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The Latin American Development Problem: An Interpretation

The economic growth experience of Latin America in the last five decades constitutes one of the most interesting episodes in modern development economics. In 1960, gross domestic product (GDP) per capita in Latin America relative to that of the United States was 30 percent. By 2009 this statistic had fallen to 23 percent. Not only is income low in Latin American countries, but it has also fallen relative to that of the technological leader. This poor economic performance contrasts sharply with other regions and countries at similar or lower stages of economic development in 1960.[1] While many countries in Latin America contribute to this relatively poor performance, some countries stand out, such as Argentina, Bolivia, Peru, and Venezuela. Broadly speaking, the facts of low and declining relative income motivate what I call the Latin American development problem. In this article, I provide an assessment and interpretation of the poor economic performance in Latin America.

Economic performance in Latin America has often been viewed as the outcome of macroeconomic adjustment, as many economies in the region have suffered numerous economic crises. High volatility in economic activity

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I thank Omar Bello, Juan Blyde, César Calderón, Gonzalo Castex, Pedro Cavalcanti-Ferreira, Margarida Duarte, Hugo Hopenhayn, Ugo Panizza, Ramón Pineda, Andrés Solimano, and Raimundo Soto for helpful comments. Samantha Azzarello provided excellent research assistance. I gratefully acknowledge the financial support provided by the Social Sciences and Humanities Research Council of Canada.

1. Duarte and Restuccia (2006) report that in 1960 the average Latin American country represented 34 percent of the GDP per worker in the United States. It also represented more than 2.4 times the GDP per worker of the average country in Asia and about half the GDP per worker of Western Europe. By 2000, the same Latin American countries represented about 25 percent of the GDP per worker in the United States. Whereas Latin American countries lost some ground in productivity relative to that of the United States, Asia overtook Latin America's labor productivity (Latin America being 73 percent of Asia) and Western Europe increased its advantage to more than three times the level of productivity in Latin America.

is a prevalent feature of these economies, and it may be important in explaining their poor economic performance.[2] Because high volatility in economic activity in the region often masks the underlying flat or negative trends in economic performance, I focus on trended data on GDP per capita. Using data for ten Latin American countries, I report the following facts about the development problem in Latin America.[3] First, between 1960 and 2009, Latin America features low and declining GDP per capita relative to the United States. Second, a decomposition of GDP per capita reveals that none of the difference is explained by differences in the quantity of work hours, while less than 20 percent of the difference is explained by a lower employment-to-population ratio in Latin America. The bulk of the difference in income stems from low GDP per labor hour (that is, labor productivity) in Latin America relative to the United States. Third, when I decompose GDP per hour using an aggregate production function that includes physical and human capital as inputs, I find that almost none of the difference is explained by systematic differences in the ratio of physical capital to output and that some of the difference is explained by differences in the quality and quantity of human capital. More importantly, most of the difference stems from differences in total factor productivity (TFP). This emphasis on the role of TFP in explaining the economic performance of Latin America is consistent with the earlier analyses.[4] I argue that in the context of a model with physical and human capital accumulation, TFP in Latin America only needs to be about 60 percent that of the United States to account for a 25 percent ratio of GDP per hour. Fourth, I report labor productivity in agriculture, industry, and services and argue that aggregate productivity differences between Latin America and the United States are not the result of sector-specific distortions. Therefore, I seek an economywide explanation for low productivity in Latin America.

Given these facts, I then consider a model in which institutions and policy distortions in Latin America cause relative measured TFP to be 60 percent of the U.S. level. The model follows Restuccia and Rogerson in extending the neoclassical growth model to allow for establishment heterogeneity.[5] This framework has been used extensively in empirical applications of productivity

2. The extensive literature on volatility and growth finds a strong empirical negative relationship between volatility and long-run growth; see, for instance, Ramey and Ramey (1995); Hnatkovska and Loayza (2005); Aghion and Banerjee (2005).

3. The countries are Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay, and Venezuela. See the data appendix for more details.

4. See, for example, Elias (1992); Solimano and Soto (2006); Cole and others (2005).

5. Restuccia and Rogerson (2008).

differences across countries.[6] A related framework has been used for more specific applications to the development problem such as size-dependent policies, financial frictions, restrictions to foreign direct investment (FDI), and informality.[7] In the model, establishments differ in their factor productivity, and the reallocation of capital and labor across establishments leads to measured TFP differences. The novelty in the analysis in this paper is that on entry, establishments invest in the likelihood of higher productivity draws from an invariant distribution. As a result, institutions and policy distortions not only misallocate resources across establishments, as emphasized in the existing literature, but also shift the distribution of establishments to lower productivity levels. This feature of the model is broadly consistent with the microeconomic data for Latin American countries where the distribution of efficiencies among establishments in the manufacturing sector is skewed to the left, toward low productivity units.[8] The class of institutions and policy distortions that I consider is broad and abstract. In particular, I consider two comprehensive sets of policies. First, I quantify the impact of institutions that cause an increase in the cost of entry for establishments.[9] Second, I quantify the impact of idiosyncratic distortions that cause a reallocation of resources from the most productive to the less productive establishments. The type of policies that would effectively cause such a reallocation is also very large, including subsidies to public enterprises, trade and labor restrictions, taxation, competition barriers, and excessive regulations. In the calibrated model, I find that these institutions and policy distortions lead to a TFP ratio between the distorted and undistorted economies in the range of 60 to 70 percent. As a result, removing productivity barriers in Latin America can lead to an increase in relative long-run labor productivity of a factor of four. Under one metric, this increase in labor productivity is equivalent to seventy years' worth of average postwar economic development in the United States.

There is an extensive literature analyzing different aspects of the development experience in Latin America.[10] There is also a strand of literature

6. See, for instance, Hsieh and Klenow (2009); Bartelsman, Haltiwanger, and Scarpetta (2013); Alfaro, Charlton, and Kanczuk (2009); Pagés (2010).

7. On size-dependent policies, see Guner, Ventura, and Xu (2008); on financial frictions, see Greenwood, Sánchez, and Wang (2010); on FDI restrictions, see Burstein and Monge-Naranjo (2009); on informality, see Leal (2010).

8. See Pagés (2010).

9. There are many examples of these costs; see, for instance, de Soto (1986); Djankov and others (2002).

10. This literature is too vast to reference here, but see, for instance, Solimano and Soto (2006) and the references therein.

studying country-specific experiences using quantitative models.[11] Cole and others emphasize the importance of competition barriers in explaining the low productivity levels in Latin America.[12] In addition, many Latin American experiences have been studied in the context of depression episodes, such as Mexico and Chile in the 1980s.[13] While similar forces may cause TFP to be below trend, the emphasis in this paper is on explaining the low productivity levels in Latin America.

The paper is organized as follows. In the next section, I document the basic facts about the development problem in Latin America. I decompose GDP per capita to show that low labor productivity (and in particular low TFP) is at the core of the development problem in Latin America. The paper then describes a model of TFP and calibrates it to data for the United States. Next, I perform a quantitative analysis of institutions and policy distortions in Latin America with a discussion of policy implications. The final section concludes.

Some Facts

In this section, I document a set of facts about gross domestic product (GDP) per capita and related factors in order to establish what I call the development problem in Latin America. The analysis serves to guide the search for an explanation of the development problem in Latin America. The period of analysis covers 1960 to 2009. I focus on long-run trends, so the data are trended using the Hodrick-Prescott filter with a smoothing parameter of $\lambda = 100$. For a detailed description of the data and sources, see the appendix.

GDP per Capita

The total amount of goods and services produced in a country within a specified period of time provides a summary measure of wealth in a nation. Between 1960 and 2009, GDP per capita grew in all Latin American countries, but this growth did not allow Latin American countries to catch up to the level of more developed economies. I take the United States, which observed a high and stable growth rate of GDP per capita throughout most of the twentieth century, as the benchmark against which to compare the economic performance

11. See, for instance, Bergoeing and others (2002); Kydland and Zarazaga (2002); Cole and others (2005).
12. Cole and others (2005).
13. See, for instance, Bergoeing and others (2002); Bergoeing, Loayza, and Repetto (2004).

