Productivity in Emerging Market Economies: Slowdown or Stagnation?

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Since the global financial crisis, productivity growth in advanced economies (AEs) has been sluggish, and it is expected to remain slow. Medium-term prospects have been also declining. Whether this is the result of secular stagnation, caused by lack of aggregate demand (Summers, 2014), or it is a long-term trend decline in productivity growth (Gordon, 2016), the implications for emerging market economies (EMEs) are far reaching. They will face low global demand for their goods and services and low tailwinds from the global economy.

Growth prospects have fallen for all countries. In figure 1 I show the change in the 5-year-ahead rate of GDP growth forecast by the IMF's World Economic Outlook (WEO) between April 2012 and April 2017. Forecasts five years ahead are a reasonable estimate of the IMF expected rate of long-term growth. In 2012, the WEO was forecasting growth at 4.6% for the world economy, and now 3.5% is expected. Moreover, for 2022 the forecast is 3.8%, a 0.8 percentage point decline. As figure 1 shows, this decline is expected for all groups of countries. The long-term growth for the category of emerging market and developing economies, mostly non-advanced economies, is expected to fall by 1.3 percentage points. The focus of this paper is on EMEs. There are many definitions for EMEs, and I combine several of them, excluding all the countries with less than 5,000 dollars income at PPP prices and 3 million people in 2010. I also exclude big oil exporters where the measures of total factor productivity (TFP) are difficult to interpret, namely Kuwait, Saudi Arabia and the United Arab Emirates. The final sample contains 39 countries (see table A.1 in the appendix for the list of countries). Taking the simple average for these countries the long-term prospects have fallen by 1.4 percentage points.[1]

Against this backdrop, the purpose of this paper is to examine TFP in EMEs and the implications of the global slowdown. Economic growth may come from the accumulation of factors or better use of those factors, the latter being TFP. But TFP is central, since it is the main driver of growth in the long run. In this paper I will look into the main historical facts about productivity in EMEs

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[1] All the aggregates usually are computed as a weighted average. My focus is on countries and therefore I will use simple average in the rest of this paper. In figure only the average of the sample used in this paper is a simple one (EMEs).

and how they compare to the US and AEs. The data come mostly from the version 9.0 of the Penn World Tables.

The main findings of this paper are:

- There has been a narrowing of the GDP per capita gap of EMEs against the US.
- The narrowing of the gap is explained by an increase in physical and human capital accumulation faster than that in the US.
- In contrast, there has not been narrowing of the TFP gap, and in most countries productivity has been growing less than in the US. About two-thirds of the output gap is explained by low productivity.
- EMEs are characterized not by a smooth process of growth, but by growth bursts followed by slowdowns. The periods of growth acceleration are also the periods when the contribution to growth of TFP is the largest.
- Productivity growth in EMEs is correlated with that of AEs and also there are more growth accelerations in periods of higher global growth.

A summary of the evidence can be seen in figure 2. It shows five-year average growth of GDP and TFP in EMEs and AEs, all computed as simple averages.[2] The rates of growth are correlated, but the most striking fact is that growth while GDP growth in EMEs is greater thann that of AEs, TFP growth is lower. On average, the sample of EMEs grew at 4.8% I the period 1950-2014, while AEs grew at 3.8%. In contrast, TFP growth in EMEs ws 0.6%, while in AEs was 1.2%. Indeed, most of the time TFP growth in EMEs has been below that of AEs. During the 2000s, the period of the commodity price boom, there was some significantly higher growth of TFP, which came to a halt with the global financial crisis.

The evidence of this paper is rather gloomy. Despite many good experiences of growth among EMEs, productivity growth is still low. But, on the other hand, there is ample room to improve productivity. The conundrum is what to do.

The paper follows in section 1 by examining the convergence of GDP in EMEs and the closing of the factors and productivity gaps. Section 2 presents a development accounting exercise for a group of Asian, European, and Latin American emerging markets and shows that most of the low income with respect to the US is explained by low TFP. In section 3 I analyze episodes of growth accelerations and compare growth decompositions during those episodes with the whole period covered by the PWT 9.0 for each country. Section 4 looks into the correlations of TFP and the frequency of growth accelerations with the global cycle. Section 5 discusses opportunities and headwinds from the current global scenario, and section 6 concludes.

[2] The sample of Advanced Economies follows the classification of the IMF. I exclude a group of countries that were classified as emerging markets many years ago, and now are advanced economies (the Czech Republic, Greece, Korea, Lithuania, the Slovak Republic and Taiwan). Those countries are included in the sample of EMEs. This avoids a potential selectivity bias by including "successful EMEs" that become high-income economies.

1. Income, factors, and productivity catch-up

There is a significant income gap between EMEs and AEs. For purposes of evaluation, I follow the standard by using the US as the benchmark for comparisons. The income gap has declined, but still there is a significant difference. Indeed, for the sample of countries I use, the simple average income gap (one minus relative GDP per capita) was 69% in 1990. This gap declined to 61% in 2014. There has been partial catch-up. Being the US the productivity frontier, the income gap would be expected to decline by the accumulation of factors and a more rapid growth of productivity in EMEs than in the US.

Here I examine the closing of the GDP, physical capital, human capital—all in per capita terms—and TFP gaps. All the data are taken from the PWT 9.0.

The PWT have no direct data for the level of total factor productivity in constant prices. It has an index for TFP at constant national prices with base 2011 equal 1 (*rtfpna*). With this index, it is possible to compute the real rate of growth of TFP, but not the level, impeding to compare the gap with respect to the US. The PWT also provide an index for TFP at current prices with US equal to one for each year, and hence, we can use the ratio for 2011 to compute the relative value for TFP. Starting from the observation of 2011 we can compute relative TFP at constant 2011 prices using the rates of growth of real productivity from *rtfpna* for each country and for the United States.

I will compare the gaps of 2014, the last year of the database, with respect to 1990. The comparisons could be done with 1980, but the 1980s were years of low growth in EMEs, in particular in Latin America, where countries suffered the debt crisis and it was a lost decade, starting from high levels of income, often fueled by the abundant liquidity in the global economy. In any case, starting comparisons in 1980 leads to broadly similar results. In contrast, the 1990s marked the beginning of increased international financial integration and it was a period of the resurgence of capital flows to EMEs (Calvo et al., 1993). In addition, starting in 1990 allows to expand the sample, since some countries did not exist before, e.g., members of the former Soviet Union.

Figure 3 presents the comparison of GDP per capita with respect to the US. Most countries increase their relative GDP per capita; indeed, out of the 39 countries of the figure, 31 had a larger ratio in 2014 than in 1990. The most successful cases are Korea and Taiwan, that went from 40% and 33% to 80% and 67%, respectively. Among the low-income countries, China went from 6% to 24%. Among the countries that experienced a decline in relative GDP are the cases of Russia, Greece, Venezuela and Ukraine. It is interesting to note that Mexico, which signed NAFTA in 1994, also experienced a decline in relative GDP per capita. Its rate of growth was less than that of the US, resulting in a decline from 33% to 30%.

The relative levels of physical and human capital are shown in figures 4 and 5, respectively. Regarding physical capital, capital for short, most countries have been catching up. The

magnitudes are like those of relative GDP. The ratio of the stock of capital per capita went from 29% in 1990 to 38% in 2014. In 33 countries the ratio increased, while only in 6 of them it declined. Again, the cases of Korea and Taiwan are the most remarkable. They went from 27% and 37% to 86% and 89% respectively. Within the middle-income countries, the performance of Lithuania was also noteworthy, closing the gap by 20 percentage points. Chile and Malaysia at a level of income somewhat lower also narrowed the gap by more than 20 percentage points. In the lowest income portion, it is again noticeable the case of China, where relative capital soared from 4% to 31% that of the US.

Human capital in PWT 9.0 is measured with an index based on years of schooling and returns to education using Miner equations. The return for the first four years of schooling is 13.4%, for the next four is 10.1% and for all the years above eight the return is 6.8%. The measures are not country specific and, therefore, we cannot control for the quality of education in each country. Using these data, figure 5 shows that all the countries in the sample increased their ratios with respect to the US between 1990 and 2014. On average, they went from 65% to 76%, and dispersion is relatively low. Korea, The Slovak Republic and the Czech Republic reached levels matching those of the US.

Finally, figure 6 shows the evolution of EMEs' relative TFP with respect to the US. In the PWT, measures of TFP are calculated for each country using their own income shares. There are some potential anomalies. Below I will do some comparisons using same income shares as robustness. Some countries have TFP above that of the US, including Bulgaria, Egypt, Iran, Iraq and Turkey. I exclude these countries from the comparisons, because I have no explanation for that fact, which seems to be more a measurement problem that an actual greater TFP. The results are striking. There is no pattern of catching up. Moreover, on average the productivity gap has increased. On average the initial ratio of productivity to US TFP was 67% in 1990, and it declined to 60% in 2014. The countries that have the largest GDP catch-up, Korea and Taiwan, had only small productivity catch-up. I contrast, Mexico, Russia, Ukraine and Venezuela, show significant setback.

