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The Evolution of TFP in Latin America: High Productivity when Distortions Were High?

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Abstract

Due to widespread government intervention and import-substitution industrialization, there has been a general presumption that Latin America has been much less productive than the leading economies in the last decades. In this paper, however, we show that until the late seventies Latin America had high total factor productivity (TFP) levels relative to the US and other regions. It is only after the late seventies that we observe a fast decrease of relative TFP in Latin America. Results are robust to the use of different methodologies and data sources.

Key Words: Latin America, Total Factor Productivity,

JEL Classification Code: O11, O47, O54.

1   Introduction

Due to widespread government intervention and import-substitution industrialization, among other policy distortions, there has been a general presumption that Latin America has been

much less productive than the leading economies in the last decades. Recent papers, such as Hopenhayn and Neumeyer (2004) and Cole et al (2005), seemed to confirm empirically this hypothesis. In particular, Hopenhayn and Neumeyer (2004) found that average TFP growth in Latin America was slightly negative between 1960 and 1985. Cole et al (2005) found that average total factor productivity (TFP) in Latin America corresponded to roughly 50% of US productivity between 1950 and 2000. These authors also present evidence that competitive barriers may explain why TFP is low in Latin America relative to the US.

In this paper, however, we show that until the late seventies Latin American countries had high productivity levels relative to the US and other regions. On average, TFP in Latin America corresponded to 88% of the U.S. between 1960 and 1980 and it was higher than that of a sample of Western European countries. It is only after the late seventies that we observe a fast decrease of relative TFP in Latin America, which fell to 62% of US TFP and 72% of Western European productivity in 2000.

We show that our results are robust to the use of different methodologies and data sources. In particular, it is possible that natural resources might account for the high relative TFP in Latin America between 1960 and 1980, and the reduction in its participation in GDP may have contributed to the decline in relative TFP in Latin America since 1980. In order to address this possibility, we present a robustness exercise in which we follow Hall and Jones (1999) and subtract from GDP the value added in natural resource-related sectors. We then compute a measure of TFP adjusted for natural resources for the seven largest Latin American countries, for which there is detailed sectorial data available from the Groningen Growth and Development Centre 10-Sector Database. Despite being lower than our baseline measure in every year, the adjusted relative TFP displays the same pattern. In particular, it was high between 1960 and 1980, corresponding on average to 76% of US TFP during this period. It then fell sharply, declining to only 56% of US TFP in 2000.

Some studies have documented a negative TFP growth rate in Latin America in the eighties. Bosworth and Collins (2003) and Loayza et al (2005) show that average TFP in Latin America declined during this decade. Other studies have confirmed this finding for some specific countries, including Kydland and Zarazaga (2002) and Hopenhayn and Neumeyer (2006) for Argentina, Bergoing et al (2002) for Mexico and Bugarin et al (2007) for Brazil.

These papers are consistent with our finding that relative TFP in Latin America was higher before 1980. However, by focusing on relative TFP levels rather than growth rates we

are able to provide new evidence that calls into question the results obtained in the recent literature on Latin America productivity. In particular, TFP in Latin America was close to that of the US between 1960 and 1980, when competitive barriers were highest in the region. Moreover, relative TFP in Latin America declined despite the implementation of several market-oriented reforms in the eigthies and nineties.[1]

These facts are puzzling from the standpoint of recent research in neoclassical growth theory. For instance, Parente and Prescott (2005) develop a model in which barriers to the efficient use of technology reduce relative TFP. Their model suggests that relative TFP in Latin America should have been low in the seventies, when import-substitution was widespread, and should have increased in the following decades, when the reforms were implemented.

This paper documents these stylized facts and is organized as follows. In section 2 we present the methodology used to construct our measure of relative TFP. Section 3 presents the stylized facts about relative TFP in Latin America and several robustness exercises. Section 4 concludes.

2   Methodology and Data

Let the production function in terms of output per worker be given by:

$$y_{it} = A_{it} k_{it}^{\alpha} h_{it}^{1-\alpha}, \tag{1}$$

where y_{it} is the output per worker of country i at time t, k stands for physical capital per worker, h is human capital per worker, and A is total factor productivity (TFP). Estimates in Gollin (2002) of the capital share of output for a variety of countries fluctuates around 0.40, so we set α at this value.

In our exercises we follow Bils and Klenow (2000) to model human capital and set:

$$h = \exp \phi(s) = \exp \left(\frac{\theta}{1 - \psi} s^{1-\psi} \right), \tag{2}$$

where s stands for schooling. We measured s using average years of schooling of the population aged 15 years and over, taken from Barro and Lee (2000), interpolated (in levels)

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[1]See Kuczynski and Williamson (2003) for a description of the reforms implemented in Latin America in the eighties and nineties.

to fit an annual frequency. According to the calibration in Bils and Klenow (2000), we set $\psi = 0.58$ and $\theta = 0.32$.