TABLE 1. GDP per Capita in Latin America

	Relative GDP per capita		
Country	*1960*	*2009*	*Annualized growth (%)*
Argentina	0.48	0.33	1.32
Bolivia	0.14	0.09	1.15
Brazil	0.19	0.20	2.17
Chile	0.38	0.42	2.32
Colombia	0.22	0.22	2.11
Ecuador	0.20	0.15	1.61
Mexico	0.27	0.25	1.94
Peru	0.26	0.16	1.03
Uruguay	0.45	0.31	1.37
Venezuela	0.82	0.32	0.17
Latin America	0.30	0.23	1.53
United States	1.0	1.0	2.10

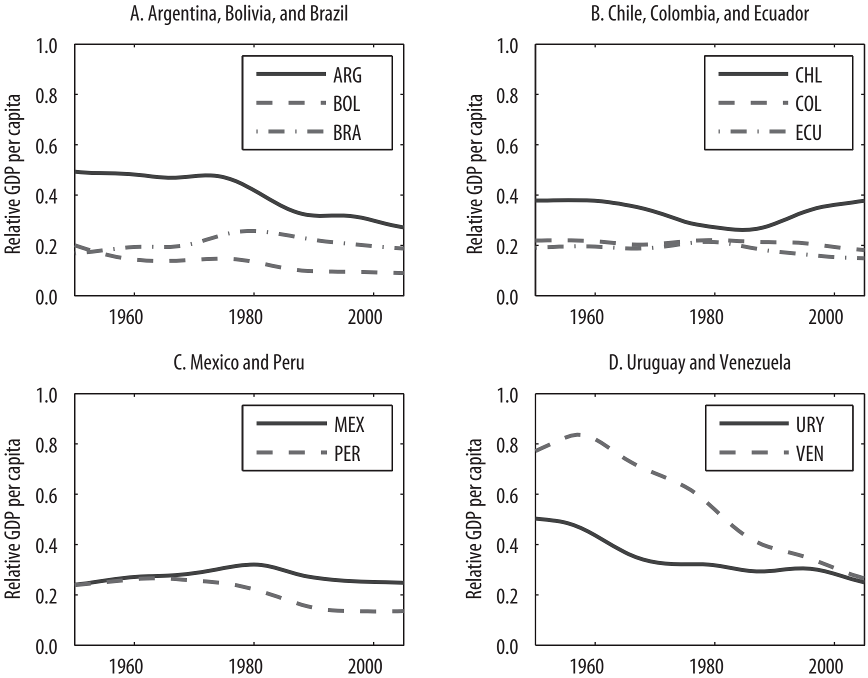
in Latin America. Relative to the U.S. level, GDP per capita in Latin American countries is low and has been declining. Table 1 summarizes these facts. In 1960 Latin America's GDP per capita was 30 percent of the U.S. level. By 2009 this statistic had declined to 23 percent. This relative decline is highly influenced by the negative economic performances of Argentina, Bolivia, Peru, Uruguay, and Venezuela. Figure 1 reports the evolution of GDP per capita in Latin American countries relative to the United States between 1950 and 2009. Relative GDP per capita was stagnant or declining for Latin American countries during this period. With the exception of Chile in recent years, no other Latin American country has grown at rates substantially above the United States, despite the fact that Latin American countries have levels of GDP per capita below that of the United States. Even though there is substantial room for catch-up in income to the United States, this process has not occurred for Latin American countries. This performance contrasts sharply with the evolution of GDP per capita in other countries at a similar stage of development.[14]

Decomposing GDP per Capita

What is the source of the poor economic performance of Latin American economies? To explore this question, I decompose the aggregate evolution

14. See Duarte and Restuccia (2006) for a comprehensive documentation of these different growth experiences.

FIGURE 1. GDP over Capita Relative to the United States



of GDP per capita into three factors, as follows. At each date, GDP per capita can be written as

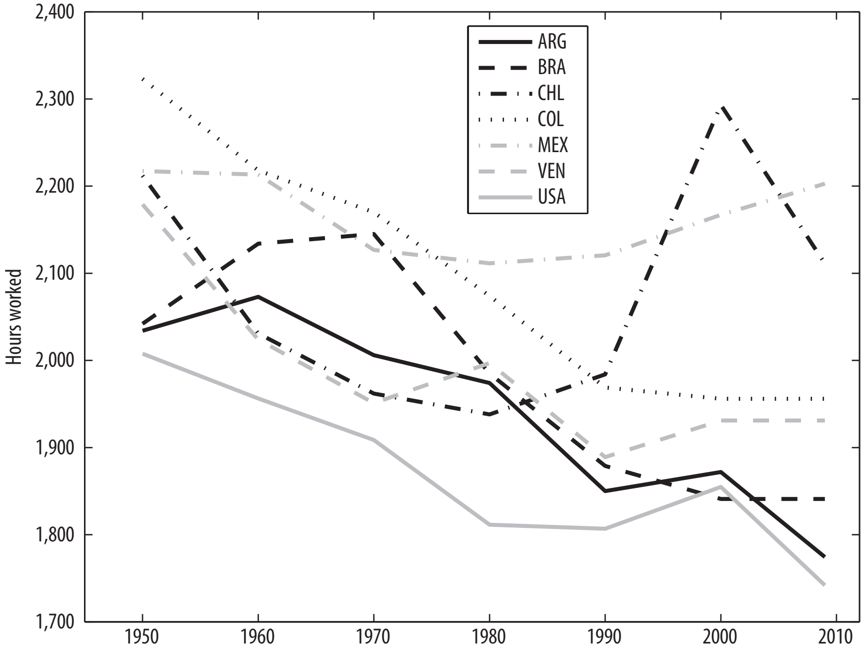
$$\frac{Y}{P} = \frac{Y}{nE} \times \frac{E}{P} \times n,$$

where Y/P is GDP per capita, E/P is the employment-to-population ratio, n is hours per worker, and Y/nE is labor productivity (GDP per labor hour). Hence, the ratio of GDP per capita between any two countries i and j is given by:

$$\frac{(Y/P)_i}{(Y/P)_j} = \frac{(Y/nE)_i}{(Y/nE)_j} \times \frac{(E/P)_i}{(E/P)_j} \times \frac{n_i}{n_j}.$$

In other words, relative GDP per capita between countries i and j is the product of the ratio of labor productivity, the ratio of employment to population,

FIGURE 2. Annual Hours per Worker



and the ratio of hours worked. Hence, a low relative GDP per capita can be the result of low labor productivity, low employment rates, low hours worked, or any combination of these factors. The evidence from table 1 indicates that the factor difference in GDP per capita between Latin America and the United States is roughly one to four (or 25 percent). Which variables in the above decomposition explain a fourfold difference between GDP per capita in the United States and Latin America? I describe these differences in turn.

HOURS WORKED. I first examine whether hours of work can account for the low relative levels of GDP per capita in Latin America. While there are important limitations in collecting and comparing hours of work across a wide range of countries, the available data suggest that hours of work cannot explain the low relative levels of GDP per capita in Latin America. I use data on annual hours per worker collected by the Conference Board and Groningen Growth and Development Centre from a number of sources.[15] Figure 2 documents the

15. Conference Board and Groningen Growth and Development Centre (2010).

available time series data for a number of Latin American economies and the United States. As the figure shows, Latin American countries systematically work more hours than the United States (about 7 percent more hours in 1960 and 11 percent more hours in 2009). Over time, hours of work have declined for all countries except Mexico, but hours worked remain higher for Latin American countries than for the United States. As a result, hours worked represent only a small difference between Latin America and the United States and contribute negatively to explaining low relative GDP per capita in Latin America. I conclude then that an explanation of low and declining relative GDP per capita in Latin America cannot be based on differences in hours of work.

EMPLOYMENT-TO-POPULATION RATIO. I next examine whether differences in the employment-to-population ratio can explain the low relative GDP per capita in Latin America. Table 2 reports the employment-to-population ratio across Latin American countries and the United States in 1960 and 2009. While the employment ratio is higher for the United States than most Latin American countries, the difference in the employment ratio can only explain less than 20 percent of the difference in GDP per capita across Latin America and the United States. Specifically, the ratio of employment to population between Latin America and the United States is 0.82 to 0.87, while the ratio of GDP per capita is 0.30 to 0.23. The employment ratio thus explains between 17 percent of the GDP per capita in 1960 [log(0.82)/log(0.30)] and 10 percent in 2009 [log(0.87)/log(0.23)].

LABOR PRODUCTIVITY. The previous analysis leaves us with one factor to explain the bulk of differences in GDP per capita: namely, labor productivity or

TABLE 2. Employment-to-Population Ratio

Country	*1960*	*2009*
Argentina	0.39	0.38
Bolivia	0.33	0.40
Brazil	0.38	0.48
Chile	0.31	0.45
Colombia	0.28	0.40
Ecuador	0.27	0.37
Mexico	0.25	0.39
Peru	0.33	0.37
Uruguay	0.32	0.47
Venezuela	0.29	0.35
Latin America	0.31	0.40
United States	0.38	0.46
Ratio (LA/US)	0.82	0.87

GDP per labor hour. Since I have already established that differences in hours worked are small and stable, the bulk of the difference in GDP per capita is explained by differences in GDP per worker between Latin American countries and the United States. As a summary measure, the ratio of GDP per hour between Latin America and the United States was 0.34 in 1960 and 0.24 in 2009, thus explaining 90 percent of the difference in GDP per capita in 1960 [log(0.34)/log(0.30)] and 97 percent in 2009 [log(0.24)/log(0.23)].