Importantly, the previous comparisons should not be interpreted as a decline in TFP, but as a lower growth than that of the US. Figure 7 shows the annual average growth productivity during the period 1990-2014, where it can be seen the rapid growth of productivity in China and Sri Lanka. But few countries have more rapid growth than the US and others experienced negative TFP growth. Indeed, technological reversal is difficult to rationalize, however this may be more a phenomenon of reallocation from more productive firms and sectors to less productive ones. The figures from the PWT 9.0 many times differ from more careful estimates made in each country, and, hence, these comparisons allow to have a broad view of productivity developments across countries rather than taking them as precise figures country by country, adding all the intrinsic difficulties with the measures of TFP.[3]

[3] For example, in Chile, productivity growth has been slow due to some extent to low PTF in the mining sector, because during the copper price boom mineral ores decline, and hence, recent low TFP growth was due to geological rather than technological factors. Excluding mining, TFP growth was higher (Blagrave and Santoro,

An interesting and puzzling case is Mexico, which has seen negative productivity growth. This is not a data problem, since they are not very different from those of national sources, such as those of Torre and Colunga (2015). They show that TFP annual growth between 1990 and 2011 was -0.6%, while PWT for the same period was -0.9%. Looking at 5-year periods, the only period in which productivity growth was positive was 1996-2000, that corresponds to the recovery from the Tequila crisis and the first years of NAFTA. This productivity performance is puzzling, considering NAFTA, the stabilization of inflation and several other important reforms. Openness has increased. Exports went from 6% of GDP in 1990 to 27% in 2014. This is why Levy and Rodrik (2017) call it the Mexican paradox. They argue that dualism is an important explanation of this. After liberalization, the informal sector has increased, deepening dualism. To this we must add that the potential benefits of NAFTA could have been limited by the entrance of China to the global economy, although the dynamism of Mexican exports has been quite relevant, and hence, there is no evidence of a relevant obstacle to trade. In addition to dualism, another contributing factor could be the weak rule of law and high levels of corruption.

Summing up, the closing of the GDP per capita gap between EMEs and the US has been due mainly to the decline in the gap between the capital stock and human capital, while there has been no contribution in terms of productivity. This evidence reminds of the discussion generated by the findings of Young (1994) on the Asian miracle. He showed that the Asian miracle was more transpiration than inspiration. It was the result of increased labor force participation and high levels of investment, with modest TFP growth. We can see this in the data for Indonesia, Malaysia and Thailand where their positive TFP growth is below that of the US, resulting in a widening of the gap, in the case of Philippines that remains roughly the same, and Korea and Taiwan with a small decline in the gap. Most of the GDP catch-up came from factors. What the evidence here shows is that this pattern is not particular to Asia, but for most EMEs. One important exception is China, where productivity growth has been close to 3% per year, and one of the largest among EMEs. With labor share of 0.65 and TFP growth of 3%, the steady-state rate of growth of per capita GDP in the neoclassical growth model would be 4.6%, allowing for rapid catch-up. The question is how long can this TFP growth be sustained.

2. Development accounting

To have additional evidence on the closing of the GDP gap I perform a comparative exercise of development accounting for a group of Asian, Emerging European, and Latin American countries. Given the following production function,

$$Y = AK^{\alpha}H^{1-\alpha}, \tag{1}$$

2016). In the case of Uruguay, Donagello et al. (217) have argued that it was caused by improved international conditions and an increase in the rate of capital utilization.

where *Y* is output, *K* capital and *H* human capital, measured by a Mincer equation as discussed before, *H=hL*, where *h* is human capital per worker, measured as a combination of years of schooling and returns, we have that GDP per capita can be expressed as:

$$y = (k/y)^{\alpha/(1-\alpha)} hA^{1/(1-\alpha)}, \quad (2)$$

where small letters represent per-worker variables, which assuming no labor force participation changes should be proportional to GDP per capita. Using a subscript *i* for any EME and *u* for the US we can have the following decomposition for the GDP per capita ratio,

$$\frac{y_i}{y_u} = \left(\frac{k_i/y_i}{k_i/y_u}\right)^{\alpha/(1-\alpha)} \left(\frac{h_i}{h_u}\right) \left(\frac{A_i}{A_u}\right)^{1/(1-\alpha)}. \quad (3)$$

With this equation, I perform the development accounting exercise.

The first two terms are the decomposition of factors, physical and human capital, and the third is the term for TFP. The decomposition could be done directly using (1), and the component of capital would not be measured as the relative capital-output ratio in (3), but as the ratio of capital per worker. In this case, the equation for development accounting would be:

$$\frac{y_i}{y_u} = \left(\frac{k_i}{k_u}\right)^{\alpha} \left(\frac{h_i}{h_u}\right)^{1-\alpha} \left(\frac{A_i}{A_u}\right), \quad (4)$$

In general (3) is preferred, because, in the neoclassical growth model, capital per worker depends on the level of productivity, and therefore part of the differences in capital in equation (4) would be explained by TFP. In contrast, the capital-output ratio is independent of TFP.[4] In the appendix I report the decomposition using equation (4) as an alternative. In this case since the capital gap is greater than the capital-output ratio gap, the productivity gap will decline.

I assume labor shares, 1-α, are the same across countries and equal to 0.65. Data on GDP, physical capital and human capital are taken from PWT, and, in contrast to previous figures, total factor productivity (*A*) is computed as a residual from equation (3), dividing the ratio of GDP per worker by the ratio of factors. The results are presented in table 1. To avoid giving excessive weight to large countries, the aggregation is done using geometric averages, so the multiplication of the averages of columns 2, 3, and 4 yields exactly 1. The last column is the share of the GDP per worker ratio explained by TFP.

All groups of countries have reduced their GDP per worker gap. There has also been a decline in the physical capital and human capital gaps. The TFP gap also declines in Asia and Emerging Europe, while it has increased in Latin American countries. The last column of table 1 shows the share of the TFP gap explaining the GDP gap. In all regions the TFP gap explains between 60%

[4] For further details, see Jones (2016).

and 70% of the total gap in output per worker. From 2000 to 2010 the TFP gap increased its explanatory power of the GDP per worker gap.

Overall, the results of this decomposition show similar patterns to those of the previous figures. The output gap as well as the factors gap have declined. The TFP component shows a less clear pattern. But also, this development decomposition shows another stylized fact, namely that the TFP gap is the largest component of accounting for the output gap, approximately two thirds.[5] In the decomposition presented in the appendix, the TFP gap is about 50%, while the capital gap increases its share. Which one is the most relevant depends on how tight we think capital is to productivity in the long run.

3. Evidence during growth accelerations

Economic growth is not a smooth process. It changes significantly over time. Countries with high rates of average growth over long time spans have experienced some episodes of growth acceleration, and the rest of more moderate growth. After a period of relatively modest growth, growth bursts to then return to more normal levels (Hausmann et al., 2005; Jones and Olken, 2008; Berg et al., 2012). In this section I will examine whether the patterns of TFP growth are different in normal times compared to growth accelerations.

In the previous section I have focused on the period 1990-2014. In this exercise I will focus on the entire period starting in 1950. This will serve as a robustness check and confirm that the low growth of TFP among EMEs has been a long-standing problem, not just post 1990. In this section I will also I do standard Solow decompositions using a labor share of 0.65, and obtain TFP as a residual. This will also serve as a robustness check to different calculations of TFP. In addition, these decompositions will be independent of the using the US as a benchmark.

To define a growth acceleration, I extend the evidence form Hausmann et al. (2005) (HPR) by endogenizing the length of the high growth spell. HPR look at periods of acceleration lasting for exactly eight years, while I start searching for periods of eight-year acceleration and then extending them to estimate whether it lasts longer.

The HPR method proceeds by estimating log-linear regressions for GDP per capita, and the coefficient of the regression is the average rate of growth, denoted by g(t,t+n), where n=7 since it considers eight years for the level of per capita GDP. The change in the rate of growth is defined as $\Delta g=g(t,t+n)-g(t-n.t)$, that is, the difference between growth in an eight-year period and the previous eight years. A growth acceleration is defined when the three following conditions hold:

- g(t,t+n)>3.5%, that is, growth is relatively high, greater than 3.5% a year.

[5] The results are not sensitive to the labor share. If the labor share is 0.5 instead of 0.35, the last column would be between 58% and 74% instead of 56% and 73%.

- $\Delta g \geq 2\%$, that is, growth increases by at least 2 percentage points.
- Per capita GDP at the end of the episode is greater than or equal to the maximum growth before the episode, so no recoveries from a big slump are considered.

Since there may be several years to define the beginning of an episode, the year that maximizes the F-statistic of a spline regression is assumed to be the year of the break in growth.[6] To define the last year of the acceleration I consider whether average growth for three years following the eight-year episode is greater than or equal to 2.5%, that is, growth is still high. The idea is that growth can decelerate but only by one percentage point in a three-year average. A three-year period is chosen to avoid being sensitive to a single year's growth rate.

The results for the periods of growth accelerations are presented in table A.2 in the appendix. For each of these countries I do Solow decompositions. I compare the results of the decomposition during accelerations and during the whole period in which data are available. A summary of the results is presented in figure 8, which shows the contribution of TFP during the periods of high growth against the whole period. Some countries had more than one acceleration, so they are on a horizontal line at the level of the contribution for the entire period. The basic data from PWT cover the period 1950-2014, and I use the longest period of data available for each country.[7]

The results are quite strong and show that in most of the cases the contribution of TFP growth is larger during accelerations. Indeed, the average contribution of TFP growth during the whole period is 32%, while during the period of accelerations it is 55%. Therefore, periods of growth accelerations are periods of productivity take-off. It is interesting to note that in the cases of Korea and Taiwan the growth of TFP is greater in the whole period, but it must also be noted that these countries have one of the longest periods of growth acceleration. Indeed, the longer the episode, the closer it is to the whole period. In the cases of Korea and Taiwan the contribution of TFP to growth during accelerations is somewhat smaller than in the non-acceleration period.

