LATIN AMERICAN GROWTH SHORTFALL: PRODUCTIVITY AND INEQUALITY

(CHAPTER 1 - BACKGROUND PAPER 3)

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Countries of Latin America and the Caribbean (LAC) have experienced poor economic performance for a long time, only interrupted by brief periods of unsustained rapid growth. This paper analyzes this experience decomposing per capita GDP growth in a given period in two terms: the estimated growth contribution of factor accumulation (both physical and human capital) and the productivity improvement in the use of the factors of production in place (growth of total factor productivity or TFP). As customary in growth accounting, the growth of TFP is obtained as a residual to account for observed output per capita growth beyond the estimated direct contribution of factor accumulation inferred from a production function. It is important to highlight that this is an accounting decomposition of growth sources and therefore descriptive in nature, not a causal attribution of the ultimate drivers of output growth. In this decomposition, TFP growth, referred as productivity growth hereafter, reflects not only technology-related advances but also changes in policies and market conditions that affect the aggregate effectiveness with which the factors of production available in the economy are utilized.

This paper demonstrates that looking at the experience through the lens of productivity growth, as opposed to factor accumulation, holds the key to understand the failure of LAC’s performance and informs productive development policies. This distinction of sources in growth diagnostic is relevant for policy purposes because the considerations regarding both sources of growth are of different nature. For example, while the promotion of faster factor accumulation is necessarily a costly process involving the diversion of resources to investment, improvements in productivity may be “simply” produced by better, sounder policies and institutions involving little if any economic cost. That would be a reason for optimism regarding LAC’s future economic development. But failing productivity may also reflect entrenched dysfunctional political economy features that are highly resistant to change, which would be a reason for pessimism, at least in the short term. It is therefore critical to identify the drivers of low productivity growth.

The first section (LAC Economic Performance) characterizes economic performance of LAC over time and shows that the evolution of productivity growth is the main driver of its income per capita growth dynamics. The second section (A Comparative Approach to Assess LAC Performance) gauges LAC performance against extra-regional benchmarks and documents how lower growth has led to a decline in its relative output per capita, both with respect to developing countries peers as well as to the developed countries it aspires to catch up. In particular, it uses this comparative approach against benchmarks to assess LAC performance and finds that lower productivity growth is the key factor underlying underperformance. Finally, the third section (Productivity Growth and Inequality) looks empirically at the connection between economic underperformance and inequality, exploring the hypothesis that low productivity growth and high inequality, two salient characteristics of the region, are linked.

1. **LAC ECONOMIC PERFORMANCE**

Per capita output growth in LAC over the past decades has been remarkably unstable. Figure 1 summarizes the situation looking at real per capita GDP annual growth over the period 1962-2017, representing the region by a simple average over the sixteen countries for which complete data is available.[[1]](#footnote-1) At the yearly frequency, it clearly shows the growth collapse of the LAC debt crisis of the 1980s, starting in earnest in 1983, and to a lesser extent the brief growth collapse of 2009 associated with the global Great Recession.

Growth rates at yearly frequencies, however, may fail to be informative of the structural characteristics and trends this paper is set to analyze because they are contaminated by business cycle fluctuations. In order to control for the business cycle in a parsimonious manner, in the remainder of the analysis we consider average annual growth rates over periods of seven years (1962-68, 1969-75, 1976-1982, 1983-89, 1990-96, 1997-2003, 2004-10, 2011-17).[[2]](#footnote-2) This periodization also has the advantage of conforming a balanced panel of four periods around the year 1990, which is often regarded as pivotal, starting a new era of market reforms and macroeconomic prudence in the region after the debt crisis.

Filtering business cycle noise taking 7-year averages in this way, the trend line in Figure 1 still shows substantial instability of per capita output growth within a band of about 0 to 3 percent per annum. By and large, there are two main growth phases: before and after 1990. Growth before 1990 appears to be reasonably strong at the beginning in the first two periods but falters in the late seventies and collapses in the eighties during the debt crisis, as mentioned. Growth after 1990 recovered and was sustained but, overall, without reaching the levels of the sixties and early seventies. (A more in-depth analysis in the next section will shed more light on this issue and show that progress after 1990 has been effectively more successful than it appears in Figure 1.)