To summarize, GDP per capita between Latin America and the United States in 1960 is accounted for by

$$\underset{0.30}{\frac{(Y/P)_{LA}}{(Y/P)_{US}}} = \underset{0.34}{\frac{(Y/nE)_{LA}}{(Y/nE)_{US}}} \times \underset{0.82}{\frac{(E/P)_{LA}}{(E/P)_{US}}} \times \underset{1.07}{\frac{n_{LA}}{n_{US}}},$$

and relative GDP per capita in 2009 is

$$\underset{0.23}{\frac{(Y/P)_{LA}}{(Y/P)_{US}}} = \underset{0.24}{\frac{(Y/nE)_{LA}}{(Y/nE)_{US}}} \times \underset{0.87}{\frac{(E/P)_{LA}}{(E/P)_{US}}} \times \underset{1.11}{\frac{n_{LA}}{n_{US}}}.$$

Hence, low relative GDP per capita in Latin America is a labor productivity problem! Relative labor input ($E/P \times n$) changed from 0.88 in 1960 to 0.97 in 2009.

Decomposing GDP per Hour

To investigate the sources of differences in GDP per hour, the standard procedure is to write down an aggregate production function that explicitly states the relevant factors of production. For this purpose, I consider a standard Cobb-Douglas aggregate production function augmented to include human capital:

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

where Y is output, K and H are the inputs of physical and human capital services, respectively, and A is total factor productivity (TFP). Since I am ultimately interested in broadly separating the importance of factor accumulation (human and physical capital) and TFP, I write the production function above in intensive form.[16] To do this, first I write aggregate human capital (H) as the product of human capital per worker (h), the number of workers (E), and hours of work (n), that is, $H = hEn$. Using this substitution in equation 1, dividing by Y on both sides, taking Y/nE to the left-hand side, and rearranging terms, I obtain

$$\text{(2)} \qquad \frac{Y}{nE} = A^{\frac{1}{1-\alpha}} \left(\frac{K}{Y} \right)^{\frac{\alpha}{1-\alpha}} h.$$

Using equation 2, the ratio of GDP per hour (Y/nE) between countries i and j is given by

$$\text{(3)} \qquad \frac{(Y/nE)_i}{(Y/nE)_j} = \left(\frac{A_i}{A_j} \right)^{\frac{1}{1-\alpha}} \times \left[\frac{(K/Y)_i}{(K/Y)_j} \right]^{\frac{\alpha}{1-\alpha}} \times \frac{h_i}{h_j}.$$

In words, differences in GDP per hour can result from three factors: differences in TFP, differences in physical capital to output, and differences in human capital per worker. The goal is to investigate the factors on the right-hand side of equation 3 that can account for one- to fourfold differences in GDP per hour between Latin America and the United States. Because measures of TFP are not readily available across countries, I follow the typical approach in development accounting of measuring the factors of physical and human capital, leaving TFP as a residual. This implies that mismeasurement of physical and human capital inputs will produce biased estimates of the implied differences in TFP. There is a large literature addressing the potential mismeasurement problems such as quality of physical and human capital.[17] The broad conclusion from this literature is that with the exception of differences in human capital quality, which I address explicitly below, accounting for these measurement problems is unlikely to change the overall conclusion that differences in TFP are a critical determinant of differences in income per capita across countries.

PHYSICAL CAPITAL. I first investigate the importance of physical capital accumulation. I focus on institutions and policies that lead to differences in the capital-to-output ratio across countries. Differences in TFP could also cause capital accumulation to differ across countries, but in a broad class

16. This follows Bils and Klenow (2000) and Klenow and Rodríguez-Clare (1997).
17. See, for instance, Klenow and Rodríguez-Clare (1997).

TABLE 3. Ratio of Real Physical Capital to GDP

	K/Y	
Country	*1960*	*2009*
Argentina	1.77	1.81
Bolivia	1.15	1.09
Brazil	1.85	1.50
Chile	3.17	2.31
Colombia	1.62	1.43
Ecuador	3.10	2.21
Mexico	2.23	2.43
Peru	4.41	2.02
Uruguay	2.08	1.53
Venezuela	3.61	1.74
Latin America	2.32	1.76
United States	2.05	2.57

of models, TFP differences imply no differences in the capital-to-output ratio. This implication is what makes the decomposition in equation 2 useful for separating the forces directly related to capital accumulation from TFP differences.

The next step is to look for measures of physical capital across countries. Typically the physical capital stock is measured in domestic prices.[18] In these units, the physical capital stock relative to GDP is not systematically different across Latin American countries and the United States. However, measuring the capital stock at domestic prices may give a biased view of capital accumulation, since the price of capital goods is systematically higher in poor countries than in rich economies.[19] Alternatively, a measure of the capital stock at common international prices can be constructed using investment rates from the Penn World Tables.[20] I follow this approach in constructing the capital-to-output ratio for Latin American countries and the United States (see the appendix for details). I report these estimates in table 3. The main conclusion I draw is that capital accumulation as measured by the capital-to-output ratio is not systematically different between Latin America and the United States. In fact, in 1960 the capital-to-output ratio in Latin America was 13 percent above the U.S. level, whereas in 2009 it was 31 percent below (see table 4). Nevertheless, these

18. Cole and others (2005) and other authors use the domestic-price measure from Nehru and Dhareshwar (1993) in their analysis.
19. See Restuccia and Urrutia (2001).
20. Heston, Summers, and Aten (2009).

TABLE 4. Differences in the Ratio of Real Physical Capital to Output

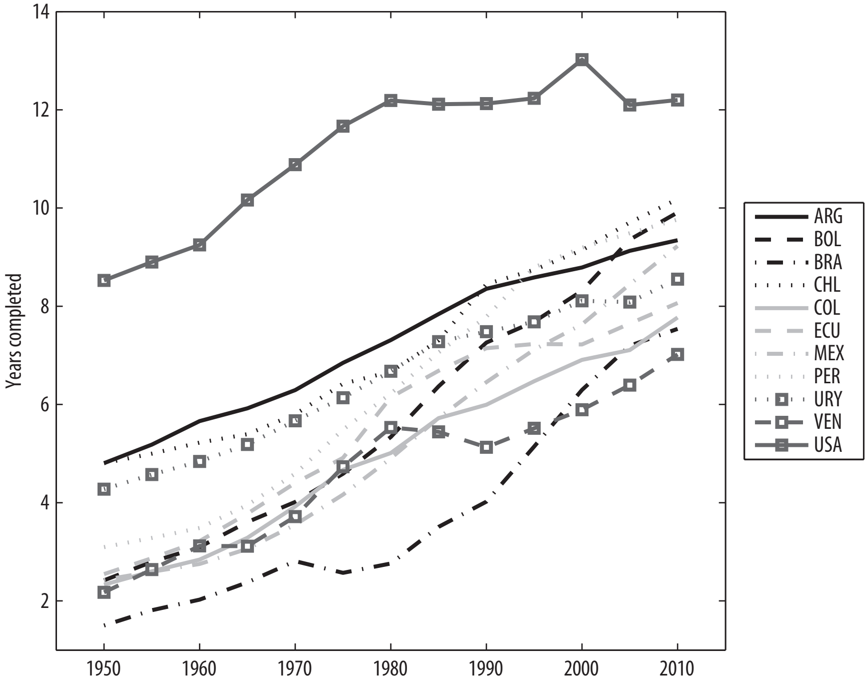
Variable	*1960*	*2009*
$(K/Y)_{LA}$	2.32	1.76
$(K/Y)_{US}$	2.05	2.57
Ratio	1.13	0.69
$[(K/Y)_{LA}/(K/Y)_{US}]^{\alpha/(1-\alpha)}$	1.06	0.83

level differences are too small to account for any substantial portion of the difference in labor productivity across these countries. For instance, with a capital share of one-third ($\alpha = ⅓$ in equation 3), a 13 percent higher capital-to-output ratio translates into a 6 percent higher GDP per hour, while a 31 percent lower capital-to-output ratio translates into a 17 percent lower labor productivity. I conclude that although there are some relevant country differences in the capital-to-output ratio, these differences are not systematic and quantitatively substantial enough to explain differences in GDP per hour of a factor of four between Latin American countries and the United States.

HUMAN CAPITAL. A serious limitation of development accounting studies lies in the difficulty in measuring human capital across countries. The most widely available evidence is on the quantity of schooling across countries. Barro and Lee have collected detailed data on enrollment rates across different levels of education to calculate average years of schooling across a large set of countries.[21] Using these data, figure 3 reports the evolution of average years of schooling for Latin American countries and the United States. Average years of schooling are increasing in all countries. However, the data indicate important differences in education quantity across countries. For instance, average years of schooling in Latin America (geometric average) was 2.9 years in 1960 and 4.4 years in 2010, whereas for the United States it was 8.5 years in 1960 and 10.9 years in 2010. From the accounting perspective, the key issue is determining how differences in years of schooling translate into differences in human capital across countries. This is a difficult issue. The most widely used approach, advocated by Bils and Klenow and implemented in a development accounting exercise by Klenow and Rodríguez-Clare, is to use Mincer's insights into how years of schooling translate into human capital and hence generate differences in wage earnings across workers in an economy.[22] The approach maps years of schooling into log wages using Mincer returns to schooling. Abstracting from

21. Barro and Lee (2010).
22. Bils and Klenow (2000); Klenow and Rodríguez-Clare (1997); Mincer (1974).

FIGURE 3. Average Years of Schooling



Source: Barro and Lee (2010).