The physical capital series is constructed with investment data in international prices from the Penn World Table 6.1 using the perpetual inventory method.[2] As usual in the literature, we assume that all economies were in a balanced growth path at time zero and compute the initial capital stock, K_0, according to the expression $K_0 = I_0/[(1 + g)(1 + n) - (1 - \delta)]$, where I_0 is the initial investment expenditure, g is the rate of technological progress, n is the growth rate of the population and δ is the rate of capital depreciation.

To minimize the impact of economic fluctuations we used the average investment of the first five years as a measure of I_0. In order to reduce the effect of K_0 in the capital stock series, we started this procedure taking 1950 as the initial year.[3] We use the same depreciation rate for all economies, which was calculated from US census data. We employed the capital stock at market prices, investment at market prices, I, as well as the law of motion of capital to estimate the implicit depreciation rate according to:

$$\delta = 1 - \frac{K_{t+1} - I_t}{K_t}.$$

From this calculation, we obtained $\delta = 3.5\%$ per year (average of the 1950-2000 period). We obtained the rate of technological progress by adjusting an exponential trend to the U.S. output per worker series, correcting for the increase in the average schooling of the labor force and obtained $g = 1.53\%$. The population growth rate, n, is the average annual growth rate of population in each economy between 1960 and 2000, calculated from population data in the Penn World Table 6.1.

Data on output per worker in international prices were obtained from the Penn World Table 6.1. In order to compute the value of A_{it}, we use the observed values of y_{it} and the constructed series of k_{it} and h_{it} so that the productivity of the i-th economy at time t was obtained as:

$$A_{it} = \frac{y_{it}}{k_{it}^{\alpha} h_{it}^{1-\alpha}}. \tag{3}$$

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[2] See Heston, Summers and Atten (2002) for a description of PWT 6.1.

[3] For Chile, Dominican Republic, Ecuador and Paraguay we have investment data since 1951, so we set this as the initial year to compute capital stocks for these countries.

3 Stylized Facts

3.1 Baseline Results

Figure 1 shows the evolution between 1960 and 2000 of the (geometric) mean and the median of TFP of 18 Latin American countries[4] relative to U.S TFP.[5] Until the late seventies, mean total factor productivity in Latin America was very close to that of the leading economy, corresponding to 88% of US TFP between 1960 and 1980. The median Latin American TFP increased from 82% to 87% of US TFP between 1960 and 1980. However, since the late seventies both the mean and the median TFP in Latin America fell continuously, declining to 62% and 65% of US TFP in 2000, respectively.

In absolute values, TFP grew on average 0.69% per year in Latin America between 1960 and 1980, slightly above the US TFP growth rate of 0.64%. In the following two decades, however, while U.S. productivity growth kept roughly the same pace, at 0.53% per year,[6] Latin America TFP collapsed, declining at an average annual rate of 1.23%. As a result, in the entire 1960-2000 period TFP in Latin America fell in absolute terms 0.30% per year, and in eleven out of 18 countries of our sample it had zero or negative growth.

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[4]The Latin American countries are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela.

[5]For each country i and year t, relative TFP is given by: A_{it}/A_{USt}. We then computed the unweighted average of this ratio across countries for every year to calculate the Latin America relative TFP.

[6]It should be noted, however, that the growth in US productivity was not constant between 1960 and 2000. In particular, it was close to zero between 1975 and 1983, corresponding to the well-known productivity slowdown. It increased since then, especially after 1995, averaging 1.4% between 1995 and 2000.
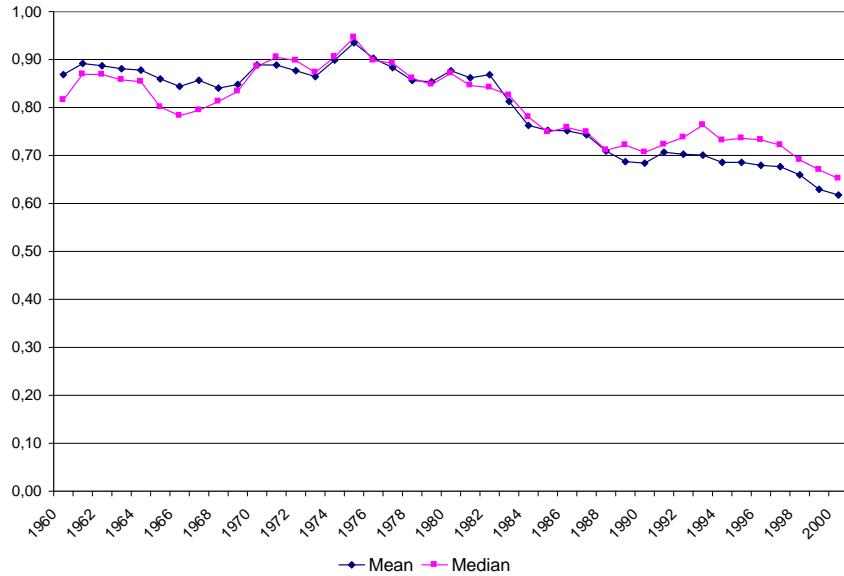
Figure 1: Latin America Relative TFP (US=1)

Table 1 presents data on relative TFP for the seven largest economies in Latin America. In some countries TFP surpassed that of the US before 1980 (e.g., Brazil between 1975 and 1980, Venezuela between 1960 and 1975 and Mexico from 1960 to 1980), and in eleven out of the 18 economies of our sample TFP was at least 80% of the American TFP between 1960 and 1980. This contrasts drastically with the situation in 2000, when relative TFP in Latin America was, on average, 62% of US TFP and in only two economies it was above 0.80.