The growth dynamics features depicted in Figure 1 can also be observed considering the median LAC country (instead of the mean country) and, by and large, in each one of the sixteen countries (Figure 2 and 3). The main exceptions were Chile, Colombia and to some extent Uruguay, which appear to have escaped the growth collapse of the debt crisis (while in countries such as Costa Rica and Jamaica the crisis materialized a bit earlier and in countries like Brazil and Barbados it came right after). The experience of relatively higher growth in the earlier periods is especially true in the case of Brazil (as well as Dominican Republic), which explains why in an aggregate sense, due to the dominant relative size of Brazil within LAC, growth around 1970 is sometimes regarded as the golden years of LAC growth. Venezuela is a singular case, experiencing its worst growth collapse in the last period.

To go deeper in the analysis and gauge the role of productivity growth, it is useful to decompose per-capita output growth into per-capita factor accumulation (akin to an extensive margin) and productivity growth by means of traditional growth accounting. In order to focus on productivity growth, in this paper we lump together the (per-capita) output growth contribution of the accumulation of all factors of production, namely physical capital accumulated through net investment as well as human capital increases, both additions to the workers headcount and improvements in the average productive skills of the labor force (as measured by the wage impact of the additional education received). In this paper we perform an additive decomposition of the per-capita output growth rate for each country into the two sources of growth, namely factor accumulation and productivity improvement. Country growth rates are averaged over the 7 years of each period to obtain decompositions for each period and averaged over the 16 LAC countries to produce decompositions for LAC as a whole. (See Statistical Appendix for sources and methods utilized).

Decomposing per-capita GDP growth into the contributions of factor accumulation and total factor productivity growth, it is clear that, in an accounting sense, per-capita output growth in LAC has been sustained by factor accumulation. Table 1 exhibits this decomposition by period and shows that, in fact, productivity growth has often detracted from output growth. Productivity growth has made a null (actually slightly negative) contribution to cumulative or long-term output growth in LAC, both before and after 1990. Factor accumulation, on the contrary, has consistently made a positive contribution, virtually the same before and after 1990, and is the reason why LAC´s per capita output grew at all. This predominance of factor accumulation holds true in each one of the 16 countries (Figure 4 and Figure 5). Even in the countries in which productivity growth made a long-term contribution, the contribution of factor accumulation usually dwarfs it (Figure 4). This finding indicates a small growth contribution coming from the absorption of new technologies as well as better policies and market conditions at the aggregate level (with the exception of Uruguay after 1990).[[3]](#footnote-3)

However, the dominant role of factor accumulation in long-term growth does not mean that productivity growth was irrelevant to account for the experience of LAC. Table 1 suggests that in the periods when LAC performance is particularly good or bad, so is productivity growth. To see this more closely, we compute the correlation between per-capita GDP growth and its components over the eight periods, obtaining that the correlation with productivity growth is 0.78 while that with factor accumulation is only 0.48 (results are similar if changes in growth rates, that is accelerations, are considered instead). The conclusion is that the main driver of the unstable dynamics of LAC output growth is unstable productivity growth, which matches the international evidence uncovered by Easterly and Levine (2001).

The analysis in this section sets the stage of LAC’s experience and is informative to assess its performance. However, it cannot answer to what extent this performance is unsatisfactory (is per capita output growth unsuitably low?) and, if so, what are the factors behind the failure. The next section will refine this analysis by looking at benchmarks to assess LAC performance and answer these questions.

1. **A COMPARATIVE APPROACH TO ASSESS LAC PERFORMANCE**

Measuring comparative performance relative to a representative group of peers is useful to assess whether growth is below what is needed or could be expected and, concerning growth diagnosis, to detect anomalies revealing specific domestic failures. Underperformance relative to a norm is a key analytic tool to gauge poor performance and discover its drivers. This section makes intensive use of this approach in a number of ways.

***The Evidence from Comparative Development Analysis***

Before refining the growth accounting methods utilized in the previous section with a comparative approach, it is useful to review the insights gained from the literature of comparative development analyses on this very subject of the role of productivity in LAC performance. This literature looks at the stocks of factors of production in place (physical and human capital, capital for short) and the level of total factor productivity with which they are utilized to explain the level of output per capita in LAC countries. To answer the question of whether low output is due to low capital or low productivity, it looks at the corresponding output, capital and productivity gaps relative to benchmarks. Since the stock of capital and the level of productivity with which it is utilized result from the cumulative effect of changes over time (net additions to capital and changes in productivity), the findings in this literature are closely related to those from growth accounting over long periods of time.