For Korea, the growth acceleration went from 1963 to 1994, while for Taiwan from 1960 to 2000. China also experienced a long period of high growth, from 1978 to 2014, except for 1988 to 1991. It still has not ended, and it has continued in recent years beyond the period considered in this exercise. For China, the contribution of TFP growth was 42% compared to 22% during 1952-2014. Thailand is another country that had a long spell, from 1957 to 1995, and the contribution of TFP growth was 50% compared to 41% for the whole period.

[6] The Matlab do files to estimate growth accelerations of eight years are those of Buera and Shin (2017).

[7] There are 52 episodes of growth acceleration, and for graphical convenience I exclude those cases where during the whole period productivity is negative, which accounts for eight cases. This is the case of two episodes in Uruguay during 1950-2014, three cases in Nigeria during 1960-2014 and one case in Russia from 1990 to 2014. In the case of Morocco, two episodes have large declines in productivity, and another an unusually large increase, which are not considered for being clearly outliers. In any case, six out of the eight episodes excluded follow the general patterns discussed in the text, that is, TFP growth was quite significant.

There are periods of growth accelerations that end up in large recessions; these are those that probably originated in transitory causes that could have triggered a crisis in the future, such as financial liberalizations and massive capital inflows than end in sudden stops, or periods of booms caused by exchange-rate-based stabilizations. To distinguish among sustainable and unsustainable accelerations I compare the level of per capita GDP four and five years after the end of the episode. If per capita GDP in some of those years is below the level at the end of the spell, I call it unsustainable. The evidence, shown also in table A.2, is that there are no significant differences between both types of accelerations. Therefore, all accelerations, whether sustainable or not, coincide with a higher contribution of TFP growth. There are of course difficulties in defining unsustainable episodes, in particular after the global financial crisis, where the slump was caused mainly by an external shock, as was the case of the Czech Republic. Unsustainable episodes are largely driven by good external conditions and financial liberalization, while sustainable ones are associated with large increases in trade, real depreciations and economic reforms. They also start after political changes (Hausmann et al., 2005). Berg et al. (2012) also endogenize the duration of the spells in episodes of growth spurs. They find them to be positively related to export orientation, openness to FDI, equality levels and democratic institutions. More work can be done on a larger sample of countries to study more carefully the distinction between sustainable and unsustainable growth accelerations. In this paper, the unsustainable ones are relatively few.

These results suggest that after the implementation of reforms, most of them associated to trade and stabilization, many economies take off. Buera and Shin (2017) show how periods of reforms that remove distortions trigger growth accelerations and TFP growth.[8] Before the reforms, capital is misallocated across sectors, and reallocation is what causes TFP to grow. The question is why does TFP decelerate. Perhaps this is a period in which the economy may be reaching its potential level of productivity. After that, growth becomes more difficult. Rather than removing basic distortions, what is needed is that they move their own frontier. Many have argued in favor of second-generation reforms such as increasing transparency and improving governance, but there is neither an obvious answer nor evidence showing which are those that spur growth.

4. Productivity in EMEs and the global economy

I have shown that in broad terms productivity performance in EMEs has been quite modest, and we can think that this extends to frontier and low-income economies. With the slowdown of productivity growth in advanced economies another question arises: Will this slowdown result in a drag of productivity in EMEs? For this I will look at the relationship between productivity in EMEs and the Advanced Economies (AEs) for the longest available period.

[8] In their model savings rises before investment takes-off, and hence at the beginning of the period there are capital outflows.

As seen in figure 2, the aggregates of AEs' and EMEs' productivity growth (measured as five-year averages) are correlated. Figure 9 shows the correlation of average TFP growth of EMEs with respect to AEs for 10 and 20 years rolling data. The 20-year correlation started relatively low before the first oil shock, to then increase until the early 1990s. The correlations have increased again in more recent years. These correlations are quite similar when the sample is broken down across regions. Therefore, without examining the causal links or the mechanisms for this correlation, the decline in AE productivity should lead to a decline in potential TFP growth among EMEs. This is also consistent with the worldwide decline in growth prospects reported in figure 1

Another issue that could be examined is whether the frequency of growth accelerations, those that spur productivity as seen in the previous section, are correlated with global growth. Figure 10 shows the number of growth accelerations and two measures of global growth. They are the rate of growth of AEs from the WEO database available since 1980, and the simple average rate of growth of PWT. The figure starts in 1960 because the first growth accelerations are detected only by the end of the 1950s. Until the early 70s there was robust global growth and a good number of accelerations, after which they declined and resumed in the 90s. This is also a period in which the correlation between productivity in EMEs and AEs declined. After the global financial crisis the number of growth accelerations has declined.

If productivity growth in EMEs consists mostly of adopting technologies from the frontier in AEs, one should not expect high correlations as those seen in the data. An intuitive explanation for this is the procyclicality of TFP inasmuch as standard measures do not take into account the utilization of production factors. Another reason is that periods of high growth are those that are most conducive to the adoption of better technologies. In both cases, assuming that the business cycles around the world are correlated, and becoming ever more synchronized, the periods of high productivity growth will be correlated at a global level. This helps to explain correlations, but it does not explain the main point of this paper, i.e., the very low productivity growth in EMEs.

5. Opportunities and headwinds for TFP catch-up

Beyond the productivity slowdown, there are two major features of the global economy that are relevant for the prospects of growth in EMEs. Trade growth, which has been the engine of growth in many successful experiences is low and expected to remain subdued. On the other hand, global interest rates are low, which permits to increase investment at lower costs. There are additional headwinds such as population ageing and inequality. [9]

Trade. Between 1990 and 2007 real trade grew twice as fast as real GDP, and prior to 1990 about 1.5 times. Since 2011, at about the same rate. For the next few years growth is expected

[9] For a recent discussion on the global productivity slowdown and headwinds for a global pint of view see Adler et al. (2017).

to grow at rates similar to those of GDP, about 3.7%. This contrasts with a rate of growth of global trade at 7% from 1990 to 2008. There are many reasons for this development, however they are not related to increased protectionism (Freund, 2016). Among the most relevant are the decline in growth of China, the halt in the expansion of global value chains, and the cyclical downturn in global investment, as trade of capital goods is an important component of trade. The decline in trade is not the result of protectionism or a global economy growing too slowly. Although future growth will be lower than expected, it is still at reasonable levels for small open economies to export, and trade has shown to be one of the most consistent determinants of economic growth, with some caveats discussed above. As long as structural transformations may change the relationship between global growth and trade, there are still opportunities in world markets. For example, the decline in the global value chain expansion, and retrenchment in some cases, changes the cross-border transactions without necessarily affecting global output. However, countries that may have relied on being part of the global value chains may see their capacity to grow restrained.

Low global growth is also bad news for commodity-exporting countries. The impact across commodities is heterogeneous and depends on the effects on supply and commodity-saving technological progress that took place during the commodity price boom. The recent evolution of commodity prices would suggest that oil has been more affected than foods and metals.

Interest rates. Another important development in the global economy has been the systematic decline in interest rates since the late 1980s, and which is expected to persist (Rachel and Smith, 2017). Whether this is caused by changes in the balance of global savings and investment due to demographics and investment decline, or by an increase in the demand for safe assets, this has been happening in many countries around the world, and the reduced long-sovereign rates have also been passed-through to market rates. This helps to explain the massive increase in corporate debt in emerging markets.

To make simple real rates comparison in EMEs and the US I estimate a real rate in the US using the Michigan survey of inflation expectations and the 10-year bond yield. In addition, I add in the 10-year TIPS yield, but this series is somewhat shorter, although it may be a better estimate of long real rates.[10] I compare these rates to the indexed interest rate for a 10-year bond in Chile, which has a deep market on indexed papers from several decades ago. The evolution of those rates is presented in figure 11. Since the early 1990s rates have accumulated a decline between 400 and 500 bp.

The cost of capital has declined and this is good news for investment. Although the biggest gap is in productivity, investment still plays an important role in growth, and it has demonstrated to

[10] On average, the TIPS yield is 1000 basis points higher tan the rate I have constructed, but the trend is very similar.

be the main driver of output growth. Moreover, investment, foreign and domestic, may bring about technologies and spur further growth.[11]

Low interest rates and investment booms bring also macroeconomic tensions in EMEs. The search for yield could lead to capital inflows booms, current account widening and exchange rate appreciation. The first task is to safeguard financial stability to avoid fragilities building up. In addition, allowing the exchange rate to float to facilitate the adjustment and using exchange rate intervention in exceptional cases may also help. The use of capital controls may be another option, but the experience of EMEs that have already significant degrees of financial integration shows they are broadly ineffective and may add distortions. Perhaps more relevant is the discussion on how and when to open up to capital inflows, but that issue is more relevant for lower-income economies.[12]

Demographics. Ageing population has been considered to be a drag to growth in the US (Gordon, 2014) and more in general in advanced economies. However, this phenomenon is also being experienced in EMEs. Ageing population reduces income per capita for a given labor productivity, as older people work shorter hours or not at all. But also the change in the age composition of the labor force may affect TFP as older persons have more experience while younger ones bring more knowledge to the labor force. The net effect could have been a reduction in TFP growth of 0.1 percent a year in EMEs (Adler et al., 2017).