age and experience differences, the approach implies that human capital is given by $h = c_m \exp(\eta s)$ for workers in the same labor market, where c_m is a constant level parameter and η is the Mincer return to schooling, which is also assumed to be constant. Using this approach to estimate h_{LA}/h_{US} in equation 3 with $\eta = .01$, I find that this term is 0.57 in 1960 and 0.52 in 2010. This implies that measured TFP differences are the most important factor in explaining the low income per capita in Latin American economies. While this method of estimating human capital differences across countries is practical and well grounded on microeconomic evidence, it has its limitations in measuring human capital differences across counties. Although it may be reasonable to assume that c_m and γ are constant for workers in the same labor market, which was Mincer's focus, it is less so for workers in different labor markets. The key issue is that the empirical specification cannot account for differences in the quality of education across countries. Those differences can be important.[23] More importantly, unlike the separation of TFP and physical capital accumulation implied by Solow-type growth models, it is generally difficult to disentangle the role of TFP and other factors in explaining schooling and human capital differences. For these reasons, recent studies have used quantitative theory to get at the importance of human capital in development.[24] How do productivity differences translate into human capital differences across countries? Standard models of human capital accumulation imply a log-linear relationship between human capital and income when economies differ on TFP, that is,

$$\log h = c_h + \gamma \log(y),$$

where h is human capital per worker, y is labor productivity, and c_h is a constant. When this expression is substituted for h in equation 2, GDP per hour (Y/nE) can be expressed as a function of TFP and capital accumulation, as follows:

$$\text{(4)} \qquad \frac{Y}{nE} = c_y A^{\frac{1}{(1-\alpha)(1-\gamma)}} \left(\frac{K}{Y}\right)^{\frac{\alpha}{(1-\alpha)(1-\gamma)}},$$

where c_y is a constant. Given equation 4, GDP per hour between countries i and j is given by

$$\text{(5)} \qquad \frac{(Y/nE)_i}{(Y/nE)_j} = \left(\frac{A_i}{A_j}\right)^{\frac{1}{(1-\alpha)(1-\gamma)}} \times \left[\frac{(K/Y)_i}{(K/Y)_j}\right]^{\frac{\alpha}{(1-\alpha)(1-\gamma)}}.$$

The critical difference with equation 3 is the elasticity of the TFP and capital accumulation factors. Differences in TFP across countries lead to differences in physical capital accumulation and human capital accumulation (in the form of both quantity and quality of schooling). These factors can lead to a substantial amplification of TFP differences across countries. To see how

23. See, for instance, Hendricks (2002) and Schoellman (2012), who assess the role of quality differences for human capital across countries.

24. See, for instance, Manuelli and Seshadri (2005); Erosa, Koreshkova, and Restuccia (2010). See also Restuccia and Vandenbroucke (2012) for an analysis of how development may explain the observed differences in education across countries at a point in time, as well as over time.

important this mechanism can be, first suppose in equation 5 that $\gamma = 0$ and $\alpha = 1/3$, consistent with the standard one-sector growth model. Then, to generate a fourfold difference in labor productivity between the United States and Latin America, a TFP ratio of 2.5 is needed—that is, TFP in Latin America would need to be 0.4 that of the United States. This number is perhaps too small to be justified empirically. If instead $\gamma = 1/2$, equation 5 would require a TFP ratio of 1.6 in order to achieve a fourfold difference in labor productivity. The key question, then, is how important this amplification mechanism is quantitatively. In other words, what is a reasonable value for the elasticity parameter summarized by γ? I address this issue next. However, the implicit assumption in equation 5 is that γ and c_y are constant across countries. This assumption is less restrictive than the related assumptions in the Mincer approach of c_m and η being constant. The reason is that γ is an elasticity, whereas η is a semi-elasticity that in turn depends on average years of schooling. Put differently, Mincer returns to schooling, η, would tend to be high in countries with low average years of schooling. Similarly, while c_m may vary across countries due to country differences in educational quality, these factors are taken into account when estimating human capital and are hence embedded in the estimates of γ. While this is a simple and tractable approach to measuring human capital that takes into account key factors such as education quantity and quality, it leaves out some factors that may lead to differences in c_y and γ. Consequently, the implied differences in A may be biased by those factors, especially when considering country-specific experiences.

TOTAL FACTOR PRODUCTIVITY. The relationship implied by equation 5 can be used to establish the difference in TFP between Latin America and the United States that is needed to explain a difference in GDP per worker of one to four. Using cross-section heterogeneity across individuals in the United States, Erosa, Koreshkova, and Restuccia estimate that γ is around 0.46.[25] Given this estimated value for γ, equation 5 implies that in order to generate a fourfold difference in GDP per worker between the United States and Latin America, TFP must be 60 percent higher in the United States. In the next section, I consider a TFP model that can potentially explain a productivity difference of this magnitude between Latin America and the United States.

25. Erosa, Koreshkova, and Restuccia (2010). Roughly speaking, the parameters of the human capital production function that generate an elasticity of TFP on income across countries also generate an elasticity of heterogeneity across individuals and their earnings. Thus, cross-section heterogeneity within a country gives some information on the relevant cross-country elasticity.

To summarize, relative GDP per hour in 1960 is accounted for by

$$\underset{0.30}{\frac{(Y/nE)_{LA}}{(Y/nE)_{US}}} = \underset{0.27}{\left(\frac{A_{LA}}{A_{US}}\right)^{\frac{1}{(1-\alpha)(1-\gamma)}}} \times \underset{1.12}{\left[\frac{(K/Y)_{LA}}{(K/Y)_{US}}\right]^{\frac{\alpha}{(1-\alpha)(1-\gamma)}}},$$

while relative GDP per hour in 2009 is

$$\underset{0.23}{\frac{(Y/nE)_{LA}}{(Y/nE)_{US}}} = \underset{0.32}{\left(\frac{A_{LA}}{A_{US}}\right)^{\frac{1}{(1-\alpha)(1-\gamma)}}} \times \underset{0.71}{\left[\frac{(K/Y)_{LA}}{(K/Y)_{US}}\right]^{\frac{\alpha}{(1-\alpha)(1-\gamma)}}}.$$

The TFP gap (A_{LA}/A_{US}) is 0.62 in 1960 and 0.66 in 2009. As a result, in both periods, low relative GDP per hour in Latin America is driven mainly by low relative TFP. While the decline in capital accumulation in Latin America explains most of the decline in relative GDP per hour between 1960 and 2009, this relative decline of 7 percentage points during the period is small compared to the large level gap in GDP per hour between Latin America and the United States. In what follows, I focus on TFP as the main determinant of GDP-per-hour differences between Latin America and the United States.

Sectoral Labor Productivity

Before I move on to the model, there is one last point about the data. An argument could be made that Latin America suffers low productivity in specific sectors or that distorting activity affects some sectors of the economy more than others. This view of the development problem in Latin America is not consistent with the facts. Table 5 summarizes the evidence from Duarte and Restuccia.[26] The table reports labor productivity (real value added per labor hour) in each broad sector—agriculture, industry, and services—relative to that of the United States. The main finding is that low labor productivity in Latin America is a prevalent feature in all sectors of the economy. I conclude

26. Duarte and Restuccia (2010) develop a tractable model of the structural transformation across agriculture, industry, and services to both measure sectoral productivity differences across countries and assess the importance of the structural transformation in aggregate productivity growth outcomes.

TABLE 5. Sectoral Labor Productivity[a]
Percent relative to the United States

	Agriculture		*Industry*		*Services*	
Country	*1960*	*2000*	*1960*	*2000*	*1960*	*2000*
Argentina	42.1	27.3	65.7	66.5	62.2	34.4
Bolivia	12.7	4.4	62.9	13.4	24.2	6.2
Brazil	17.3	15.1	44.1	33.6	18.5	17.5
Chile	28.5	43.2	44.7	49.3	35.1	29.7
Colombia	17.7	7.3	54.3	29.7	22.1	11.8
Mexico	17.8	8.3	103.1	73.2	46.1	24.9
Peru	19.0	5.0	76.5	39.9	32.2	10.3
Venezuela	30.0	17.0	163.6	29.8	87.4	37.7
Latin America	21.6	11.9	69.9	37.4	32.8	16.7

Source: Duarte and Restuccia (2010).
a. Ecuador and Uruguay are not included in the data set used by Duarte and Restuccia (2010).

that low labor productivity in Latin America is not the result of sector-specific policies or distortions, but rather is an economywide phenomenon.