This brief review of LAC comparative development analysis draws heavily from Daude and Fernandez-Arias (2010) and Fernandez-Arias and Rodriguez Apolinar (2014). The main point to highlight from these papers is that low productivity is the main culprit of LAC’s disappointingly low GDP per capita. This conclusion is based on a number of claims and observations:

1. LAC productivity is only about 50% of that of the US (taken as the leading country) and, in contrast to theory and evidence in elsewhere, the gap is now wider than it was at the onset of the debt crisis.
2. LAC’s per capita output gap with the US is increasingly accounted by the productivity gap (rather than by the gap in the stocks of production factors in place).
3. The diversity of country output per capita around the world is matched by a corresponding diversity of productivity levels: the correlation between the two is 0.95. LAC is no exception: the correlation across LAC countries is 0.80. (These high correlations can be rationalized by the positive feedback loop between higher productivity and higher factor accumulation: higher aggregate productivity provides incentives to higher factor accumulation and higher factor accumulation may include new vintage capital and skills bringing about higher aggregate productivity).
4. Despite distortions in markets and policies underlying factor accumulation, if the region’s productivity gap were closed, its per capita output gap would largely disappear over time because of the correspondingly enhanced incentives to invest.
5. However, concerning the reverse direction of causality from factor accumulation to productivity, LAC’s investment in physical capital appears to be less effective than in other regions in promoting higher aggregate productivity. The implication is that investment with more spillovers, rather than more garden-variety investment, is needed to make a dent to the productivity shortfall from this angle.

These are all pieces of evidence supporting the idea that LAC’s growth underperformance is not associated with the accumulation effort, working through what can be thought as the extensive margin, but with the failure to generate productivity growth.

***Comparative Growth Accounting***

Turning to comparative growth accounting, Figure 6 and Figure 7 extend the information in Figure 4 and Figure 5 by showing the contributions of factor accumulation and productivity to per capita output growth over for each one of the 71 countries in our world sample. The question in this comparative approach is whether LAC countries are anomalous in this world context in ways that are helpful to assess and diagnose its growth experience.

Our first step is to consider growth accounting gaps between LAC and four benchmarks: all 55 non-LAC countries, the 4 East Asian tigers, the 14 African countries and the United States (see Statistical Appendix for further details on how this world sample was assembled). Each one of the benchmarks is useful to probe different dimensions. The rest of the world or Non-LAC countries could be considered as the norm, the normal country experience around the world. The specific extra-regional benchmarks represent interesting contrasting scenarios. The East Asian tigers are the paradigmatic development success story of the period. The African countries, on the contrary, conform a scenario of unsatisfactory development. In each case, we consider the mean country, constructed as the simple average of country growth rates (of those in the LAC region and in each benchmark grouping). Finally, the US benchmark represents the productivity frontier and, more generally, the development frontier towards which successful development ought to converge.

Tables 2, 3, 4 and 5 build on Table 1 showing annual growth gaps between LAC and each one of the four benchmarks, meaning LAC growth rates shown in Table 1 minus the corresponding growth rates of the benchmark (so that negative gaps are shortfalls). LAC’s poor performance can be characterized by the overall negative gaps in per capita output annual growth over the period. The shortfall is almost a full percentage point with respect to the rest of the world or Non-LAC countries, meaning that it is substantially below the norm. Had LAC grown over 1962-2017 at the normal rate, its current GDP per capita would be about 50% higher than it actually is. LAC’s per capita output growth is only marginally above Africa’s and is of course far below the East Asian tigers. LAC also grew more slowly than the most advanced country, the US, getting further behind from the frontier.

However, not all is bad news. The comparison between pre and post 1990 growth gaps shows clear progress. While LAC per capita output growth post 1990 is still substantially below the norm (Table 2), relative to pre 1990 this shortfall contracted by a full percentage point. This enormous progress is insufficient, but it erased most of the initial gap. Progress measured against the US (Table 5) is even larger. Post-1990, the mean country in LAC actually grew faster than the US. This comparative analysis uncovers that 1990 was in fact pivotal in terms of LAC growth bringing considerably better growth performance, a fact that was not apparent in the non-comparative analysis in the previous section (Table 1). In particular, high per capita output growth in LAC before the debt crisis shown in Table 1 is misleading: those early periods were also of high growth throughout the world (in fact, growth gaps in that time frame are negative because the rest of the world actually grew faster, Table 2) and LAC growth success back then should not be attributed to a special virtue that it lost afterwards. Post 1990 performance is better, albeit poor.