Inequality. Beyond social justice concerns, high levels of inequality hamper potential growth (Berg and Ostry, 2017). But also, rising inequality may be detrimental for growth and productivity. Indeed, high or rising inequality induces increase in taxation to provide transfers and equalizing government expenditure, with the consequent distortions. Thus, inequality affects negatively public finances and inflation. More generally, inequality induces bad policies and weakens institutions (De Gregorio and Lee, 2004). Inequality is a waste of potential resources as many talented young people cannot afford good levels of education. It can also exacerbate the financial cycle, because, for example, it increases demands for financial aid in the housing market. Despite that this is an empirically unsettled issue,[13] rising inequality may generate social demands that cannot be met in a sustainable form and consistently with keeping an environment conducive to economic growth. For the US, Gordon (2014) has argued this to be one of the headwinds for productivity growth.

[11] The adoption of frontier technologies does not necessarily result in higher growth and depends on the skill-intensity of these technologies as well as the absorptive capacity of the economy (Mies, 2017). Perhaps this is an issue more relevant in lower-income countries were the skill gap may be more relevant. This may also have to bear with the prevalence of dualism.

[12] For further discussions of the Latin American experience during the global financial crisis, see De Gregorio (2014). In addition, as shown in Alvarez and De Gregorio (2015), capital controls do not help to explain better performance during the global financial crisis.

[13] Rajan (2010) argues that rising inequality in the US led to subsidized mortgages that were central causes of the financial crisis. However, Bordo and Meissner (2012) do not find evidence of the link between inequality and crisis in a broad sample of countries.

Regarding EMEs the evidence is mixed, but can be summarized, with some caveats, as follows: In the less unequal areas, Emerging Asia and Europe, inequality has increased since the early 1990s. In contrast, in Latin America, where inequality is relatively high, it has declined (De Gregorio, 2015, figure 14).[14] Hence inequality has become an issue everywhere, in some countries because it has increased, in others because it is high. When inequality is high or rising, but growth is also high, the demands for greater redistribution diminish, but at times of low growth they increase and may weaken further growth.

Corruption. Another factor that hinders growth, and which is quite pervasive in EMEs, is corruption. Like inequality, corruption is also related to bad policymaking, many times more driven by the interests of particular groups, those more prone to illegal activities, than on a technically sound basis. Corruption is also a sign of weak respect for property rights. Figure 12 shows the Corruption Perception Index computed by Transparency International, which is based on surveys to experts, and grades them from 0 to 100, 100 being absence of corruption. The group "others" is mostly composed of low-income countries, but also countries with higher income that are not considered to be EMEs in the sample used in this paper. A look at the figures makes it quite clear. Corruption is lowest in AEs, followed by EMEs and the Others. It is, therefore, highly correlated with income. The more corrupt are the countries the less income they have. This is a drag for most non-AEs. At the top of EMEs, with an index of 60 or more are Uruguay, Chile, Poland and Taiwan. Causation may go both ways, but reducing corruption should help to increase economic growth.

6. Concluding remarks

This paper has shown that EMEs have reduced their income gap with respect to the US. In many cases progress has been remarkable. However, with the notable exception of China, the productivity gap has not declined significantly. Moreover, several countries that have reduced the income gap have not been able to reduce their productivity gap. During periods of growth acceleration, TFP growth has been a more relevant driver of income catch-up. TFDP growth among EMEs is also correlated with that of AEs.

An issue that I have not explored and which is very relevant regarding measures of TFP is whether current statistics are measuring GDP and productivity appropriately. Indeed, if there is a downward bias in the measures of GDP, the measures of TFP may probably be underestimated. Progress in health, IT, and other sectors could not been properly measured.

In this context, the productivity slowdown in AEs is a drag for productivity growth in EMEs. However, the problem is deeper, and it is why EMEs have not been able to have robust TFP growth in a long time, despite important economic progress.

[14] For Asia, Lee and Lee (2017) show that despite the equalizing effects of higher and less unequal educational attainment, the rising in inequality is explained by fast economic growth, globalization and technological change.

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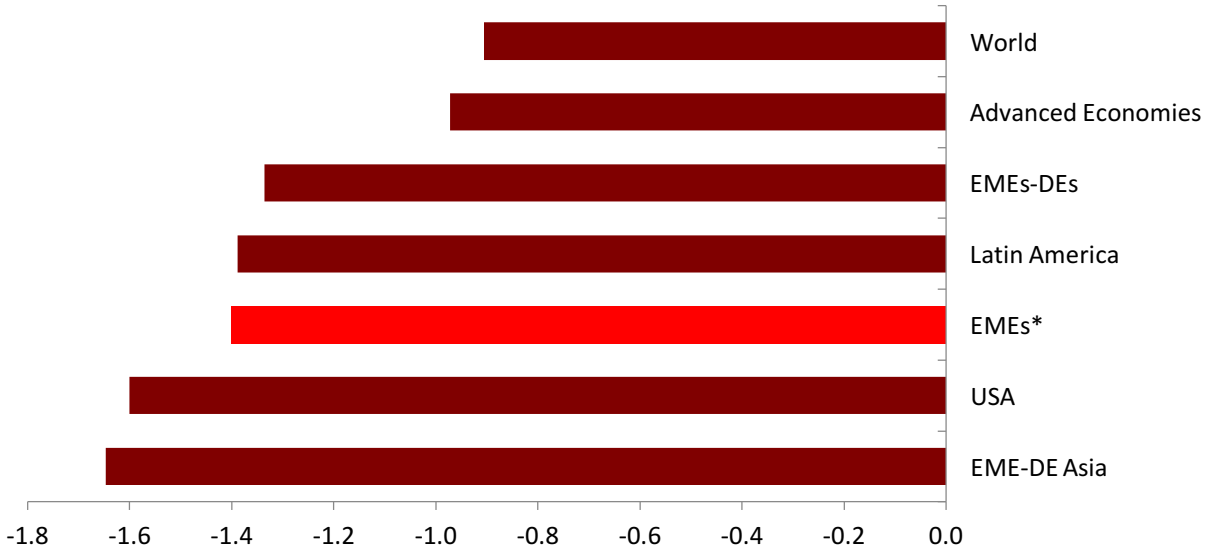
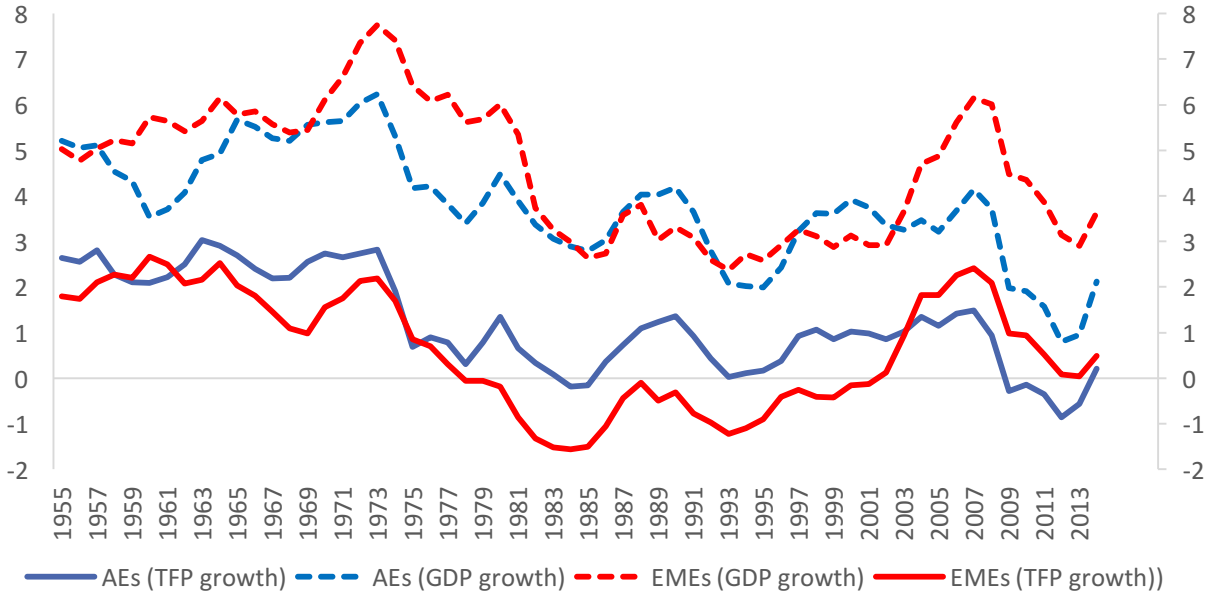
Figure 1. Change in Long-Term Growth between 2012 and 2017
(percent)