Table 1: Relative TFP (U.S=1)

	1960	1965	1970	1975	1980	1985	1990	1995	2000
Argentina	0.99	0.93	0.93	0.98	0.93	0.75	0.58	0.74	0.69
Brazil	0.83	0.80	0.88	1.07	1.02	0.86	0.75	0.80	0.73
Chile	0.68	0.64	0.73	0.64	0.76	0.65	0.72	0.87	0.80
Colombia	0.81	0.80	0.90	0.91	0.96	0.87	0.90	0.77	0.64
Mexico	1.09	1.11	1.10	1.18	1.13	0.99	0.79	0.74	0.77
Peru	0.58	0.66	0.69	0.83	0.66	0.57	0.45	0.44	0.40
Venezuela	1.33	1.55	1.64	1.20	0.88	0.73	0.77	0.73	0.61
Latin America	0.87	0.86	0.89	0.93	0.88	0.75	0.68	0.69	0.62

Individual examples may be illustrative. TFP in Mexico corresponded to 77% of US TFP in 2000, whereas it was 18% above US TFP in 1975. The fall in Argentina was even more

dramatic, and maybe the worst case was that of Venezuela, where relative TFP reached 1.64 in 1970, but in 2000 it was only 61% of US TFP. Only Chile experienced an increase in relative TFP in the period.

We have identified, hence, two general patterns: relative TFP in Latin America was high until the late seventies and since then it fell continuously in the region. Is this a general fact observed in other regions? Figure 2 shows that this is not the case. From 1960 to 1980 average TFP in Latin America was higher than that of Western Europe and 53% higher than East Asia TFP.[7] Hence, productivity in Latin America was higher than that of richer or similar regions. However, while in Western Europe and East Asia we observe convergence to the US productivity level between 1960 and 2000, particularly strong in the latter, in Latin America there was increasing divergence relative to US TFP since the late seventies. Specifically, in 2000 both regions surpassed Latin America TFP by more than 20%.
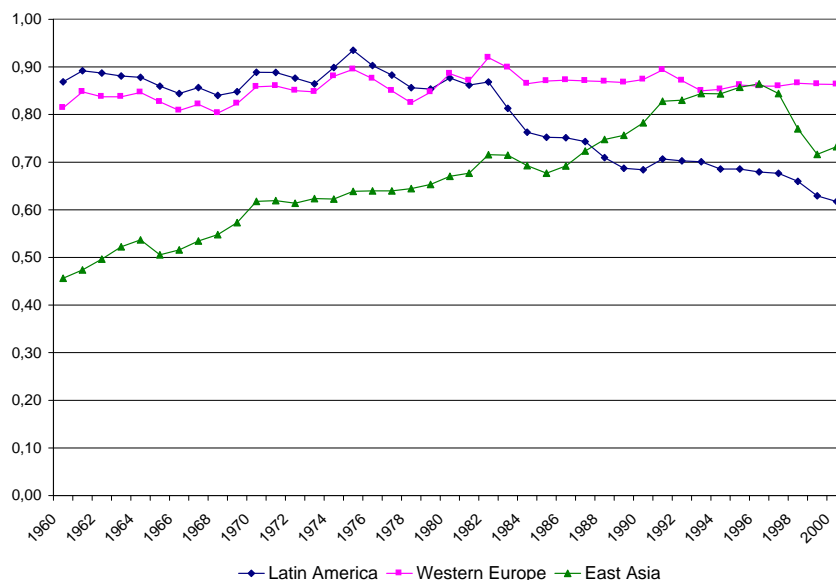
Figure 2: Relative TFP, Region and Continent Averages (U.S.=1)

We observe the same qualitative patterns if we compare Latin America TFP with average TFP in a larger sample of 83 developed and developing countries.[8] In particular, mean TFP

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[7]The countries included in our comparison are as follows. Western Europe: Austria, Italy, Finland, Belgium, France, Norway, Iceland, Denmark, Germany, Netherlands, Sweden and Switzerland. East Asia: Taiwan, Hong Kong, Korea, Singapore, Thailand and Japan.

[8]See the Appendix for a list of the countries included in the sample.

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in Latin America was 20% above the average world TFP between 1960 and 1980. However, in 1995 it was only 5% above and five years later it was 3% below average world TFP. Only Sub-Saharan Africa fares worse in terms of TFP reduction in the period.