Against this background, the key question is what is the role of productivity growth as a contributor to poor performance. The first observation is that productivity growth in LAC is subpar. The four benchmarks consistently show that, overall, LAC has a substantial shortfall of productivity growth. And in this regard, progress after 1990 is not impressive. In fact, relative to the norm, the shortfall shrunk by half but it is still substantial (Table 2). It closed only marginally against the US (Table 5), with respect to which it continues to fail to catch up by a wide margin. (There is no progress with respect to Africa and the progress observed with respect to the East Asian tigers can be best attributed to their own slowdown.) It is a further matter of concern that, in all four benchmarks, the productivity growth shortfall in the last period ending in 2017 has widened relative to the previous one and is larger than the average shortfall after 1990.

In contrast, the growth contribution of factor accumulation in LAC does not appear to be subpar. Overall, it is virtually at par with the norm of all non-LAC countries, ahead with respect to Africa and, importantly, about half a percentage point above the US (it only lags with respect to the East Asian tigers, substantially as expected). This encouraging conclusion about the growth contribution of factor accumulation is reinforced by its performance after 1990, which was actually above the norm of non-LAC countries. In fact, factor accumulation has strengthened considerably after 1990 with respect to this norm, the East Asian tigers and the US.

The picture that emerges from this accounting analysis is that per capita output growth in LAC has been sustained by a healthy contribution of factor accumulation dragged down by subpar productivity growth. This picture matches well the insights gained from comparative development analysis. LAC strengthened both sources of growth after 1990 but productivity growth remains subpar. With a normal rate of productivity growth, LAC would have a normal per capita output growth and would converge firmly to the US output per capita.

***Adjusting for Stage of Development***

In what follows, the robustness of this conclusion of failing productivity growth is tested by refining the comparability with benchmarks to account for expected transitional growth dynamics. It could be argued that the observed LAC’s subpar performance is a temporary phase of a longer process. If it can be expected that LAC countries would organically speed up to attain normal growth results in due course, crude comparisons with benchmarks at a point in time could be misleading. In what follows, we look at how productivity and factor accumulation growth contributions tend to evolve over the course of economic development in order to adjust growth comparisons with benchmarks by stage of development.

A lower stage of development may be beneficial for growth because low levels of capital stock lead to higher investment returns (traditional transitional convergence) and also because there are more low-hanging fruits to facilitate catching up with the productivity frontier (emulating technology as well as economic policies and institutions). However, a lower stage of development may also be dysfunctional to growth because of poor institutions distorting the workings of underdeveloped economies despite potentially favorable growth opportunities, and may itself be the result of low growth bringing about political economy conditions inimical to growth. The exercise in this section is not a causal analysis but a stylized description of how growth normally evolves over the course of economic development, so that a country’s normal or expected growth can be better ascertained taking into account its stage of development. Whether a lower stage of development is associated on average with a growth kick (unconditional transitional convergence) or not is an empirical matter.

For the purpose at hand, we measure the stage of development of a country as its output per capita relative to the US at any given point in time (in logarithmic terms). With this metric of stage of development, transitional convergence would imply that progress in development (per capita output closer to the US’s) is associated with less growth. If this is what the evidence shows, then adjustments would be needed to reflect the effective underlying growth shortfall to leave aside the effect of differences in stages of development. When a LAC country is more developed than the comparator, subpar growth could be excused to some extent; when a LAC country is less developed than the comparator, its observed growth shortfall would underestimate the effective one. In contrast, if the evidence shows divergence (higher relative output is associated with more growth), the opposite adjustments would be needed.