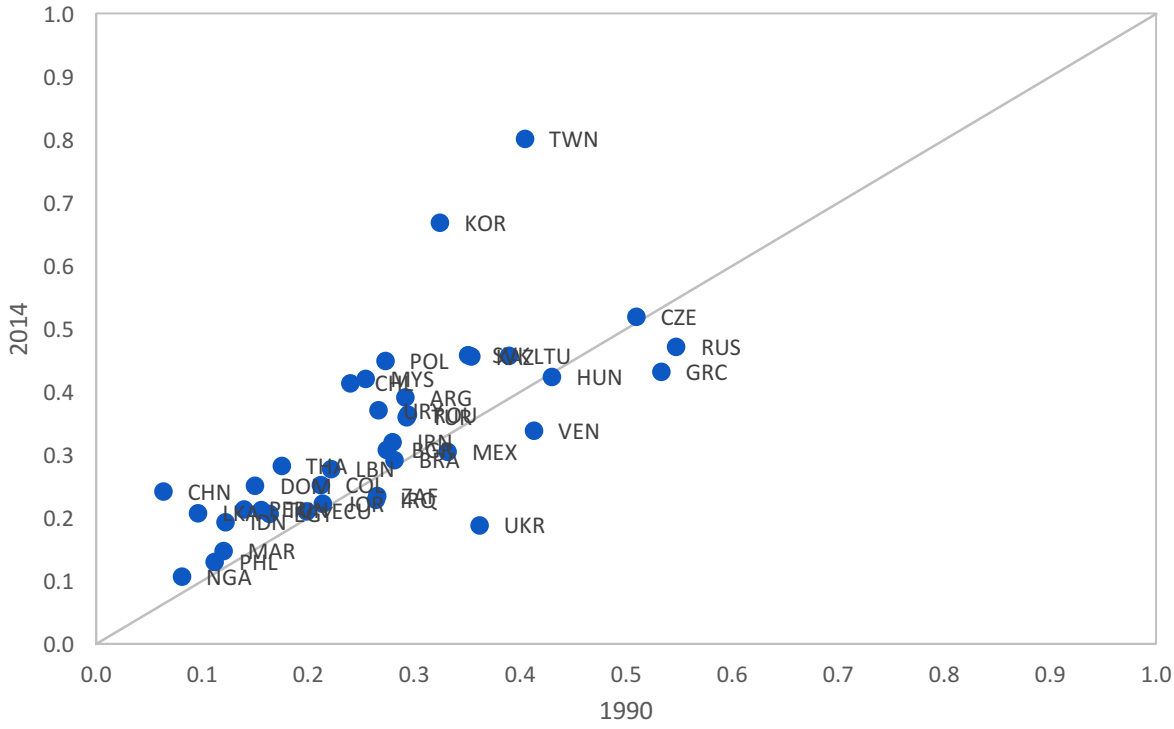
Source: IMF World Economic Outlook, April 2012 and April 2017. * Simple average for EMEs of this paper.

Figure 2. TFP growth in EMEs and AEs
(five-year average growth, percent)



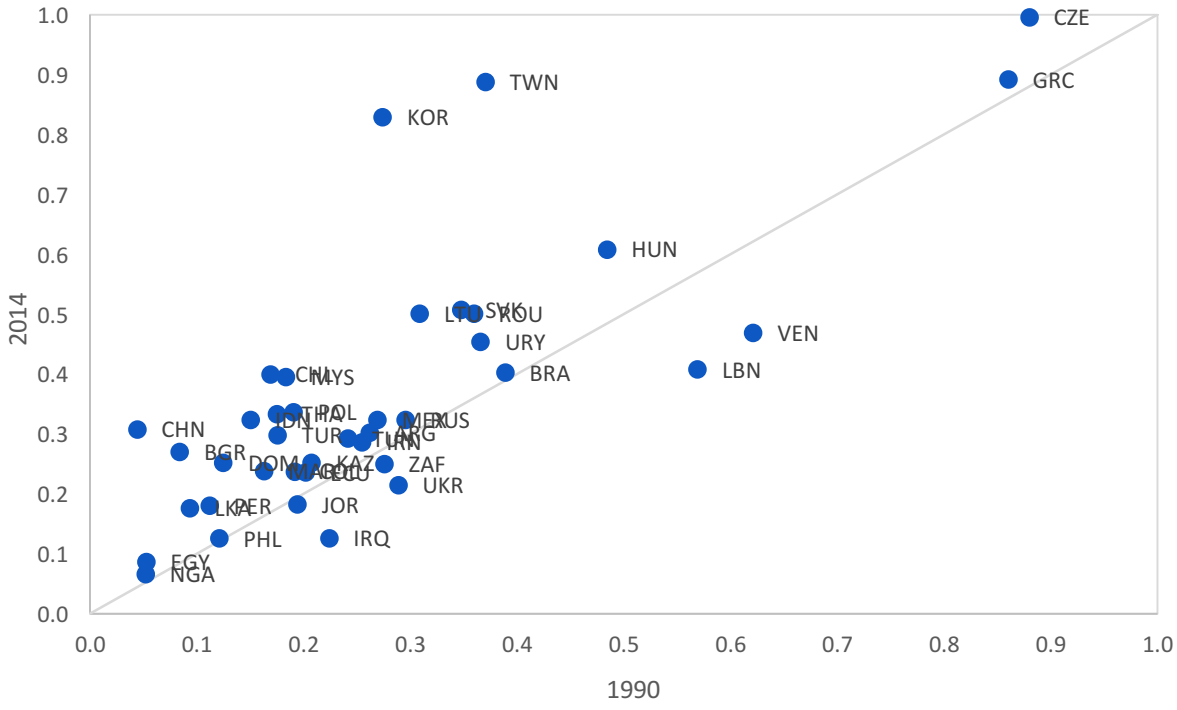
Source: PWT 9.0.

Figure 3. GDP per capita relative to the US



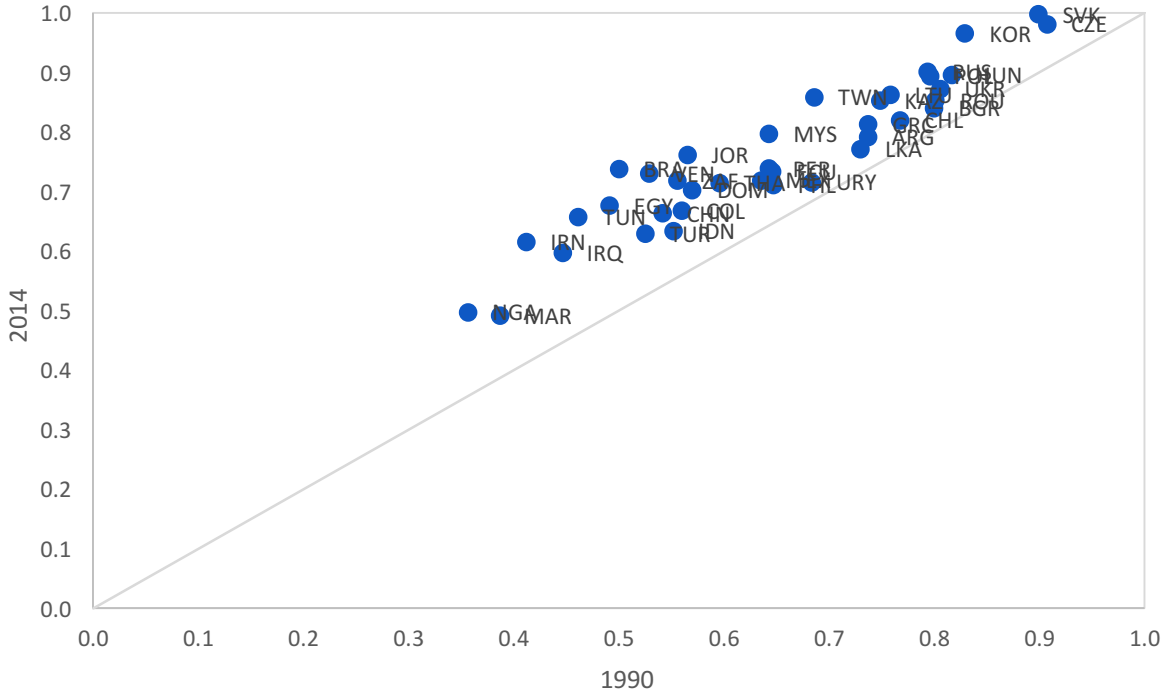
Source: PWT 9.0.