3.2 Robustness

It could be the case that our results are driven by measurement error in the TFP series. In particular, if our capital stock is measured with error due, for instance, to the procedure used to construct the initial capital stock or to our hypothesis about the depreciation rate, our TFP calculations could be biased.[9]

In order to verify the sensitivity of the results to the initial capital stock, we reconstructed the capital stock series using a 10% depreciation rate and the same methodology as above. This new capital stock series was then used to generate a new TFP series according to (3). This exercise is important because a higher depreciation rate reduces the importance of the initial capital stock in the capital stock series. Results did not change much, as shown in Table 2. Between 1960 and 1980, average TFP in Latin America was close to 88% of US TFP. After this date, it fell continuously and in 2000 it corresponded to only 63% of US TFP.

Table 2: Relative TFP (U.S=1) - $\delta = 10\%$

	1960	1965	1970	1975	1980	1985	1990	1995	2000
Argentina	0.98	0.90	0.92	0.97	0.93	0.77	0.62	0.79	0.73
Brazil	0.72	0.72	0.81	0.98	0.95	0.83	0.74	0.80	0.75
Chile	0.67	0.62	0.74	0.68	0.84	0.71	0.76	0.86	0.77
Colombia	0.78	0.78	0.89	0.90	0.95	0.86	0.90	0.76	0.64
Mexico	1.02	1.03	1.03	1.12	1.08	0.96	0.79	0.72	0.77
Peru	0.56	0.65	0.70	0.87	0.71	0.61	0.49	0.48	0.42
Venezuela	1.25	1.51	1.63	1.21	0.86	0.75	0.82	0.79	0.67
Latin America	0.85	0.84	0.88	0.94	0.88	0.76	0.72	0.71	0.63

Klenow and Rodriguez-Clare (1997) and Hall and Jones (1999), among others, construct a measure of TFP using a methodology in which the production function is expressed in

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[9]It is important to remind, however, that for 14 of the 18 Latin American countries included in our sample, the initial year for the capital stock series is 1950, whereas for the other 4 countries we have investment data since 1951. This reduces the impact of the initial capital in the capital stock series.

terms of the capital-output ratio instead of the capital-labor ratio. In this formulation, the effect of productivity on capital accumulation is attributed to TFP, which is calculated according to the formula:

$$A_{it} = \frac{y_{it}}{\kappa_{it}^{\frac{\alpha}{1-\alpha}} h_{it}}$$

where κ denotes the capital-output ratio. Table 3 presents the results when TFP is computed according to this methodology.

Table 3: Relative TFP (U.S=1) - Capital-Output Ratio Methodology

	1960	1965	1970	1975	1980	1985	1990	1995	2000
Argentina	0.98	0.88	0.89	0.97	0.89	0.62	0.40	0.60	0.53
Brazil	0.73	0.69	0.80	1.11	1.04	0.78	0.62	0.68	0.60
Chile	0.53	0.48	0.59	0.48	0.63	0.49	0.58	0.80	0.69
Colombia	0.70	0.69	0.83	0.86	0.93	0.80	0.84	0.65	0.47
Mexico	1.15	1.19	1.18	1.32	1.22	0.98	0.68	0.60	0.64
Peru	0.40	0.50	0.54	0.73	0.50	0.40	0.27	0.26	0.21
Venezuela	1.60	2.08	2.27	1.36	0.81	0.60	0.65	0.59	0.44
Latin America	0.79	0.78	0.82	0.89	0.80	0.62	0.53	0.53	0.45

The results presented in Table 3 confirm the relative TFP pattern documented previously. Between 1960 and 1980, TFP in Latin America was roughly 80% of US TFP. Since 1980, however, it experienced a sharp decline, and in 2000 it corresponded to only 45% of US TFP. The fall in relative TFP is larger when it is calculated based on the capital-output formulation since in this case the reduction in capital accumulation induced by the fall in productivity is attributed to TFP.

Klenow and Rodriguez-Clare (1997) present TFP results for several countries in 1985. Using their results for our sample of Latin American countries gives a TFP gap in Latin America relative to the US of 61% in 1985, which is close to our gap of 62% in the same year. They also obtain similar TFP estimates for specific countries. For instance, according to their data, Mexico had a TFP level of 129% of the US, which is consistent with the high value of 98% that we found in our data. Our results are also similar to the TFP measures obtained from Hall and Jones (1999) for 1988, which correct for natural resources. Using the same group of Latin American countries, their calculated TFP gap is 52%, which is close to our number for 1990. Note, however, that none of these authors stressed the relatively high

TFP in the region before the eigthies.

Historical data from Baier, Dwyer and Tamura (2006), that goes as far as 1900 for some Latin America countries, lead to similar results. Between 1930 and 1980, average TFP in Latin America was close to that of Western countries. However, Latin America TFP was well below TFP of the Western countries in 2000.