Table 10 shows three simple regressions to look at the dynamics of per capita output growth and the contributions of productivity and factor accumulation using the entire world panel controlling for stage of development as well as time dummies for each one of the eight periods to isolate worldwide shocks. The point estimates in the first column (per capita output growth) are approximately the sum of the point estimates in the other two columns (sources of growth). Our sample confirms the standard result of unconditional divergence in per capita output growth, meaning that backwardness is a drag to growth. This pessimistic result comes from a productivity growth rate that is lower for poorer countries, which more than offsets a (statistically insignificant) tendency of transitional convergence associated with the contribution of factor accumulation. (As a robustness test to this characterization of the normal growth evolution over the course of development that could be expected in LAC countries, Table 11 eliminates any possible contamination from LAC’s own experience by running the same set of regressions restricting the sample to Non-LAC countries, obtaining similar results.)

Stage of development could explain a part of the growth gaps shown in Tables 2 thru 5 because LAC and the benchmarks have different output per capita. In our sample, LAC countries are, on average, poorer than Non-LAC countries as well as than East Asian tigers and the US. Therefore, relative to these benchmarks, shortfalls in overall growth and in productivity growth can be partly excused and, on the contrary, those associated with factor accumulation are effectively larger. However, the estimations of the effects of stage of development on growth comparisons tend to be small and do not change the overall qualitative conclusions of the previous section. Tables 6 thru 9 show the adjusted growth gaps with respect to each benchmark based on the transitional dynamics estimations of Tables 10 and 11, and confirm that the qualitative conclusions derived from the raw gaps in Tables 2 thru 5 remain valid, namely that failing per capita output growth in LAC can be traced to subpar productivity growth. If anything, these adjustments reinforce the conclusion that LAC’s productivity growth is failing by showing a substantial shortfall also with respect to Africa.

***LAC Growth in Panel Regressions***

Finally, we use this panel regression framework to show in a more compact way how the performance of LAC countries deviates from the world experience and attach statistical significance to these deviations. First, Table 13 extends the same basic set of three growth regressions of Table 10 adding a LAC dummy to contrast its experience with the rest of the world. These estimations control for stage of development (as well as worldwide growth changes reflected in time period dummies).

This simple set of regressions shows stark results that reaffirm the conclusion that LAC’s per capita output growth is below expectation and that such shortfall is essentially due to abnormally low productivity growth, rather than factor accumulation weakness. In fact, the negative LAC dummy for productivity growth is large (and statistically significant with very high confidence) but not so the one for the contribution of factor accumulation, which translates into a considerable (and also statistically highly significant) overall per capita output growth shortfall relative to normal of about 0.8 percentage points per year. LAC per capita output growth in the period 1962-2017 is substantially below expectation. The shortfall of productivity annual growth is the predominant component, amounting to more than 80% of this overall growth shortfall.

Table 14 introduces two LAC dummies, pre and post 1990, and shows that in the latter period there was substantial progress relative to the norm in both productivity growth and the contribution of factor accumulation, of about half percentage point each. Nevertheless, there is still a substantial shortfall in productivity growth of about 0.4 percentage points per annum that more than offsets a factor accumulation contribution slightly above the norm. The conclusion is that in the current post 1990 regime the contribution of factor accumulation appears in line but productivity growth is still deficient and leads to subpar per capita growth.

How do individual LAC countries deviate from this average poor performance? Table 16 opens up the LAC dummy in Table 14 into a dummy for each LAC country. The conclusion is that the average analysis holds well in each one of the sixteen countries in our sample. It is remarkable that there is a productivity growth shortfall in every single LAC country in our sample leading to an overall shortfall in per capita output growth except in Dominican Republic (while the experience with factor accumulation is mixed, above the norm in a number of countries). Figure 10 demonstrates this result showing the contributions of productivity and factor accumulation for each country over 1962-2017.

LAC progress in the mean country after 1990 is of course supported by improvements in a number of countries. Table 17 opens up the pre and post 1990 LAC dummies in Table 14 into country dummies to uncover country diversity in the evolution of the contributions of growth sources. In particular, Figure 8 shows the productivity growth shortfalls pre and post 1990 for each one of the sixteen LAC countries. After 1990 most countries improved their comparative productivity growth (with the exception of Barbados, Brazil and Colombia). Nevertheless, in the current post 1990 regime, based on these estimations, productivity growth in LAC countries in our sample is still largely subpar, with the exception of Argentina, Costa Rica, Dominican Republic, Peru and Uruguay. Furthermore, at par productivity growth (at the rate of a comparable Non LAC country) is not enough to converge to the rate of productivity growth of the US. In fact, even after 1990, productivity growth in every LAC country is below that in the US with the only exception of Uruguay. If the stricter success standard of converging to the productivity frontier is applied, virtually no LAC country has successful productivity growth.

