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On the Development Gap between Latin America and East Asia:

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Carlos A. MENDEZ-GUERRA*

Abstract

Both long economic stagnation in Latin America and sustained growth and in East Asia imply a rapidly raising development gap between the two regions. Using a series of numerical decompositions, this article documents three facts about this gap. First, differences in welfare-adjusted development are larger than those predicted by per-capita GDP. Second, differences in labor productivity account for most of the differences in both production and welfare-adjusted development. Third, inefficient production is the main factor holding down labor productivity. Furthermore, detailed analysis of the sectorial dynamics suggests that labor misallocation across sectors had been reducing economy-wide efficiency in Latin America. In particular, premature deindustrialization (i.e., workers moving from manufacturing into services) and falling productivity in the service sector had potentially large negative effects on efficiency, productivity, and welfare-adjusted development.

1. Introduction

The contrasting economic performance of Latin America[1] and some fast growing countries in East Asia[2] constitutes one of the most interesting cases in modern development studies. Just after World War II, GDP per capita in Latin America was just under 30 percent relative to that of the United States, while relative GDP per capita in East Asia was just under 20 percent. By 2010, Latin America has not only failed to catch-up, but its relative GDP per capita had fallen to 23 percent.[3] In contrast, relative GDP per capita in East Asia increased to 83 percent. From a welfare perspective, results are mixed. Latin America is lagging behind in life expectancy and inequality, yet it enjoys a larger consumption share and higher leisure per adult. These contrasting experiences in *both production and welfare* motivate what I call the development gap between Latin America and East Asia. How large is this development gap? How can we add up measures of the production and welfare into a more comprehensive measure of development[4]? What explains the evolution of this development gap?

Using aggregate data on production and welfare, I document three facts about the development gap between Latin America and East Asia. First, based on the expected utility framework suggested by

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Jones and Klenow (2011), in 2000, differences in welfare-adjusted development are larger than those predicted by per-capita GDP. Second, although differences in life expectancy and consumption inequality hold down welfare and development in Latin America, labor productivity actually accounts for most of the development gap between the regions. Third, based on the production framework described in Caselli (2005), most of the labor productivity gap steams from a continuous fall in aggregate efficiency in Latin America.

The importance of aggregate efficiency[5] as the main determinant of production has been well documented in the growth and development literature, in particular for a large set of countries at a point in time (Caselli 2005; Hall and Jones 1999; Klenow and Rodriguez-Clare 1997). This article, however, not only emphasizes its importance from a time series perspective, but also evaluates its contribution to a welfare-adjusted measure of development. As expected, the contribution of aggregate efficiency to development (27 percent) is less than that in production (49 percent)[6], yet this contribution is still larger than other factors such as physical capital or human capital.

Given its relatively large contribution, and the recent availability of industry-level and firm-level data, the growth and development literature has focused its attention on a well-known theoretical determinant of aggregate efficiency: resource misallocation (Banarjee and Duflo 2005; Hsieh and Klenow 2011; McMillan and Rodrik 2011; Restuccia and Rogerson 2008; among others). Using industry-level data on employment and value added, I explore the efficiency consequences of intersectorial labor misallocation. First, from an empirical standpoint, I document a strong negative correlation between aggregate efficiency and the variation in intersectorial productivity. Second, from a theoretical standpoint, I adapt the simple two-sector model suggested by Jones (2011) and show that labor misallocation across sectors reduces aggregate efficiency. Finally, in line with the empirical findings of Pages (2010) and McMillan and Rodrik (2011), I argue that both premature de-industrialization (i.e., employment moving from manufacturing into services) and falling productivity in the service sector have deteriorated the overall efficiency of Latin America.

This article builds on a large literature that studies the proximate sources of economic divergence in Latin America from a comparative perspective. This literature (Cole et al. 2005; Daude 2013; Ferreira, Pessoa, and Veloso 2013; among others) typically focuses on the development gap between Latin America and the technological leader of the post-World War II period--the United States. This article, however, focuses on the development gap with respect to some economies of East Asia that were at similar or even lower stages of development in the early 1950s.

