causation. Similar evidence is found for capital flows, that do not seem to cause changes in TFP. Evidence for reverse causality in capital inflows, on the other hand, is mixed: while in the 1960-1980 period TFP Granger caused foreign resources, such causality disappeared in the 1981-2002 period.

With regards to domestic factors, we obtain some interesting evidence. TFP changes were induced by changes in inflation in the 1981-2002 period, but not before. Higher inflation rates in recent decades reduced TFP, with no evidence of reverse causality. On the other hand, higher inflation volatility Granger-caused and reduced TFP in the 1960-1980 period but not afterwards, where there is evidence of causation from lower TFP growth towards higher instability. With regards to real exchange rate volatility there is evidence of simultaneous causation in the 1981-2002 period, but not before.

Table 10

**GRANGER CAUSALITY TESTS PANEL DATA FOR 12 LATIN AMERICAN COUNTRIES, 1960-2002**

	1960-1980	1981-2002		1960-1980	1981-2002
<b>Terms of Trade Cause TFP</b>	0.48	0.36	<b>TFP causes Terms of Trade</b>	0.22	1.10
<b>Capital Flows Cause TFP</b>	1.25	3.42	<b>TFP causes Capital Flows</b>	4.07*	1.80
<b>Inflation Causes TFP</b>	2.75	5.24*	<b>TFP causes inflation</b>	0.72	0.11
<b>Inflation volatility Causes TFP</b>	9.63*	0.37	<b>TFP causes Inflation Volatility</b>	0.87	22.51*
<b>RER volatility Causes TFP</b>	0.02	11.77*	<b>TFP causes RER Volatility</b>	1.75	4.71*
<b>Saving Cause TFP</b>	0.68	1.33	<b>TFP causes Saving</b>	0.75	0.20

**Note:** (\*) significant at 95 confidence. Critical values from Hurlin and Venet (2002)

## VII. Conclusions and final remark

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Economic growth in Latin America in the last 40 years has been modest and unstable. The rate of growth of GDP per capita in this period has been 1.6 percent (for the main 12 economies), a meager performance by international standards.

Economic growth decelerated and become more volatile in the period 1980-2002 compared to the two previous decades. After the poor decade of the 1980s there was a recovery in growth in the early to mid 1990s in the region but that proved to be transient. In the half-decade after the Asian and Russian crises of the late 1990s there has been another growth slowdown in the region.

Certainly the Latin American region has had serious problems to adjust to a more competitive but also more volatile global economy of the last two decades. The internal policy reforms of the 1990s were, in general, poorly implemented and, consequently, did not lead to more rapid growth in a sustained way. Growth performance after 1980 period became more sluggish in all countries, in particular in the fast growers of the 1960s and 1970s: Brazil and Mexico. The stories of persistent decline in per capita growth in 1980-2002 are Argentina, Bolivia, Peru and Venezuela. This performance has delayed economic progress and poverty reduction. However, Chile and the Dominican Republic have been the only two economies that managed to growth at fast rates in the post-reform period, although, currently, both economies are growing less than their average of the 1990s.

The 1980-2002 period is characterized not only by lower average growth but also by a dramatic increase in the frequency of growth crises (years of negative growth) with respect to preceding decades. The countries with the highest frequency of growth crises are Venezuela (12 years in 22) and Argentina (11 years in 22). Internal instability and external factors married to drive these countries to repeated growth crises with very negative welfare consequences for their citizens.

The sources of growth analysis conducted in the paper shows that the deceleration in capital formation explains around 1/3 of the deceleration in GDP growth after 1980 on average in Latin America. This percentage is higher, though, for Mexico, Brazil and Venezuela. However, the acceleration in growth in Dominican Republic and Chile in the 1990s is explained by accelerations in TFP growth and by faster capital accumulation.

The data shows that public investment has been more volatile than private investment in the 1980-2002 period. This may have been the consequence of recurrent fiscal crises that were “adjusted” by repeated cuts in public investment that save for the case of Chile were not followed by a compensating increase in private investment rates.

Episodes of “sustained growth” and “sustained decline” identified in this paper highlight the variety of impulses to sustained growth as well as of factors that halt growth and send the economies into a downward spiral of negative growth.. We identified 8 cases of GDP growth per capita above 2 percent per year for at least 6 consecutive years (on average these episodes lasted 9 years). Interestingly, these growth episodes were accompanied by sustained increases in TFP. These episodes occurred both in the 1960s and 1970s (e.g in Brazil and Mexico) under import substitution but also in the 1990s under more market-oriented policy regimes (in Chile and Dominican Republic). In turn, we also computed 4 cases of “sustained decline” in which GDP per capita grew at rates below 1 percent (often GDP growth was negative) for 5 consecutive years. These episodes of protracted growth collapse have reduced living standards in substantial ways in the affected countries.

In the 1980-2002 period TFP grew at negative rates in seven out of 12 economies. TFP growth was close to zero in Colombia and Costa Rica and positive in the two most dynamic economies of that period: Dominican Republic and Chile.

Historically, factor productivity has been following a decreasing trend in Latin America, particularly since the 1960s (although TFP growth is quite pro-cyclical: it goes up in periods of rapid growth and declines in slowdowns and recessions). Still across cycles, various empirical studies show a downward trend in TFP growth in several economies of the region. This is consistent with the modest rates of increases in GDP per capita registered in Latin America in the last 40 years.

International comparisons of TFP growth rates indicate much higher TFP growth in dynamic Asian economies such as Korea, Hong Kong, Singapore, Thailand as well as in Ireland and Spain, part of our reference group. These economies, in turn, have had a more steady growth process than Latin America and have experienced a much lower frequency of growth crises than the Latin American countries. In our reference group, only Turkey and Philippines have frequencies of growth crises comparable to the Latin American averages in the 1980-2002 period.



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