1. **PRODUCTIVITY GROWTH AND INEQUALITY**

This section explores the possible connection between low productivity growth and high inequality, both salient characteristics of the region. While there is a substantial literature looking at the connections between inequality and output per capita growth, this is the first time to our knowledge that a separate analysis for productivity growth is conducted.

There is a tentative consensus that inequality limits the opportunities of the disfavored undermining human capital accumulation, and may cause lower and distorted investment due to political and economic instability (Ostry et. al 2014). Inequality is also often associated with large informal sectors, which may lead to an economic fabric overwhelmed by stagnant traditional firms. In the extreme, it may lead to a fractious political economy threatening the workings of market economies. It stands to reason to think that these factors may slow down productivity growth. By contrast, the opposite view that inequality fosters growth, for example because it facilitates the accumulation of a critical mass of investable resources, appears to be receding.

However, a harmful effect of inequality on growth does not necessarily justify inequality-reducing policies, because such policies may be deleterious to growth. There is a fundamental tradeoff between the benefits from the alleviation of inequality and the potential cost of removing incentives to innovate and invest associated with redistribution. Any policy intervention premised on favoring growth needs to take into account this potential tradeoff.

The findings of empirical analyses on the relation of inequality and growth are not consistent or robust. One reason may be that such relation is contaminated by the inequality policies mentioned above, which may vary widely across time and space. Furthermore, it is clear that growth may also have an important effect on inequality, for example through compositional effects of the transition from traditional to modern economies (such as Kuznets’ transition from agriculture to manufacture and other processes of structural transformation nowadays). This reverse causation channel may also confound the statistical association between inequality and growth.

In the empirical analysis in this section we do not attempt to address these issues of omitted variables and reverse causation, and therefore do not claim any policy implication. This section extends the basic regressions of the previous section to explore whether inequality accompanies poor growth experiences, with a focus on whether inequality is associated with the subpar productivity growth in LAC. Consistent with our previous approach of controlling for stage of development, we also condition the association between inequality and growth to the stage of development.[[4]](#footnote-4)

To be done:

1. Extend basic regressions in Table 10 to include inequality variable (INEQ), both by itself and interacted with per capita output gap, and analyze the relevance of INEQ
2. Extend basic regressions in Table 13 and 14, and analyze how LAC dummies are altered
3. Analyze how LAC country dummies in Table 16 and 17 correlate with INEQ.

**STATISTICAL APPENDIX**

The data for growth accounting (Sections 1-3) is from *Penn World Tables* (PWT) version 9.1 (Feenstra et al. 2015). In all cases output-based versions of real GDP are used because they are more suitable for the comparisons of productive capacity (as opposed to expenditure-based versions that are affected by the evolution of terms of trade).

Following Feenstra et al. (2105), growth accounting exercises are based on the variable RGDPNA (real GDP using national-account growth rates), which is recommended for studies comparing (output-based) growth rates across countries. Total factor productivity is the corresponding variable RTFPNA as estimated by PWT. By contrast, output per capita with respect to the US, utilized to measure the distance to the frontier at each point in time, is based on the variable CGDPo ((Output-side) GDP at current PPPs), which is recommended to compare relative productive capacity across countries at a single point in time.

We put together a panel with annual information for 1961-2017 for 71 countries divided into the following groupings:

**(16)** **Latin America and the Caribbean (LAC):** Argentina, Barbados, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Peru, Trinidad and Tobago, Uruguay, Venezuela

**(55) Non-LAC countries,** divided into:

* + **United States**
  + **(4) East Asian Tigers:** Hong Kong, South Korea, Taiwan, Singapore
  + **(14) Africa:** Burkina Faso, Cameroon, Cote d’Ivoire, Egypt, Kenya, Morocco, Mozambique, Niger, Nigeria, Senegal, South Africa, Tunisia, Tanzania, Zimbabwe
  + **(36) Others:** Australia, Austria, Belgium, Canada, China, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, Jordan, Luxembourg, Malaysia, Malta, Netherlands, New Zealand, Norway, Philippines, Portugal, Romania, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Turkey, United Kingdom