We also repeat our exercises using capital and output data from Nehru and Dhareshwar (1993). This is important because Cole et al (2005) used this data to conclude that Latin America TFP during the post-war period corresponded only to 50% of the US TFP. We use expression (3) to construct TFP measures for Latin America, Western Europe and East Asia.[10] Education data, as before, is from Barro and Lee (2000).

As shown in Figure 3, from 1950 to 1975 average TFP in Latin America fluctuates a little above 80% of US TFP. Mean relative TFP in Latin America fell continuously after the mid-seventies and in 1990 it was only 55% of American TFP. Hence, we can conclude that our previous findings are confirmed using Nehru and Dhareshwar (1993) data set.
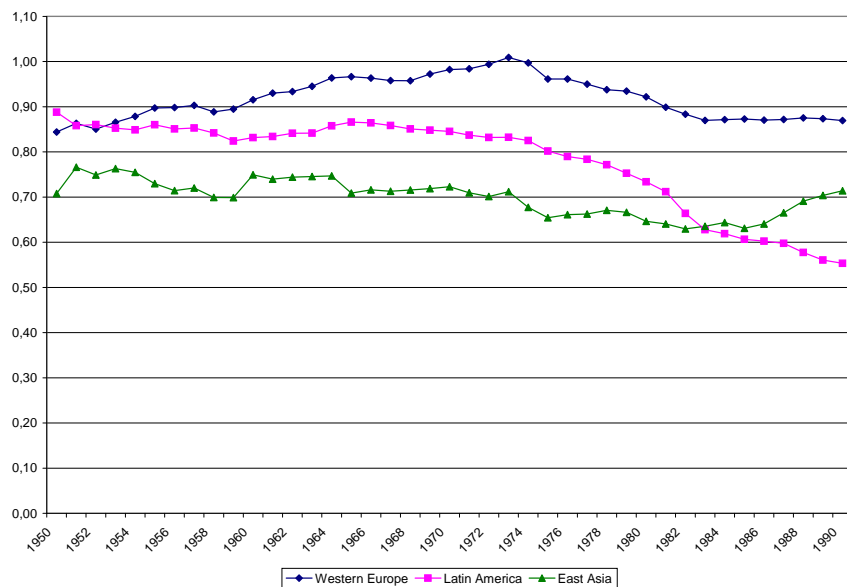

Figure 3: Relative TFP, Latin America and Other Regions (US=1) - Nehru-Dhareswar Data

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[10]We use the same sample for Latin America, Western Europe and East Asia that we have been using in the paper.

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We also checked if our results depend on the schooling data that we used, obtained from Barro and Lee (2000). A recent paper by Cohen and Soto (2007) proposed a new series of educational attainment which they claimed that improves upon Barro and Lee (2000) on several dimensions. To verify the robustness of our results to the schooling series, we present in Figure 4 the results for relative TFP in Latin America when we use education data from Cohen and Soto (2007).
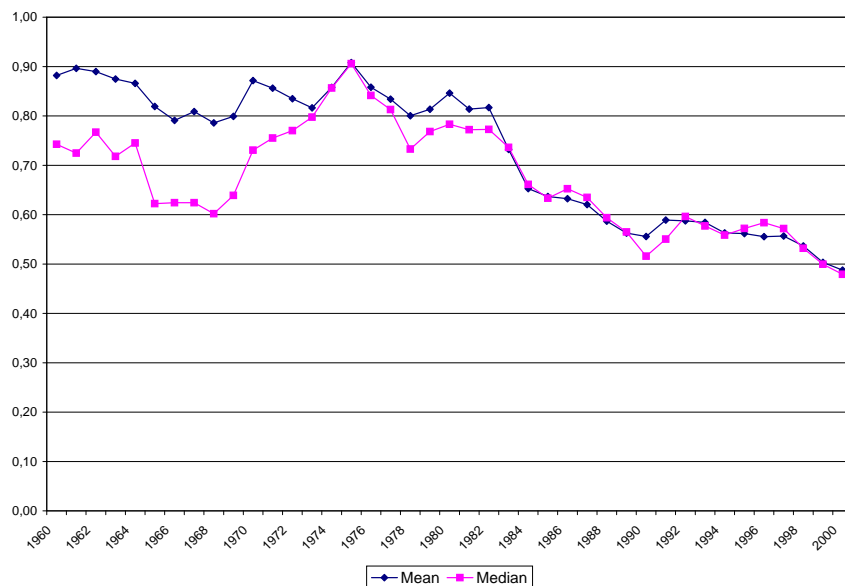

Figure 4: Relative TFP, Using Cohen and Soto (2007) Schooling Data.

Figure 4 confirms the pattern documented in Figure 1. Mean and median TFP in Latin America corresponded to 85% and 78% of US TFP in 1980, respectively. However, since the late seventies both the mean and the median TFP in Latin America fell continuously, declining to 49% and 48% of US TFP in 2000, respectively. The decline in Latin America TFP is larger using the Cohen and Soto data than Barro and Lee´s, since schooling increased more in the region in the former data set.