All countries go through a process of structural transformation whereby the agricultural sector is replaced in importance by the industrial sector and later by the service sector. While labor productivity improvements in agriculture and especially industry have proven essential in explaining episodes of substantial catch-up in aggregate productivity between newly industrialized countries (such as Korea, Japan, Singapore, and many European countries) and the United States, sectoral labor productivity in Latin America has failed to catch up in all sectors. While these facts underscore the importance of sector-specific distortions or frictions, Duarte and Restuccia show that productivity growth in the service sector may be the best avenue for Latin America to mount a substantial catch-up in income to the technological leader.[27]

A Model of TFP

There is a growing consensus in the recent macroeconomics literature that reallocation across microeconomic productive units can have an important effect on aggregate productivity, where microeconomic units can refer to sectors or establishments within sectors.[28] Since the evidence across sectors

27. Duarte and Restuccia (2010).
28. See, for instance, Restuccia (2011) for a survey of this literature.

discussed earlier points to a productivity problem within each sector, in what follows I focus on reallocation across productive establishments without emphasis on the sectoral structure. I present an extension of a model of measured total factor productivity developed by Restuccia and Rogerson.[29] The theory builds from Hopenhayn's industry equilibrium framework, embedded into a standard neoclassical growth model.[30] The basic ingredient of the theory is the heterogeneity in total factor productivity across establishments. In the context of this model, policy distortions affect the allocation of factors of production across establishments and lead to aggregate measured TFP differences across countries. I now describe the details of the model.

Economic Environment

There is an infinitely lived representative household with preferences over streams of consumption goods at each date described by the utility function,

$$\sum_{t=0}^{\infty} \beta^t u\left(C_t\right),$$

where C_t is consumption at date t and $0 < \beta < 1$ is the discount factor. Households are endowed with one unit of productive time in each period and $K_0 > 0$ units of the capital stock at date 0.

In contrast to the standard neoclassical growth model, the unit of production is the establishment. Each establishment is described by a decreasing returns-to-scale production function,

$$f\left(s, k, n\right) = s k^{\alpha} n^{\gamma}, \qquad \alpha, \gamma \in \left(0, 1\right), \qquad 0 < \gamma + \alpha < 1,$$

with capital services k and labor services n as factor inputs. The technology parameter s varies across establishments. I assume that s can take a discrete and finite number of values, $s \in S \equiv \{s_1, \ldots, s_{n_{\hat{s}}}\}$. As in Restuccia and Rogerson, I abstract from variation in s over time.[31] All establishments face an exogenous and constant probability of death, λ. Exogenous exit realizations are independent and identically distributed (i.i.d.) across establishments and across time.

New establishments pay a set-up cost of c_e, measured in terms of output. After paying this cost, a realization of the establishment-level productivity

29. Restuccia and Rogerson (2008).
30. Hopenhayn (1992).
31. Restuccia and Rogerson (2008).

parameter s is drawn, but establishments can invest in the likelihood of higher realizations of productivity levels. In particular, incurring the cost $c(q)$ in units of output, with probability q productivity is drawn from the higher productivity set $S_H \equiv \{s_{n_{\hat{s}}+1}, \ldots, s_{n_s}\}$ according to a probability density function (p.d.f.) $h_H(s)$, while with probability $1 - q$ productivity is drawn from the lower set $S_L \equiv \{s_1, \ldots, s_{n_{\hat{s}}}\}$ according to p.d.f. $h_L(s)$, where $n_{\hat{s}} \in \{1, \ldots, n_s\}$. Draws are i.i.d. across entrants, and there is a continuum of potential entrants. I denote by N_t the mass of entry in period t. I parameterize the cost function as

$$c(q) = Bq^{\phi}, \qquad B, \phi > 0.$$

Feasibility in this model requires

$$C_t + X_t + c_e N_t + c(q_t) N_t \leq Y_t,$$

where C_t is aggregate consumption, X_t is aggregate investment in physical capital, $c(q_t)$ is the investment cost in establishment quality, N_t is aggregate entry, and Y_t is aggregate output. As in the standard neoclassical growth model, the aggregate law of motion for capital is given by

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

I focus on institutions and policies that create idiosyncratic distortions to establishment-level decisions, as emphasized by Restuccia and Rogerson.[32] The empirical counterpart of these policies will be discussed in detail later. Broadly speaking, these policies are represented by a tax on output of operating plants τ. As in Restuccia and Rogerson, I assume that τ can take on three values: a positive value, reflecting that an establishment is being taxed; a negative value, reflecting that the establishment is being subsidized; and zero, reflecting no distortion for the establishment.[33] Different policy specifications are denoted by $\mathcal{P}(s, \tau)$, representing the probability that an establishment with productivity s faces policy τ, and it is possible that the value of the establishment-level tax rate be correlated with the draw of the establishment-level productivity parameter. From the establishment's perspective, what matters is the joint probability distribution over s and τ, which I denote by $g_H(s, \tau)$ and $g_L(s, \tau)$ for productivity in the high and low sets. Finally, not all policy configurations will lead to a balanced budget for the government, so I assume that the govern-

32. Restuccia and Rogerson (2008).
33. Restuccia and Rogerson (2008).

ment imposes a lump-sum tax on (or transfer to) consumers, T, in order to balance the budget.

While I am modeling distortions as particular configurations of taxes and subsidies, I don't mean this literally. The types of policies and institutions that effectively act as idiosyncratic taxes and subsidies is very large and may include policies and institutions that on paper apply to all firms but effectively act as a tax on high-productivity establishments. Enforcement differences, informality, and in general the endogenous reaction of firms' decisions can create a pattern of distortions that effectively burden highly productive enterprises. I will come back to this issue in the discussion of the results.

Equilibrium

The analysis focuses exclusively on the steady-state competitive equilibrium of the model. In a steady-state equilibrium, the rental prices for labor and capital services are constant, as are all aggregates in the economy, including the invariant distribution of establishments in the economy. The consumer's side of the model is entirely standard, so I will skip the details. The important aspect from the consumer's problem is that the real interest rate in the economy is pinned down by preference parameters and the depreciation rate of the capital stock—that is, in steady state the real interest rate, denoted by R, is given by

$$R = r - \delta = \frac{1}{\beta} - 1.$$

INCUMBENT ESTABLISHMENTS. The decision problem of an establishment to hire capital and labor services is static. The per-period profit function, $\pi(s, \tau)$, satisfies

$$\pi(s, \tau) = \max_{n,k \geq 0} \left[(1 - \tau) s k^{\alpha} n^{\gamma} - wn - rk \right].$$

It is simple to derive the optimal factor demands from this problem, which I denote $\bar{k}$ and $\bar{n}$. Because both the establishment-level productivity and tax rate are constant over time, the discounted present value of an incumbent establishment is given by

$$W(s, \tau) = \frac{\pi(s, \tau)}{1 - \rho},$$

where $\rho = (1 - \lambda) / (1 + R)$ is the discount rate for the plant, R is the (steady-state) real interest rate, and λ is the exogenous exit rate.

ENTERING ESTABLISHMENTS. Conditional on entry, an establishment invests $c(q)$ in productivity. This investment leads to a probability q of drawing productivity from the set S_H. I denote the optimal investment decision by $\bar{q}$. Establishments make their entry decision knowing that they face a distribution over potential draws for the pair (s, τ). The expected value of entering establishments is given by

$$W_e = \max_q \left[q \sum_{\tau, s \in S_H} W(s, \tau) g_H(s, \tau) + (1 - q) \sum_{\tau, s \in S_L} W(s, \tau) g_L(s, \tau) - c(q) \right] - c_e.$$

Whether an establishment decides to enter or not depends on the expected value of entering, W_e, being greater than zero. In an equilibrium with entry, W_e must be equal to zero, since otherwise additional establishments would enter. This condition is typically referred to as the free-entry condition.

DEFINITION OF EQUILIBRIUM. A *steady-state competitive equilibrium* with entry is a wage rate w; a rental rate r; a lump-sum tax T; an aggregate distribution of establishments $\mu(s, \tau)$; a mass of entry N; value functions $W(s, \tau)$, $\pi(s, \tau)$, and W_e; policy functions $\bar{k}(s, \tau)$, $\bar{n}(s, \tau)$, and $\bar{q}$ for individual establishments; and aggregate levels of consumption (C) and capital (K); such that

—Consumer optimization implies that $r = 1/\beta - (1 - \delta)$;

—Establishment optimization, given prices (w, r), requires that the functions π, W, and W_e solve the incumbent and entering establishment's problems and that $\bar{k}$, $\bar{n}$, and $\bar{q}$ are optimal policy functions;

—There is free entry, implying $W_e = 0$;

—The market-clearing conditions are

$$1 = \sum_{s,\tau} \bar{n}(s, \tau) \mu(s, \tau),$$

$$K = \sum_{s,\tau} \bar{k}(s, \tau) \mu(s, \tau),$$

and

$$C + \delta K + c_e N + c(\bar{q}) N = \sum_{s,\tau} f(s, \bar{k}, \bar{n}) \mu(s, \tau);$$

—The government budget balance is

$$T + \sum_{s,\tau} \tau f(s, \bar{k}, \bar{n}) \mu(s, \tau) = 0;$$

—μ is an invariant distribution,

$$\mu(s,\tau)=\begin{cases}\dfrac{N}{\lambda}\bar{q}g_H(s,\tau), & \forall s\in S_H,\forall\tau,\\ \dfrac{N}{\lambda}(1-\bar{q})g_L(s,\tau), & \forall s\in S_L,\forall\tau.\end{cases}$$