Figure 4. Capital stock relative to the US



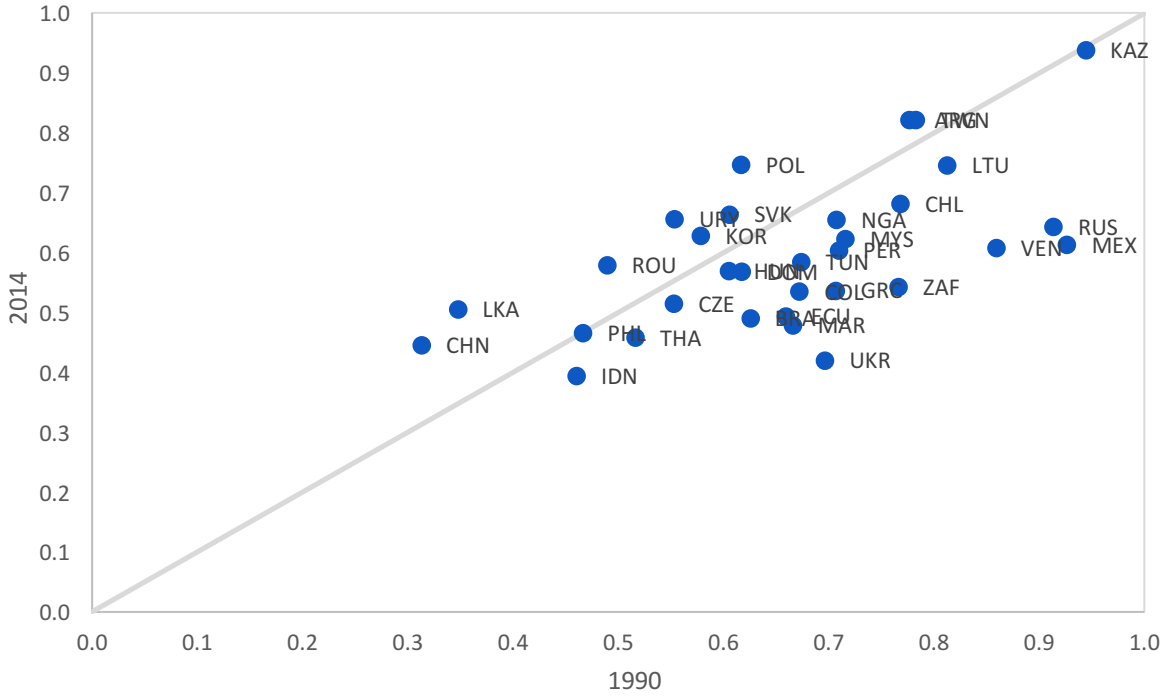
Source: PWT 9.0.

Figure 5. Human capital relative to the US



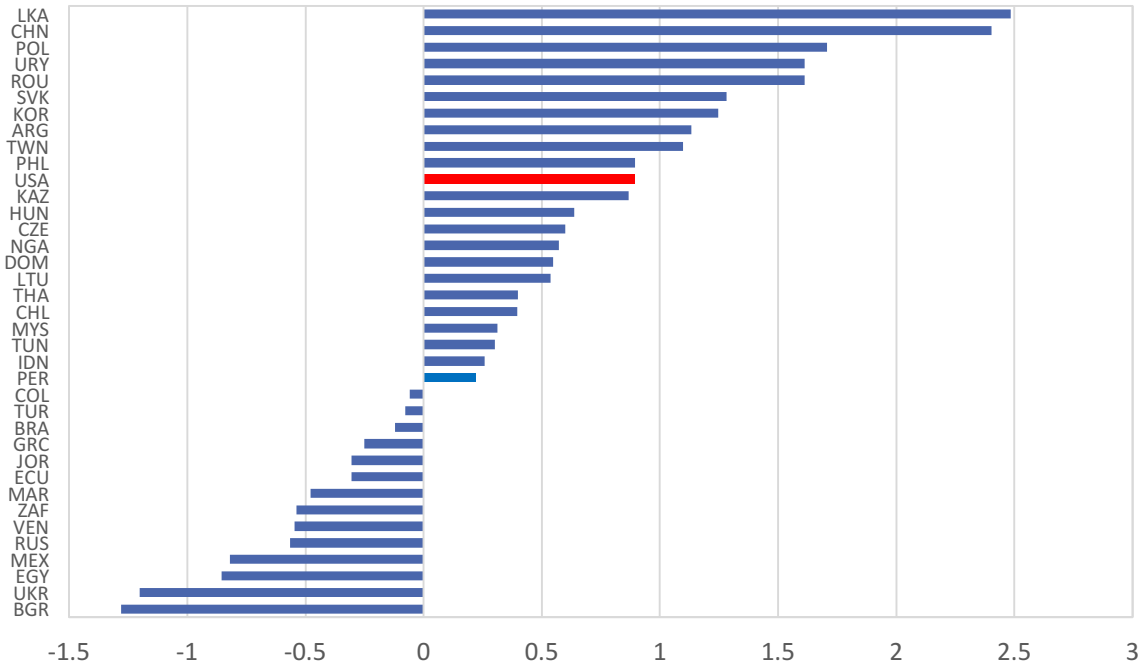
Source: PWT 9.0.

Figure 6. Total factor productivity relative to the US



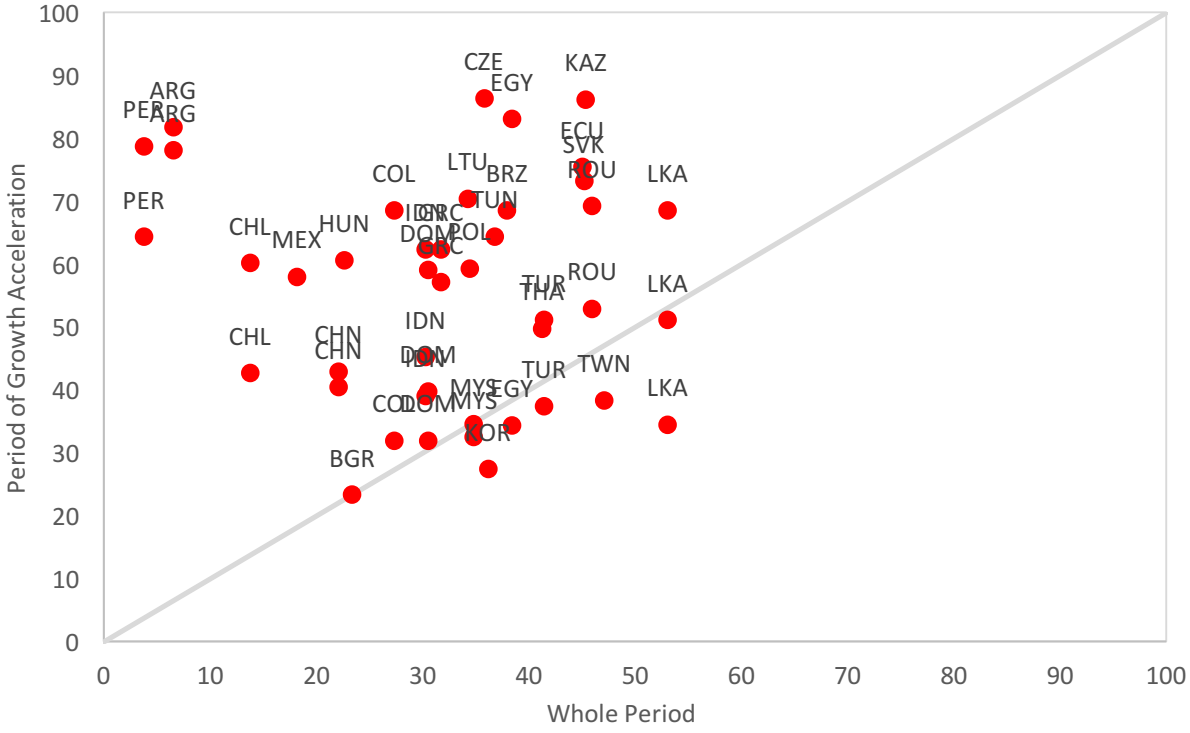
Source: PWT 9.0.

Figure 7. Total factor productivity annual growth, 1990-2014
(percent)



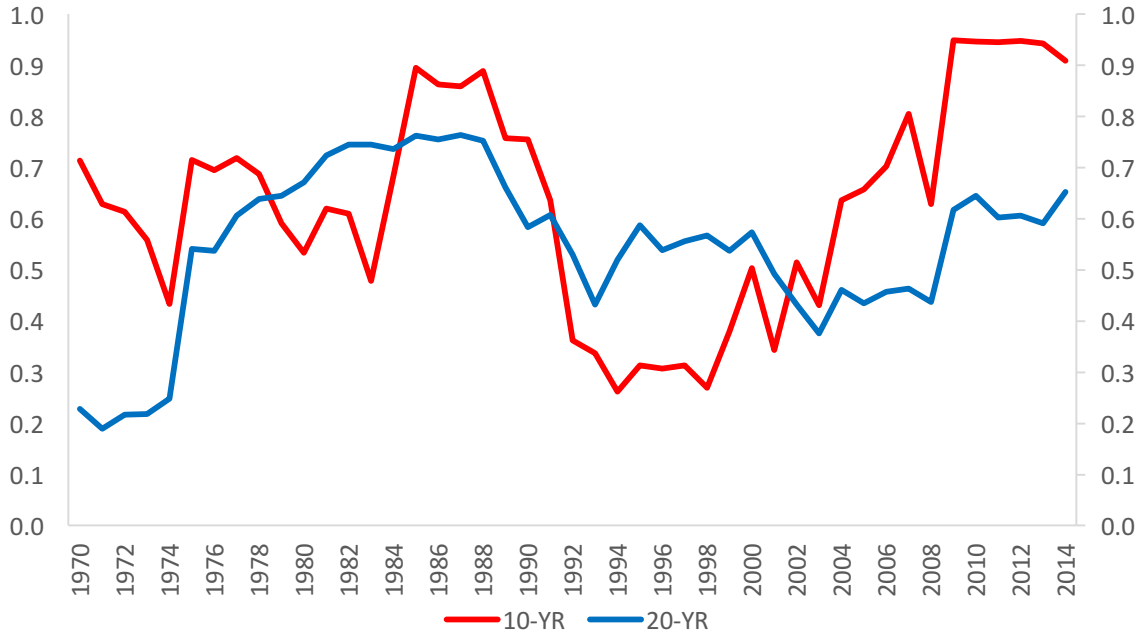
Source: PWT 9.0.