3.3 The Role of Natural Resources

All these exercises consider only physical capital, labor and human capital as factors of production. In particular, we do not consider the contribution of factors that might be important in Latin America, such as natural resources. It could be the case that the methodology we

use is attributing to productivity the contribution of natural resources and thus overestimating relative TFP in Latin America. Moreover, the reduction in the importance of natural resources in production might account for the decline in relative TFP in Latin America since 1980.[11]

In order to address this possibility, we subtract from GDP the value added in natural resource-related sectors in computing our measure of output. This is a coarse correction, since it assigns all of the value added in these sectors to natural resource inputs and neglects capital and labor inputs in these sectors. In any case, it gives a rough estimate of the distortion that natural resources may create for our observed TFP measure. This is the same procedure used by Hall and Jones (1999) to correct for natural resources. The difference is that, in addition to the mining industry, we also make a correction for value added in agriculture (including forestry and fishing).

We use data on sectorial value added obtained from the Groningen Growth and Development Centre 10-Sector Database.[12] The measure we use for the production from mineral resources is the value added in the mining and quarrying sector. We also subtract from GDP the value added in the agriculture, forestry and fishing sector. There is data for nine Latin America countries. In order to make the results more readily comparable to previous tables, we calculated the relative TFP measure for the seven largest Latin America economies: Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela.

Figure 5 compares our baseline results for these seven Latin American countries with the measure of TFP adjusted for natural resources. Figure 5 shows that, despite being lower than our baseline measure in every year, the adjusted relative TFP displays the same pattern. In particular, it was high between 1960 and 1980, corresponding on average to 76% of US TFP during this period. It then declined sharply, falling to only 56% of US TFP in 2000.

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[11]Restuccia, Yang and Zhu (2008), among others, analyze the role of agriculture and structural transformation in aggregate productivity.

[12]The data was obtained from http://www.ggdc.net/databases/10_sector.htm.
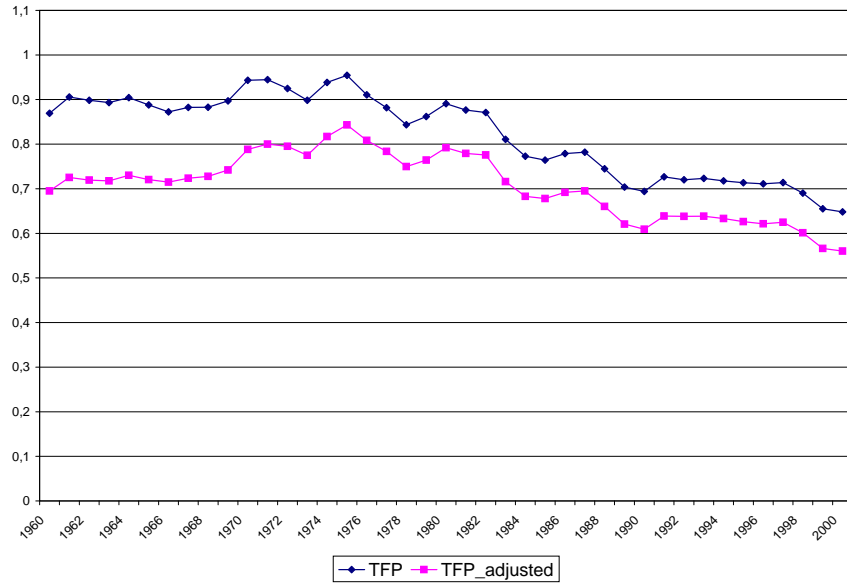
Figure 5: Relative TFP, with Correction for Natural Resources

Table 4 presents results for each of the seven Latin American countries. Venezuela was the country mostly affected by the adjustment, since the mineral sector has a large contribution to its GDP. The Appendix presents separate TFP results for adjustments due to the mineral sector and the agriculture, forestry and fishing sectors.

Table 4: Relative TFP (U.S=1) - Adjusted for Natural Resources

	1960	1965	1970	1975	1980	1985	1990	1995	2000
Argentina	0.94	0.87	0.88	0.93	0.88	0.70	0.54	0.68	0.64
Brazil	0.74	0.71	0.81	1.00	0.97	0.80	0.70	0.74	0.67
Chile	0.66	0.62	0.70	0.61	0.72	0.61	0.68	0.83	0.74
Colombia	0.59	0.60	0.70	0.73	0.78	0.71	0.71	0.63	0.51
Mexico	0.96	0.98	1.00	1.10	1.05	0.92	0.74	0.69	0.73
Peru	0.46	0.56	0.59	0.74	0.58	0.50	0.40	0.39	0.34
Venezuela	0.65	0.79	0.92	0.88	0.68	0.59	0.59	0.54	0.43
Latin America	0.69	0.72	0.79	0.84	0.79	0.68	0.61	0.63	0.56