Calibration

I calibrate the model to data for the United States, assuming that this is an economy with no distortions. The general strategy follows Cooley and Prescott in calibrating the neoclassical growth model.[34] A period in the model corresponds to one year in the data. The discount factor is selected to match a real rate of return of 4 percent, implying $\beta = 0.96$. The parameter controlling decreasing returns to scale at the establishment is quantitatively important. I assume $\alpha+\gamma=0.85$. Recent related studies argue for values around this level, in particular for manufacturing data.[35] Other studies arrive at similar values using different calibration procedures and empirical strategies.[36] For more discussion on the implications of this choice, see Restuccia and Rogerson.[37] Given this value, I separate α and γ according to the income share of capital and labor (⅓ and ⅔); hence, $\alpha = 0.28$ and $\gamma = 0.57$. The depreciation rate of capital, δ, is chosen so that the capital-to-output ratio is equal to 2.00, implying $\delta = 0.10$. The exit rate, λ, is assumed to be 10 percent, consistent with the evidence of job destruction rates found by Davis, Haltiwanger, and Schuh and exit rates of plants reported by Tybout.[38]

In the economy with no distortions, there is a simple mapping between establishment-level productivity and employment. I thus choose the range of productivity to match the range of employment levels in the data. With the lowest establishment productivity normalized to one, this calibration implies that the highest productivity is 3.78. I use a log-spaced grid of establishment productivity with 100 points, that is, $n_s = 100$. The next step is to restrict the probability distributions. I choose $n_{\hat{s}}$ to be 20 percent of n_s. With the calibrated distributions, this implies that establishments in the set S_L represent close to

34. Cooley and Prescott (1995).

35. Atkeson and Kehoe (2005).

36. See, for instance, Veracierto (2001); Basu and Fernald (1997); Atkeson, Khan, and Ohanian (1996).

37. Restuccia and Rogerson (2008).

38. Davis, Haltiwanger, and Schuh (1996); Tybout (2000).

TABLE 6. Distribution of Plants and Employment
Percent

	Establishments		Employment	
No. workers	*Data*	*Model*	*Data*	*Model*
Fewer than 10	51.4	51.4	4.0	3.8
Between 10 and 50	31.2	31.2	15.2	13.6
Between 50 and 500	16.0	16.0	48.3	43.8
More than 500	1.4	1.4	32.5	38.8

40 percent of all establishments. The mapping of productivity to employment implies that I can choose values of $[qh_H(s), (1 - q)h_L(s)]$ to match the distribution of establishments across employment sizes. This puts a restriction on the values of q and $h_H(s)$ and $h_L(s)$. For the cost function $c(q)$, I set $\phi = 2$ and then choose B so that the equilibrium $\overline{q} = 0.615$, which is the value implied by the U.S. establishment data. I use statistics from the U.S. Census Bureau to restrict these distributions.[39] An important property of the U.S. establishment data is that a large number of establishments have a small number of workers, such that these establishments account for a small share of the employment in the economy: about 50 percent of all establishments have fewer than 10 workers and account for only 4 percent of employment, while only 0.5 percent of establishments have more than 2,500 workers and represent 30 percent of the employment. Table 6 reports these statistics from the data and the calibrated economy. As the table shows, the calibrated economy matches the distribution statistics very well. Table 7 summarizes the parameter values and targets for the calibrated economy.

Quantitative Analysis

I study three types of experiments in the model to illustrate the potential quantitative role of reallocation across productive units in explaining low productivity in Latin America. First, I consider a modification of the benchmark economy to allow for a higher cost of entry. A well-known feature of Latin American economies is their higher cost of doing business. Second, I consider policies that distort the prices faced by different producers, which Restuccia and Rogerson call idiosyncratic distortions.[40] I focus on policies that

39. U.S. Census Bureau (2007).
40. Restuccia and Rogerson (2008).

TABLE 7. Calibration

Parameter	*Value*	*Target*
α	0.28	Capital income share
γ	0.57	Labor income share
β	0.96	Real rate of return
δ	0.10	Capital-to-output ratio
c_e	1.0	Normalization
λ	0.1	Annual exit rate
Values for s and h	See text	Size distribution of establishments
n_{ξ}	20	—
φ	2	Baseline
B	2.4	$q = 0.615$

reallocate resources from high-productivity to low-productivity producers. There is evidence on the prevalence of this sort of misallocation in Latin America. Third, I evaluate the quantitative impact of the two previous experiments combined—higher entry costs and policy distortions. Table 8 summarizes the results of these experiments where all statistics (except q) are reported relative to the benchmark economy.

Entry Costs

I implement higher entry costs in the model as a higher cost of productivity draws from the upper end of the productivity distribution, that is, a higher B. According to the Doing Business data of the World Bank, entry costs in developed countries are about 5 percent of GDP per capita, whereas in Latin America entry costs are about 30 percent. There is wide dispersion in these costs across Latin American countries, with Chile featuring the lowest costs

TABLE 8. Quantitative Experiments

		Experiments		
Variable	*Benchmark economy*	*Entry costs*[a]	*Policy distortions*[b]	*Entry costs + policy distortions*[c]
Relative Y	1.00	0.95	0.69	0.66
Relative TFP	1.00	0.96	0.69	0.66
Relative E	1.00	0.96	1.85	1.87
Relative w	1.00	0.95	1.00	1.00
q	0.62	0.50	0.11	0.07

a. The entry cost experiment involves an increase in B of 50 percent relative to the benchmark economy.
b. The policy distortions are idiosyncratic output taxes of 10 percent to the 50 percent most productive establishments.
c. The combined experiment implements the same increase in entry costs and policy distortions of the previous two experiments.

in the region and Bolivia being among the highest. Entry cost measures have important limitations, and it is difficult to map them exactly into the model. Rather than making an exact assessment of the quantitative importance of entry costs for productivity, my objective with this experiment is to illustrate the direction and magnitude of the potential effects.[41]

In the experiment, I assume a 50 percent higher B than in the benchmark economy. Higher entry costs discourage establishments from entering the market (see table 8). This reduces productivity compared to the benchmark economy because establishment sizes are distorted. With the higher entry cost, the average establishment has more workers than in the benchmark economy. The aggregate productivity effect of the higher entry cost is not large: it reduces output per worker by about 5 percent compared with the benchmark economy. The higher entry cost reduces q to 50 percent (versus 62 percent in the baseline), so there is not only misallocation through larger establishments, but also a shift in the distribution of establishments toward less productive businesses.[42]

Idiosyncratic Distortions

In the next experiment, I implement a set of policies that create differences in the output prices of heterogeneous producers. Restuccia and Rogerson study a general configuration of these policies, while Hsieh and Klenow (for China and India) and Pagés (for Latin America) show that output wedges across establishments are prevalent in developing countries.[43] Many policies effectively take this form. Taxes and regulations are applied and enforced on larger, presumably more productive, establishments. Informality may be the optimal response of less productive entrepreneurs to high taxes and regulations. Public enterprises are often large establishments with low productivity that are propped up by subsidies on output or inputs, which are financed by taxes on other activities. Credit frictions translate into higher cost of capital for highly productive entrepreneurs. Industrial policies in poor countries tend to promote some activities to the detriment of others, often guided by non-economic factors.

41. The literature offers a number of more comprehensive and elaborate assessments of the impact of entry costs on productivity across countries; see, for instance, Poschke (2010), Barseghyan and DiCecio (2011), and Moscoso Boedo and Mukoyama (2011).

42. Similar aggregate productivity results are obtained if higher entry costs are implemented as a higher c_e. The main difference is that entry is much more responsive to variations in c_e, and q may increase as a result.

43. Restuccia and Rogerson (2008); Hsieh and Klenow (2009); Pagés (2010).

To illustrate the potential impact of these broad types of policies and institutions in poorer countries such as those in Latin America, I assume that the 50 percent most productive establishments are taxed, while the rest are subsidized. I set the tax rate to 10 percent and then compute the subsidy rate that leaves capital accumulation the same. Holding capital accumulation constant is motivated by the observations discussed previously that capital accumulation is not a fundamental factor in explaining low relative labor productivity in Latin America. The effect on output is larger for this sort of policy (see table 8). Output falls by more than 30 percent. This is mainly the result of a systematic distortion on establishments: productive establishments become small because of the tax, while unproductive establishments become larger because of the subsidy. This distortion entails a misallocation of resources across establishments with different productivity. In addition, the policy leads to a decrease in investment in establishment-level productivity, so q falls to 11 percent versus 62 percent in the benchmark economy. This shifts the distribution of establishments by employment size to the left, reducing the average establishment size by more than 40 percent. This effect on the average establishment size is consistent with evidence that production in developing countries takes place in smaller units.[44]

Entry Costs and Policy Distortions

In the last experiment, I consider both entry costs and policy distortions together. When combined with higher entry costs, policy distortions create a fall in output and productivity of almost 40 percent (see table 8). This is close to the magnitude in productivity that is needed to generate the observed difference in labor productivity between Latin America and the United States when capital accumulation is augmented to include human capital. As with the previous experiments, the drop in productivity is a result of misallocation and a shift in the distribution of establishments by productivity (q falls to 7 percent in this experiment versus 62 percent in the benchmark). To appreciate the magnitude of reallocation involved in this experiment, table 9 reports distributional statistics. Establishments in the high-productivity set are, on average, twice as productive as the establishments in the low-productivity set. In the benchmark economy, 38 percent of establishments are in the low set and only represent 1.9 percent of the employment, while 62 percent of establishments are in the high-productivity set and account for 98.1 percent

44. Tybout (2000); Pagés (2010).

TABLE 9. Distributional Statistics

Statistic	*Productivity set* Low S_L	High S_H
Average productivity	1.1	2.3
Benchmark economy:		
Fraction of establishments (%)	38.5	61.5
Fraction of employment (%)	1.9	98.1
Distorted economy:		
Fraction of establishments (%)	92.7	7.3
Fraction of employment (%)	89.2	10.8

of the employment. This contrasts starkly with the distorted economy, where 93 percent of establishments are in the low-productivity set and represent 89 percent of the employment, while just 7 percent of the establishments are in the high-productivity set and account for 10 percent of the employment. Hence, entry costs and policy distortions together can potentially generate a substantial reduction in measured productivity by inducing significant reallocation and a shift in the distribution of productivity.