Figure 8. Contribution of TFP to GDP per worker growth
(percent)



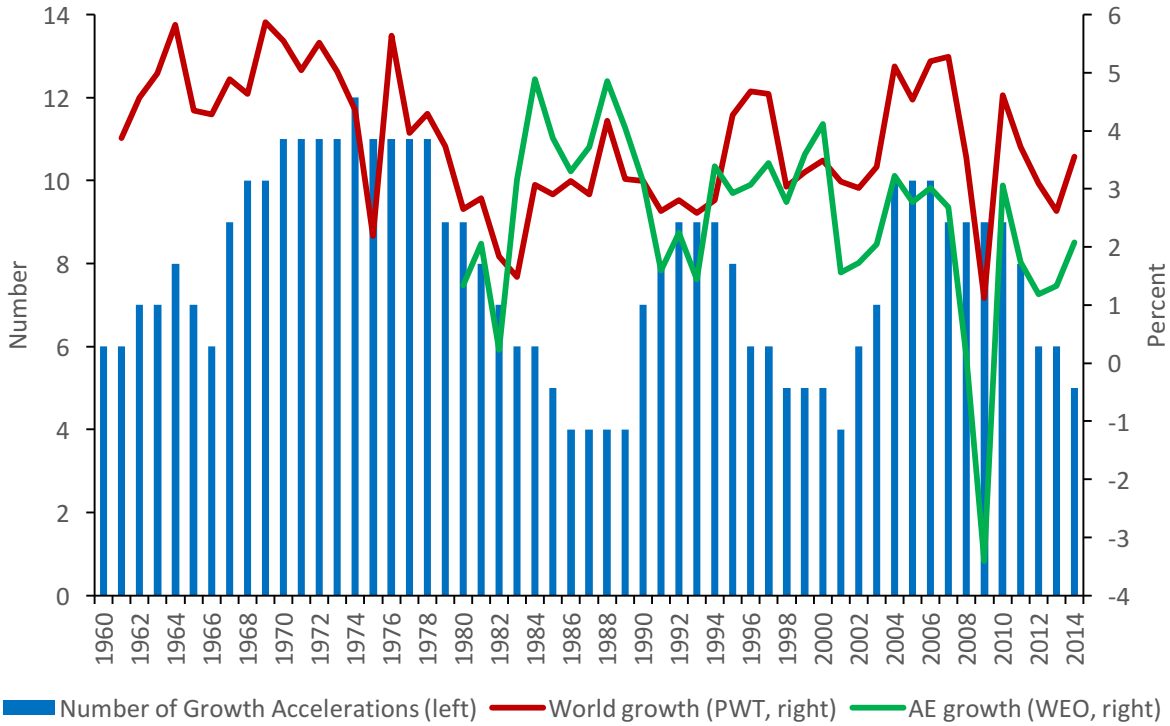
Source: Author's calculations.

Figure 9. Ten and twenty-year correlation of TFP growth in AEs and EMEs



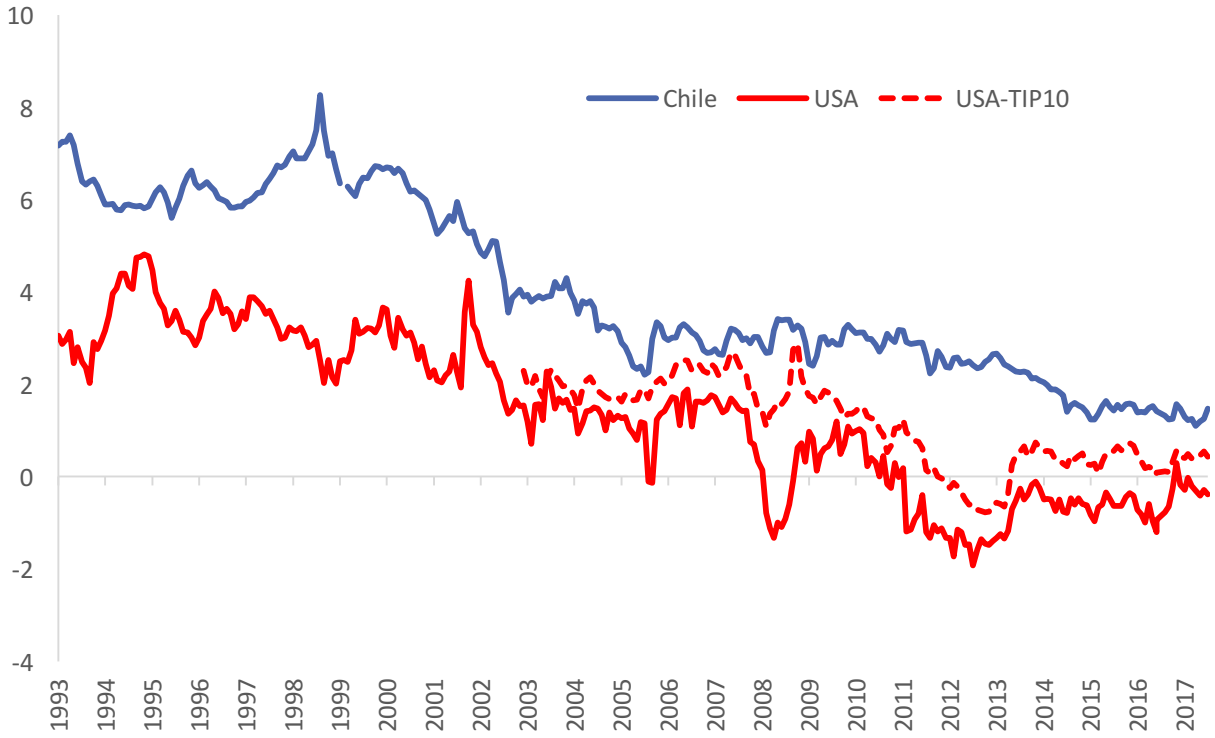
Source: Author's calculations based on PWT 9.0

Figure 10. Growth accelerations and global growth



Sources: Author's calculations, WEO October 2017 and PWT 9.0.

Figure 11. Real interest rates in Chile and the US
(percent)



Sources: Central Bank of Chile and FRED.