3.4 Why the Difference?

To conclude this discussion, we shall make a few comments about the discrepancies between our results and the findings documented in Cole et al (2005) and in other articles in the

literature. As we mentioned before, Cole et al (2005) provided evidence that TFP in Latin America has been around 50% of US TFP between 1950 and 2000. One major difference between our methodology and Cole et al´s is that we account explicitly for human capital, whereas they consider only physical capital as a factor of production. Figure 6 compares our results for TFP in Latin America relative to the US (mean TFP) with the ones we obtain when we do not account for human capital and attribute differences in relative human capital to relative TFP (mean TFP + h).
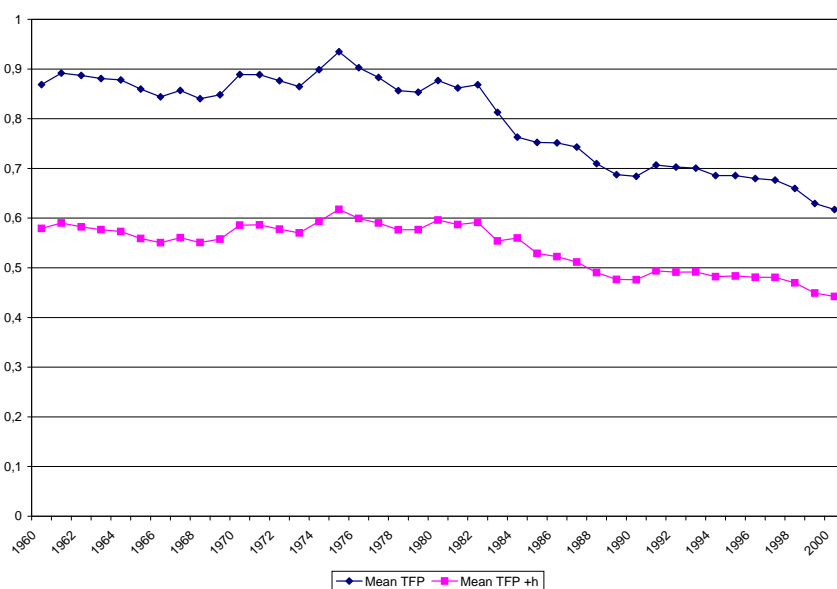

Figure 6: Relative TFP, Comparison with Cole et al (2005)

Figure 6 shows that the fact that we include human capital in the production function explains a large part of the differences between our results and Cole et al´s. When we do not include human capital in the production function, following Cole et al´s procedure, we obtain a value of 60% for Latin America TFP until 1980, which then declines and reaches 50% of US TFP in the nineties (and 44% in 2000). Since human capital in Latin America averaged only 50% of US human capital between 1960 and 1980, the fact that Cole et al do not account for relative human capital differences and thus attribute it to relative TFP leads them to significantly underestimate relative Latin America TFP until 1980.[13]

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[13]Cole et al (2005) argue that a large TFP gap between the US and Latin America remains after adjusting for human capital differences. In order to support their claim, the authors argue that, after adjusting for

Since our results are similar when we use schooling data from Cohen and Soto (2007), these differences cannot be attributed to the particular education data that we use, but are due instead to the fact that we include human capital as a factor of production, which has become the standard procedure of development accounting since the contributions of Klenow and Rodriguez-Clare (1997) and Hall and Jones (1999).[14]

In the case of Hopenhayn and Neumeyer (2004) the disparity was caused by the choice of period: we obtained, using our data set, exactly the same rate of TFP growth in the region between 1960 and 1985 as they did (-0.02% per year). There is no contradiction, since productivity collapses in the early eighties. The important point, however, is that, as shown in Figure 1, TFP growth in Latin America was considerably higher until the mid-seventies and even until 1980. In other words, the inclusion of the period 1980-1985 distorts the picture that prevailed since 1960.

4 Conclusion

In this paper it was shown that at least until the late seventies the average Latin America economy was relatively productive, with a TFP level close to or above most rich nations. Another stylized fact is that relative TFP fell sharply in Latin America after 1980, and TFP in the region declined to 62% of U.S TFP in 2000. In only one country, Chile, relative total factor productivity in 2000 was above its corresponding value in 1980. These results are robust to the use of different datasets and alternative methodologies to construct capital stocks, human capital and total factor productivity. In particular, we show that the same

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human capital, Hall and Jones (1999) find an average TFP level for a comparable group of Latin America countries of 58% of the US in 1988. They also report that Klenow and Rodriguez-Clare (1997) find a comparable Latin American TFP gap of 67%, using 1985 data and a different procedure to adjust for human capital. Taking the average of the two estimates gives a Latin American TFP gap of 62.5%, which would be around one quarter of the 50% gap calculated by the authors. However, Cole et al do not take into account the fact that Hall and Jones and Klenow and Rodriguez-Clare TFP calculations are based on the capital-output ratio methodology, which provides lower values of relative TFP than the methodology based on the capital-labor ratio, from which they derived their 50% TFP gap. Using the latter, the average Latin America TFP gap obtained from Hall and Jones and Klenow and Rodriguez-Clare´s TFP calculations would be 75% in the second half in the eighties. Since TFP in Latin America collapsed in the early eighties, their measure of the TFP gap would be even larger in the seventies.