Discussion

While the policy experiments considered above are simplified and abstract, they capture the essence of the empirical evidence on the cost of doing business in Latin America and the myriad of policies and institutions that distort firm size, in some cases disproportionally affecting large and productive establishments in Latin America.

There is abundant evidence on the high cost of doing business in Latin America.[45] For instance, table 10 reports data from Djankov and others showing that firms in Latin American countries have a cost of entry ranging between 20 to 300 percent, based on a measure of entry costs (time and goods) as a share of GDP per capita.[46] This cost is less than 2 percent in developed economies.[47] The work of Djankov and others has been extended by the World Bank into a database called Doing Business, which ranks a large number of countries in categories such as the cost of starting a business, dealing with licenses, protecting investors, enforcing contracts, and trade and other restrictions. The data

45. Empirical studies include de Soto (1986) and Djankov and others (2002).
46. Djankov and others (2002).
47. Djankov and others (2002).

TABLE 10. Barriers to Entry in Latin America

Country	Cost
United States	2
Chile	24
Argentina, Colombia	≈35
Brazil	45
Peru, Uruguay, Venezuela	≈53
Mexico	83
Ecuador	91
Bolivia	300

are reported every year.[48] Not surprisingly, Latin American economies rank among the economies with the highest costs of doing business, costs that are much higher than in developed countries such as Canada and the United States. Figure 4 reports the indicators of ease of doing business, cost of starting a business, cost of getting electricity, and the cost of registering property. In all these measures, Latin American economies feature a more difficult environment for firms to start and operate. Broader measures of regulation and its effect on economic performance indicate that Latin America has an overly regulated economy, and many of these restrictions not only impose high costs of operating a business, but also act as a de facto tax on large and productive firms.[49] The regulatory environment is often viewed as an important determinant of informality in Latin America. According to Perry and others, 56 percent of the labor force is informal, with the associated negative implications on the productivity of such activities.[50] Leal studies informality in Mexico using a framework with heterogeneous producers where regulations and taxes rationalize entry into the informal sector; he finds that these regulations and taxes can account for the prevalence of informality in Mexico, with large negative effects on aggregate productivity.[51]

Evidence on measures of idiosyncratic distortions is more sparse, as the data requirements to construct such measures are enormous. Moreover, there is no silver bullet for specific distortions. Hsieh and Klenow have estimated

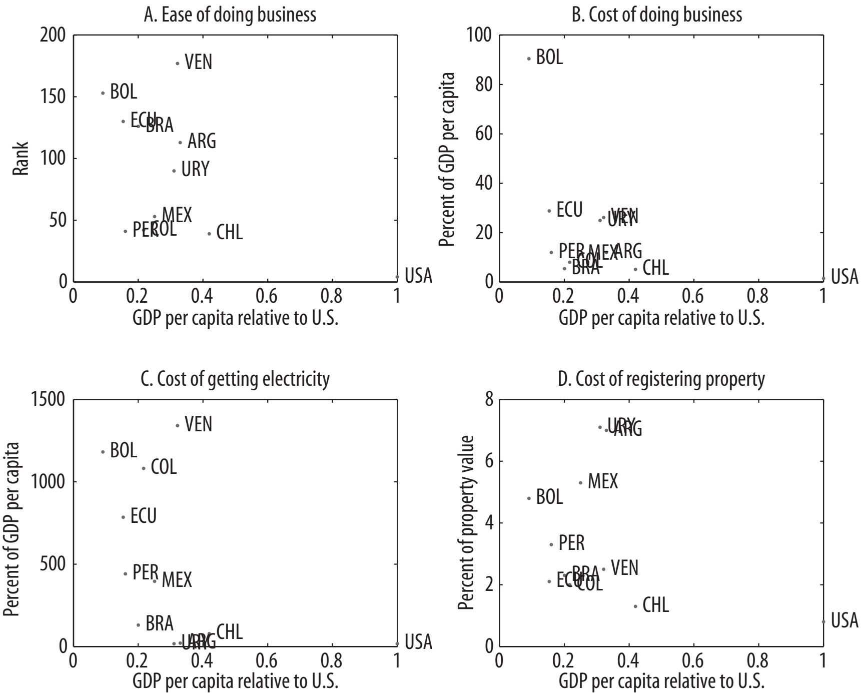
48. See World Bank (2012). For other related measures of the cost of doing business in Latin America, see Fantoni (2007).

49. Loayza, Oviedo, and Servén (2007). Galindo, Schiantarelli, and Weiss (2007) document that in developing countries, financial reforms affect the allocation of investment, leading to higher productivity.

50. Perry and others (2007).

51. Leal (2010).

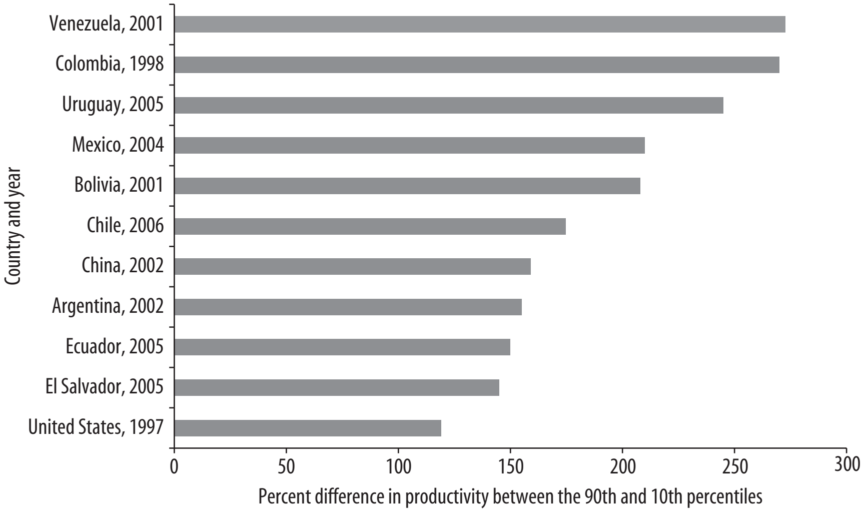
FIGURE 4. Doing Business in Latin America



large productivity losses associated with misallocation in China and India, using a heterogeneous-establishment framework and microeconomic data on establishments in these countries.[52] The distortions are estimated as reduced-form taxes and subsidies on output and capital that create dispersion in revenue productivity across establishments. Dispersion in revenue productivity is indicative of misallocation, as the framework implies that in the absence of distortions establishments act to equalize the marginal products of the factors of production. For China and India, the productivity loss from misallocation (relative to the United States) is on the order of 20 to 60 percent. Moreover, Hsieh and Klenow find that the distribution of establishment productivity is more dispersed, with a substantial shift in the distribution toward very small unproductive establishments. For Latin America, the evidence is even more striking. Pagés summarizes a set of studies that estimate the productivity

52. Hsieh and Klenow (2009).

FIGURE 5. Dispersion in Establishment-Level Revenue Productivity



Source: Bello, Blyde, and Restuccia (2011); Pagés (2010).

loss associated with misallocation using establishment-level data for Latin American economies.[53] These studies uncover important distortions across firms in Latin America, with substantial negative effects on measured productivity. For instance, the dispersion in revenue productivity as a summary measure of distortions is reported to be much larger in Latin America than in the United States. In fact, some countries have larger dispersion in revenue productivity than China or India (see figure 5). Another indirect approach to assessing the empirical relevance of distortions in Latin America is to look at the distribution of establishments in these countries. In the United States, 55 percent of establishments are small (fewer than ten workers), and these establishments account for only about 4 percent of employment. In contrast, in countries such as Argentina, Bolivia, and Mexico, more than 80 percent of establishments are small and account for 22 to 44 percent of employment.[54] This evidence is consistent with the distributional implications of the model with high entry costs and idiosyncratic distortions (see table 9). Latin America also ranks low in the quality of property rights institutions. Weak enforcement

53. Pagés (2010).
54. See Pagés (2010).

of property rights can lead to a form of extortion that would effectively act as an idiosyncratic distortion. Ranasinghe shows that weak property rights institutions can lead to substantial productivity losses associated with misallocation.[55] Understanding the exact policies and institutions that generate such distortions and reallocation is a fundamental objective for future research.[56]