The database was constructed as follows:

* Per capita variables are computed by dividing by population (variable POP), obtaining rgdpnaPerCapita and cgdpoPerCapita.
* Annual growth rates are estimated considering log differences, to obtain lrgdpnaPerCapita\_chg1 and lrtpfna\_chg1.
* Barbados, Cote d’Ivoire, Cameroon, Hong Kong, Indonesia, Mozambique, Niger, Romania, Senegal, Singapore, Tunisia, Tanzania, and Burkina Faso had missing TFP data in the first years (before 1964). For these countries, the missing variable LRTFPNA was estimated based on the predicted values of country specific regressions of lrtfpna\_chg1 on lrgdpnaPerCapita\_chg1 using the available sample for each country. We then extrapolated lrtfpna back to 1961 using the estimated growth rate.

The dataset was used as follows:

* The Non-TFP or overall factor accumulation contribution was obtained as a residual to account for Per capita output growth purged from TFP:

lrgdpnaPerCapita\_chg1\_nonTFP = lrgdpnaPerCapita\_chg1 − lrtfpna\_chg1

* In order to filter out the business cycle, the average of the annual growth rates above over subperiods of seven years were considered (1962-68, 1969-75, 1976-1982, 1983-89, 1990-96, 1997-2003, 2004-10, 2011-17). The year 1990 divides the time span in equal parts, four subperiods before 1990 and four subperiods starting in 1990.

lrgdpnaPerCapita\_chg7\_nonTFP = lrgdpnaPerCapita\_chg7 − lrtfpna\_chg7

* The representative growth rate for each country grouping was obtained as a simple average of the growth rates of the corresponding countries.
* The per capita output distance measure to the US for each country (lcgdpoPerCapitaUSA) was constructed as the logarithm of the output per capita gap cgdpoPerCapita/cgdpoPerCapitaUSA in the period.

Inequality data produced elsewhere in this project was used, which may restrict the time span and country samples used in Section 3 (to be done later).

**References**

Barro, Robert (2000). “ Inequality and Growth in a Panel of Countries” *Journal of Economic Growth*, 2000, vol.5, issue 1, 5-32

Daude, Christian and Eduardo Fernandez-Arias (2010). “On the Role of Productivity and Factor Accumulation in Economic Development in Latin America and the Caribbean” IDB Working Paper 155. Washington, DC, United States: Research Department, Inter-American Development Bank.

Easterly, Robert and Levine (2001). “What have we learned from a decade of empirical research on growth?” *World Bank Economic Review* Volume 15, Issue 2.

Fernandez-Arias, Eduardo and Sergio Rodriguez-Apolinar (2014). IDB Working Paper 155. Washington, DC, United States: Research Department, Inter-American Development Bank.

Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2015), "The Next Generation of the Penn World Table" American Economic Review, 105(10), 3150-3182

Loayza, Norman, Pablo Fajnzylber and César Calderón (2005). “Economic Growth in Latin America and the Caribbean”. World Bank. Washington, DC, United States.

Ostry, J D, A Berg and G D Tsangarides (2014), “Redistribution, Inequality, and Growth”, IMF Staff Discussion Note No. SDN/14/02, February

1. Data taken from Penn Word Tables version 9.1; see Statistical Appendix for details. LAC countries are Argentina, Bolivia, Brazil, Barbados, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Peru, Trinidad and Tobago, Uruguay and Venezuela. A balanced panel was considered, neglecting LAC countries with shorter time series for the relevant variables, in order to allow for simple and robust statistical analysis. [↑](#footnote-ref-1)
2. Alternatively, a filter can be used to estimate an estimated trend, as in Loayza, Fajnzylber and Calderón (2005) or Daude and Fernández-Arias (2010). Qualitative results are similar. Here this simpler method is used to gain comparability with the regression analsis in the subsequent sections. [↑](#footnote-ref-2)
3. To the extent that capital services estimations successfully adjust for the quality of the capital stock, productivity estimations on account of capital investment reflect only disembodied technological progress. [↑](#footnote-ref-3)
4. As shown in Barro (2000), this conditioning may be important. In his growth model, he finds that inequality retards growth in poor countries and encourages growth in richer countries (and little overall relation). [↑](#footnote-ref-4)