[14]A recent paper by Restuccia (2008) includes human capital in the production function and calculates that TFP in Latin America corresponds to 60% of US TFP, which is very similar to our results for the nineties.

patterns are observed when we adjust TFP for the presence of natural resources.

These results allow us to conclude that at least until the late seventies, TFP was not the main cause for the relative poverty of the region. The main determinants of low income per worker in the region were factors of production, namely physical and human capital.[15] However, after the late seventies the TFP decline was the main explanation for Latin America stagnation.

The puzzle raised by these results is that policies in Latin America during the entire post-war period were very distortionary and, according to recent research in neoclassical growth theory (e.g., Parente and Prescott, 2005), they were expected to be associated with low TFP. In particular, the period between 1960 and 1980 was characterized by widespread government intervention and import-substitution industrialization in Latin American economies. These interventions were associated with competitive barriers of different forms, including restrictions to international trade, licensing and cartelization and targeted investment subsidies. In spite of this, TFP in the region was relatively high. Moreover, despite the adoption of market-oriented reforms since the eighties, TFP in Latin America declined relative to the U.S. between 1980 and 2000. We intend to investigate possible explanations for the stylized facts documented in this paper in future research.

5   Appendix

5.1   List of Countries

Brazil, Mexico, Colombia, Argentina, Peru, Venezuela, Chile, Ecuador, Guatemala, Dominican Republic, Bolivia, Honduras, El Salvador, Paraguay, Nicaragua, Costa Rica, Uruguay, Panama, Austria, Italy, Finland, Belgium, France, Norway, Iceland, Denmark, Germany, Netherlands, Sweden, Switzerland, Taiwan, Hong Kong, Korea, Singapore, Thailand, Japan, Ireland, United Kingdom, United States, Australia, Canada, New Zealand, Cyprus, Portugal, Spain, Greece, Turkey, Syria, Tunisia, Israel, Iran, Jordan, Malaysia, Indonesia, Pakistan, India, Nepal, Papua New Guinea, Bangladesh, Philippines, Fiji, Barbados, Trinidad & Tobago, Guyana, Jamaica, Botswana, Lesotho, Mauritius, Malawi, Zimbabwe, Uganda,

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[15]This is consistent with the evidence provided in Ferreira, Pessôa and Veloso (2008) that in the early seventies factors of production (physical and human capital) were the main source of output per worker differences across countries.

Tanzania, Kenya, Ghana, Cameroon, Togo, Senegal, Mozambique, Zambia, Niger, Central African Republic, South Africa and Congo.

5.2 Relative TFP Adjusted for the Mineral Sector

Table A1: Relative TFP (U.S=1) - Adjusted for the Mineral Sector

	1960	1965	1970	1975	1980	1985	1990	1995	2000
Argentina	1.00	0.93	0.94	0.98	0.93	0.74	0.57	0.73	0.68
Brazil	0.83	0.81	0.88	1.07	1.02	0.85	0.74	0.79	0.72
Chile	0.65	0.61	0.69	0.60	0.71	0.60	0.67	0.82	0.73
Colombia	0.79	0.78	0.88	0.91	0.95	0.86	0.86	0.75	0.61
Mexico	1.09	1.11	1.11	1.19	1.12	0.98	0.79	0.73	0.79
Peru	0.53	0.62	0.66	0.80	0.62	0.54	0.43	0.43	0.38
Venezuela	0.69	0.85	0.98	0.93	0.72	0.62	0.63	0.57	0.46
Latin America	0.78	0.80	0.86	0.91	0.85	0.73	0.66	0.67	0.60

5.3 Relative TFP Adjusted for the Agriculture, Forestry and Fishing Sector

Table A2: Relative TFP (U.S=1) - Adjusted for Agriculture

	1960	1965	1970	1975	1980	1985	1990	1995	2000
Argentina	0.93	0.86	0.88	0.93	0.89	0.70	0.54	0.69	0.65
Brazil	0.73	0.71	0.81	1.00	0.97	0.81	0.71	0.75	0.69
Chile	0.65	0.62	0.70	0.61	0.73	0.62	0.68	0.83	0.76
Colombia	0.61	0.63	0.71	0.74	0.78	0.72	0.74	0.65	0.54
Mexico	0.96	0.98	1.00	1.09	1.05	0.93	0.75	0.69	0.73
Peru	0.51	0.60	0.63	0.77	0.62	0.54	0.41	0.41	0.36
Venezuela	1.30	1.51	1.58	1.16	0.84	0.70	0.74	0.70	0.59
Latin America	0.78	0.80	0.86	0.88	0.83	0.71	0.64	0.66	0.60

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