Finally, I have abstracted in my analysis from volatility in economic activity as a deterrent to growth and productivity. As mentioned in the introduction, there is substantial empirical evidence of a negative association between volatility and growth. While I have abstracted from volatility as a specific feature of the environment, high volatility can be a source of misallocation. A number of studies connect specific crisis episodes with misallocation.[57]

Conclusions

This paper makes two main points. First, low GDP per capita in Latin America relative to the United States (what I call the development problem of Latin America) is due to low relative total factor productivity. In other words, the development problem of Latin America is a productivity problem. I calculate that in order to explain a one- to fourfold difference in GDP per worker between Latin America and the United States, only a 1.0 to 1.6 difference in TFP would be needed. The larger difference in labor productivity arises as an amplification of productivity through physical and human capital accumulation. Second, institutions and policy distortions create a misallocation of factors across heterogeneous producers, which can potentially explain the low relative productivity in Latin America. Barriers to formal market entry, regulation, barriers to competition, trade barriers, employment protection, and general policies that discriminate against productive establishments may be at the core of productivity differences between Latin America and the United States. Removing these barriers can lead to an increase in long-run labor productivity in Latin America relative to the United States of a factor of four. This increase in income amounts to seventy years' worth of postwar economic development in the United States.

55. Ranasinghe (2011).

56. There are many ongoing research efforts providing measurement and quantitative assessment of specific policies and institutions; see Restuccia and Rogerson (2013) for a summary of some of this research.

57. For example, Oberfield (2013) explores this issue in the context of the Chilean crisis of 1982.

Appendix: Data Sources and Definitions

The data cover ten Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay, and Venezuela. For most countries, the time series include data from 1950 to 2009. The main source of data is the Conference Board and Groningen Growth Centre.[58]

I use data from Penn World Tables (PWT) version 6.3 to construct annual time series of the ratio of PPP-adjusted investment to GDP.[59] This series covers the period from 1950 to 2009 for all countries. I use the investment rates at international prices to obtain a measure of the ratio of physical capital to output (*K/Y*) at international prices. I proceed as follows: (1) I estimate *K/Y* in 1954 using the average *I/Y* from PWT 1950–54 and the steady-state relationship implied by a standard Solow model, that is,

$$\frac{K}{Y} = \frac{I/Y}{\left(n + g + \delta + ng\right)},$$

where n is the growth rate of population, g is the growth rate of productivity, and δ is the depreciation rate of capital and where I assume $\delta_2 \equiv n + g + ng + \delta = 0.10$; and I use *I/Y* to compute *K/Y* over time using the standard capital accumulation equation,

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

which implies

$$\frac{K_{t+1}}{Y_{t+1}} = \hat{g}_t \times \left[\left(1 - \delta\right)\frac{K_t}{Y_t} + \frac{I_t}{Y_t}\right],$$

where $\hat{g}$ is the gross growth rate of output (growth in output per capita times population growth). The sectoral data are from Duarte and Restuccia; for details see their appendix.[60] Data on years of schooling are from Barro and Lee.[61]

All series are trended using the Hodrick-Prescott filter with a smoothing parameter of $\lambda = 100$ before any ratios are computed.

58. Conference Board and Groningen Growth Centre (2010).
59. Heston, Summers, and Aten (2009).
60. Duarte and Restuccia (2010).
61. Barro and Lee (2010).

Comment

César Calderón: Diego Restuccia's paper addresses one of the key stylized facts of Latin America's development: over the last hundred years, relative income per capita in the region (with respect to the United States) has remained roughly flat. Some practitioners have dubbed this pattern the one hundred years of solitude, as the region has failed to converge to the living standards of higher-income countries.[1] In fact, the relative income per capita of the eight largest Latin American economies relative to the United States has fluctuated around 0.25 and 0.30 since 1900. This behavior is appalling when compared to the notable catch-up engineered by East Asia (which quadrupled over the last 60 years). The paper attributes the region's failure to catch up to institutions and policy distortions—and, more specifically, to policies and regulations that impede market contestability and an efficient reallocation of resources.

Growth Accounting: Measurement Issues

I agree with the author that Latin America's failure to catch up with the United States is likely to be attributed to systemic differences in total factor productivity (TFP). However, there are some measurement issues that the author should have discussed further. Although accounting for all these issues would not have changed his results qualitatively, they are worth mentioning as caveats as they may alter the productivity ranking among countries within the region.

Measuring TFP is not a trivial issue. The TFP component of growth is, by definition, a residual. It is typically computed as the difference between output growth and a weighted average of the growth in the quantity and quality of factors of production. As such, any measurement errors present in the variables used to measure labor and capital are mechanically imputed to TFP. For instance,

1. De la Torre (2011).

failure to account for improvements in the quality composition of capital stocks or the labor force will tend to overestimate the TFP component. Analogously, if the labor and capital actually used in production are considerably lower than their available stocks (or installed capacity), the resulting TFP estimates will be underestimated.[2] The following points should also be taken into account in the discussion.

—*The capital share.* In several papers that conduct growth accounting exercises, the share of capital (α) has been calculated using the labor income share in total income. This share tends to be overestimated, however, because it does not take into account the labor income of the self-employed and other proprietors.[3] This is key in Latin America given the importance of informality.

—*Human capital.* There is a wide discussion on the contribution of human capital (and, more specifically, education) to growth. Pritchett argues that the returns to education may be overstated as a result of low educational quality and perverse incentives created by the institutional and governance environment.[4]

—*Independence between factor accumulation and TFP growth.* This is a crucial underlying assumption in the growth accounting literature, yet it can be invalidated on theoretical grounds. For instance, Klenow and Rodríguez-Clare point out that TFP growth can revive investment projects that were previously not profitable.[5] In addition, technological innovations embodied in capital goods will render a significant relationship between TFP growth and the speed rate of capital accumulation.[6]

Explaining Latin America's Underdevelopment: What the Paper Omits

The paper fails to mention two major factors that may explain the lack of convergence of the Latin America region vis-à-vis advanced countries: namely, the instability of political institutions and macroeconomic instability. These

2. For instance, Loayza, Fajnzylber, and Calderón (2005) add controls for the rate of utilization or employment of capital and labor in the growth accounting analysis for Latin America. They adjust for the degree of utilization of the capital stock by using the rate of labor employment as a proxy. With regard to labor, they deduct from the working-age population the number of inactive and unemployed people and adjust for the number of hours actually worked.
3. Gollin (2002).
4. Pritchett (2001).
5. Klenow and Rodríguez-Clare (1997).
6. Hulten (1992).

two dimensions are important because they create the set of economic incentives that will determine agents' behavior and also condition agents' risk management practices and their ability to take risks in the economy.

With regard to political instability, economic institutions shape economic incentives and set constraints.[7] These institutions are, in turn, determined by the political process—and, hence, by political institutions. In the case of Latin America, the history of the region has been plagued by heightened political instability.[8] Some countries have had repressive, nondemocratic governments, while others have experienced episodes of civil conflict and war, terrorism and drug trafficking, and rampant crime and violence and inequality. All these events have generated a lot of political turmoil, which represents a major barrier to development in the region. As political turmoil increased, economic policy became more volatile and uncertain, leading economic agents to defer saving-investment decisions.

With regard to macroeconomic instability, economists and historians typically describe the dismal performance of Latin America in the 1980s as the Lost Decade. This decade was characterized by macroeconomic mismanagement that resulted in large macroeconomic imbalances, recurrent balance-of-payments crises, and high inflationary episodes. Inflation reached the three-digit level, and in some countries it even hit four digits (for instance, Argentina, Bolivia, Brazil, and Peru). Macroeconomic instability led to a massive outflow of capital. Government officials, in their attempt to control inflation and prevent a massive depreciation of the currency, conducted contractionary monetary and fiscal policies that ended up deepening the recessionary phase of the cycle.

This pervasive high inflation constituted a major barrier to development in the region. Several papers show that high inflation lowers growth, and the effect is transmitted through a reduction in business investment and a decrease in productivity.[9] High inflation shortens the planning horizon of households and entrepreneurs. As inflation erodes the storage value of the domestic currency, it holds back the development of domestic financial intermediaries—for instance, savings dwindle, long-term contract markets disappear, and the economy engages in a process of dollarization.

7. See Acemoglu and Robinson (2012).

8. Easterly (2005) points out that the twelve major Latin American countries had 174 revolutions over 1950–2001.

9. Khan and Senhadji (2001); Andrés and Hernando (1999).

Conclusion

Living standards in Latin America have improved in recent years. Historically, however, we have been unable to catch up with advanced economies. To make matters worse, other dynamic emerging markets have taken off and managed to distance themselves from the region in terms of income per capita. An interpretation of the underdevelopment problem in the region should, to a large extent, rest on the inadequacies of the political process that shaped incentives toward cronyism. The inherent instability of this process led to uncertain and unsustainable policies that ended up generating high inflation, greater economic instability, and, hence, lower long-term growth.

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