Figure 12. Corruption Perception Index 2016

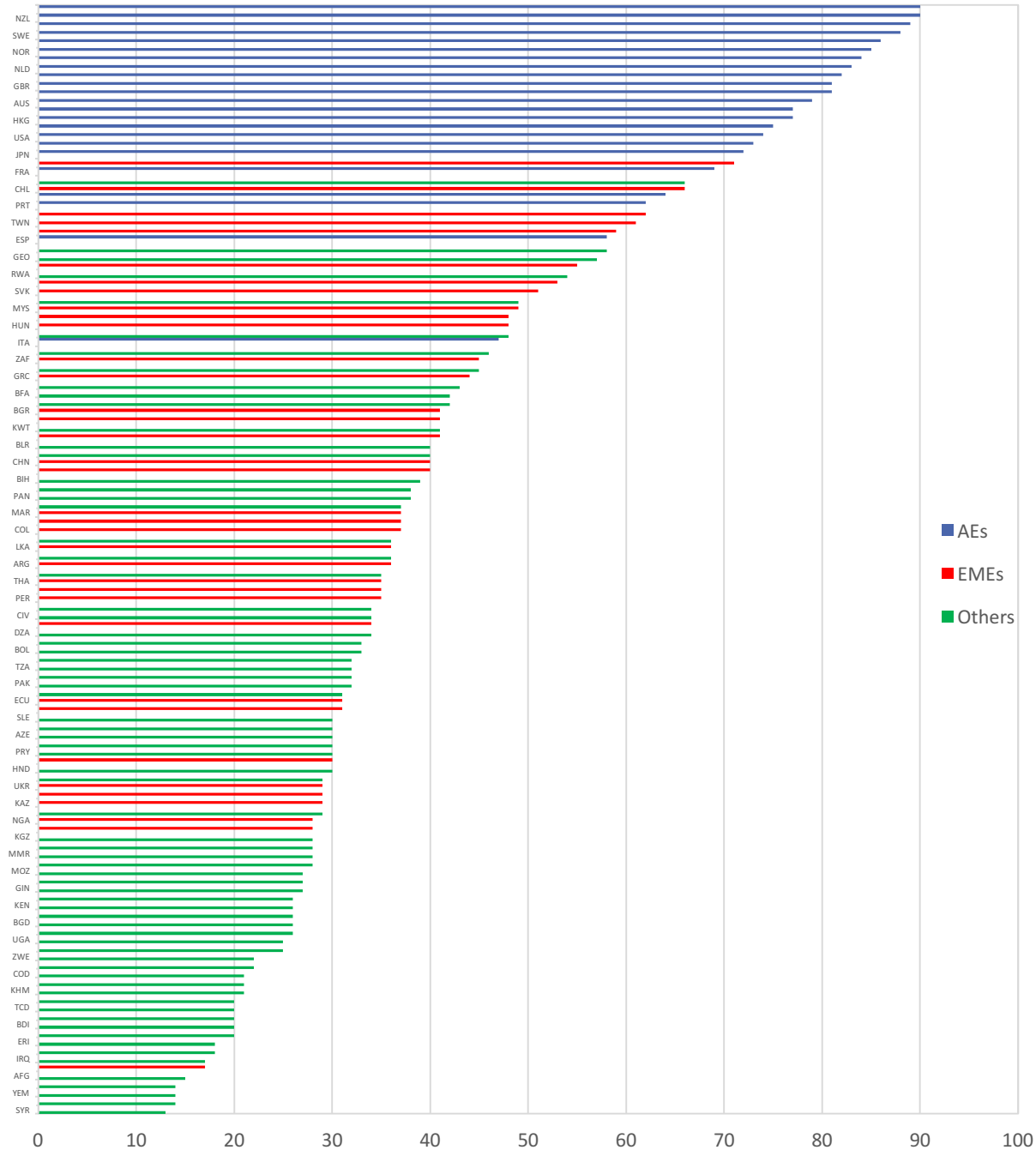


Table 1. Development accounting

	GDP per Worker	Capital/GDP	Human Capital	TFP	Share due to TFP
	(1)	(2)	(3)	(4)	(5)
Asia					
1990	0.127	0.799	0.595	0.266	64.1
2000	0.147	0.969	0.654	0.232	73.3
2010	0.208	1.024	0.694	0.293	70.8
Latin America					
1990	0.246	0.909	0.617	0.440	56.0
2000	0.242	1.025	0.668	0.354	65.9
2010	0.293	0.961	0.714	0.428	61.6
Emerging Europe					
1990	0.306	0.938	0.796	0.410	64.6
2000	0.307	1.034	0.846	0.351	71.4
2010	0.473	1.106	0.873	0.490	66.3

Source: Author's calculation based on PWT 9.0.
Countries in each group: Asia: China, India, Indonesia, Korea, Philippines, Malaysia, Thailand. Latin America: Argentina, Brazil, Chile, Colombia, Mexico, Peru, Venezuela. Emerging Europe: Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania.

Appendix

A.1 List of Emerging Market Economies

Argentina	ARG	Mexico	MEX
Brazil	BRA	Morocco	MAR
Bulgaria	BGR	Nigeria	NGA
Chile	CHL	Peru	PER
China	CHN	Philippines	PHL
Colombia	COL	Poland	POL
Czech Republic *	CZE	Republic of Korea *	KOR
Dominican Republic	DOM	Romania	ROU
Ecuador	ECU	Russian Federation	RUS
Egypt	EGY	Slovak Republic *	SVK
Greece *	GRC	South Africa	ZAF
Hungary	HUN	Sri Lanka	LKA
Indonesia	IDN	Taiwan *	TWN
Iran	IRN	Thailand	THA
Iraq	IRQ	Tunisia	TUN
Jordan	JOR	Turkey	TUR
Kazakhstan	KAZ	Ukraine	UKR
Lebanon	LBN	Uruguay	URY
Lithuania *	LTU	Venezuela	VEN
Malaysia	MYS		

Countries marked with * are countries that currently are advanced economies. When the comparisons are made with the advanced economies aggregate of the IMF, those countries are excluded from the sample of EMEs.

A.2 Development accounting using equation (4)

	GDP per Worker (1)	Capital (2)	Human Capital (3)	TFP (4)	Share due to TFP (5)
Asia					
1990	0.127	0.420	0.714	0.423	41.4
2000	0.147	0.501	0.759	0.386	49.6
2010	0.208	0.586	0.788	0.450	50.7
Latin America					
1990	0.246	0.576	0.730	0.586	41.8
2000	0.242	0.618	0.769	0.509	48.3
2010	0.293	0.634	0.803	0.576	46.9
Emerging Europe					
1990	0.306	0.634	0.862	0.560	49.4
2000	0.307	0.676	0.897	0.506	54.5
2010	0.473	0.822	0.915	0.629	54.4

It is the same set of countries of table 1 and uses equation (4) instead of (3).

A.3 Episodes of growth accelerations

	Growth		Share of	
	GDP per worker	Capital per worker	Education per worl	TFP (%)
Argentina				
1990-1997*	5.1	14.3	7.5	78.1
2003-2011	3.4	7.6	10.6	81.8
1950-2014	1.1	49.7	43.8	6.5
Brazil				
1967-1978*	4.2	31.7	-0.2	68.5
1950-2014	2.1	25.1	37.0	37.9
Bulgaria				
2000-2007	3.9	66.5	10.1	23.3
1970-2014	3.2	64.5	12.2	23.3
Chile				
1974-1981*	2.5	26.9	30.4	42.7
1990-1997	5.5	33.2	6.6	60.2
1951-2014	1.9	59.7	26.5	13.7
China				
1978-1987	4.3	38.8	18.2	43.0
1992-2014	6.9	48.9	10.7	40.4
1952-2014	3.7	55.1	22.8	22.1
Colombia				
1967-1974	3.1	17.8	13.6	68.6
2002-2014	1.7	29.7	38.3	31.9
1950-2014	1.3	29.5	43.2	27.3
Czech Republic				
2001-2008*	3.5	10.2	3.4	86.4
1990-2014	1.9	41.6	22.7	35.8
Dominican Republic				
1968-1975	6.0	27.4	13.6	59.1
1991-2000	2.8	46.9	21.2	31.9
2004-2014	3.0	29.0	31.3	39.7
1951-2014	2.0	36.3	33.2	30.5
Ecuador				
1970-1978*	5.8	12.6	12.0	75.5
1950-2014	1.6	17.7	37.3	45.0
Egypt				
1958-1965	4.2	9.1	7.8	83.1
1977-1985	7.3	47.5	18.1	34.4
1950-2014	3.0	32.6	29.0	38.4
Greece				
1959-1972	8.3	36.4	6.4	57.2
1998-2006*	2.7	19.5	18.2	62.3
1951-2014	2.6	41.7	26.6	31.7

A.3 Episodes of growth accelerations (cont'd)

	Growth		Share of	
	GDP per worker	Capital per worker	Education per worl	TFP (%)
Hungary				
1999-2006*	4.2	24.8	14.5	60.7
1970-2014	2.5	59.1	18.3	22.6
Indonesia				
1967-1984	3.5	32.4	28.5	39.1
1988-1995*	5.8	37.3	17.5	45.2
2000-2014	3.6	27.9	9.8	62.3
1960-2014	2.8	38.7	31.1	30.2
Kazakhstan				
1997-2014	4.8	6.3	7.6	86.1
1990-2014	2.4	30.4	24.2	45.3
Lithuania				
1997-2006	7.3	20.1	9.5	70.4
1990-2014	3.3	48.5	17.2	34.2
Malaysia				
1967-1982	4.5	41.4	24.1	34.6
1988-1995	5.7	43.4	24.1	32.5
1955-2014	3.2	36.8	28.4	34.8
Mexico				
1962-1973	3.4	23.7	18.2	58.0
1950-2014	1.3	38.2	43.7	18.1
Morocco				
1957-1964	8.2	-4.4	2.0	102.3
1970-1977*	1.3	68.6	38.6	-7.2
1999-2011	0.1	133.9	843.5	-877.5
1950-2014	1.4	23.1	41.6	35.3
Nigeria				
1957-1964*	-0.8	109.4	0.0	-209.4
1968-1975*	7.7	31.5	2.1	66.3
1999-2010	5.5	12.8	22.1	65.1
1960-2014	1.8	73.7	32.0	-5.7
Peru				
1959-1966	5.4	10.5	10.7	78.8
2002-2013	3.5	31.9	3.7	64.3
1950-2014	1.2	36.5	59.8	3.7
Poland				
1993-2000	5.2	29.2	11.5	59.3
1970-2014	2.7	45.8	19.8	34.4

A.3 Episodes of growth accelerations (cont'd)

	Growth		Share of	
	GDP per worker	Capital per worker	Education per worl	TFP (%)
Republic of Korea				
1963-1994	5.7	52.2	20.3	27.5
1950-2014	4.3	47.2	16.7	36.1
Romania				
1970-1978	9.4	34.8	12.2	52.9
2001-2008	8.9	26.9	3.8	69.2
1960-2014	4.8	40.4	13.6	45.9
Russian Federation				
1999-2006	5.3	0.2	7.2	92.6
1990-2014	0.5	95.7	105.5	-101.2
Slovakia				
2001-2008	5.1	12.7	14.0	73.3
1990-2014	3.2	39.2	15.6	45.2
Sri Lanka				
1976-1984	3.1	40.7	24.9	34.5
1990-1998	3.2	22.0	26.9	51.1
2004-2014	5.6	32.2	-0.8	68.6
1950-2014	3.0	24.3	22.7	53.0
Taiwan				
1960-2000	5.4	45.4	16.2	38.3
1951-2014	5.0	36.6	16.3	47.1
Thailand				
1957-1995	5.5	34.9	15.3	49.7
1950-2014	3.5	36.1	22.7	41.2
Tunisia				
1968-1979	6.4	23.5	12.1	64.4
1960-2014	2.8	28.7	34.6	36.8
Turkey				
1964-1976*	4.6	39.4	9.4	51.2
2002-2011	2.8	37.5	25.1	37.4
1950-2014	3.4	36.8	21.8	41.4
Uruguay				
1973-1980*	3.9	39.7	18.6	41.6
2004-2014	3.4	13.6	9.7	76.8
1950-2014	1.2	74.6	36.6	-11.2

*Unsustainable episodes as defined in the text.
The last line for each country is the Solow decomposition for the entire period with data available in PWT 9.0.