In terms of methodology and data this article is closest to Daude and Fernandez-Arias (2010) and Restuccia (2013). Using similar data sources, both studies evaluate the relative the contribution of capital accumulation and aggregate efficiency to per-capita GDP.[7] Restuccia (2013) goes further and proposes a model in which resource misallocation across firms reduces aggregate efficiency. Despite these similarities, my article still differs in other aspects, both methodological and empirical. First, it measures the contribution of capital accumulation[8] and efficiency to a welfare-adjusted measure of development, not only to per-capita GDP. Second, it proposes a model in which labor misallocation across sectors reduces aggregate efficiency. And third, it highlights the time-series perspective[9] of the development gap between Latin America and East Asia.

Among the limitations of the methodological approach of this article (and this particular literature), one deserves attention at the outset. Proximate sources of growth and development such physical capital, human capital, and aggregate efficiency ultimately depend on deep rooted factors such as institutions, culture, history, and geography (Acemoglu et al. 2005; Nunn 2009). Also, trade protectionism, Dutch disease, competitive barriers, and macroeconomic volatility are typically cited as deeper causes of the Latin American underdevelopment. (De Gregorio 2004; Edwards 2009; Elson 2013). The analysis of proximate sources, however, still might prove useful. It not only gives a first pass and a quantitative description of the mechanics of development, but also imposes discipline in our thinking and discussion. Ultimately, any more fundamental source should affect growth and development through one or more the proximate channels emphasized in this article.

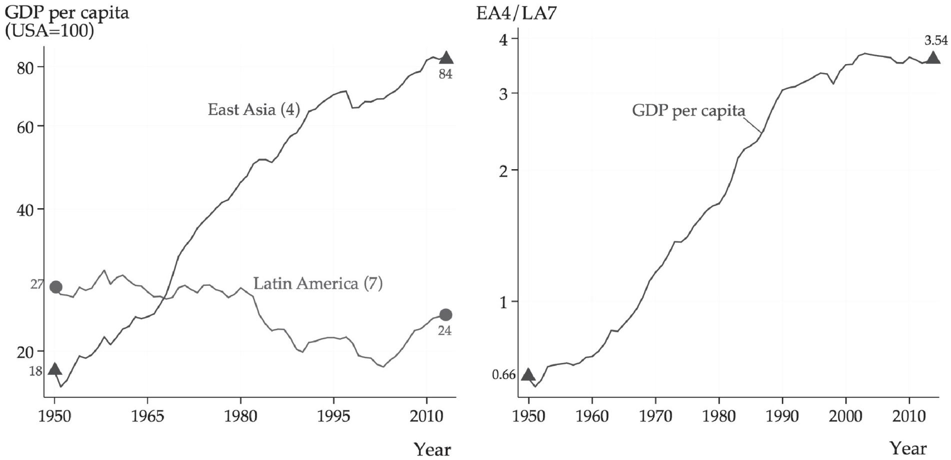
Another caveat has to do with the selection of countries and generalization of findings. The criterion for the selection of countries, in particular for the East Asian sample, was limited by the availability of long-run time series. Although, the four economies in the East Asian sample grew faster and achieved higher levels of development, this is not the case for other countries in the region that still remain underdeveloped.[10] Historically, however, the average performance of these four countries may still provide a useful alternative to the typical benchmark used in the literature--the United States.[11] Regarding the Latin American sample, the selected seven countries may not fully depict the large heterogeneity of the region. Yet, they still represent more than 80 percent of the regional GDP and almost 80 percent of the total population.

The rest of the article is organized as follows. Section 2 first characterizes the development gap between Latin America and East Asia in terms of welfare and production differences, then it evaluates their the contribution. Section 3 further decomposes differences in production into differences in labor productivity, employment-to-population ratio, and annual worked hours. Section 4 uses a neoclassical production function to evaluate the relative contribution of capital accumulation and aggregate efficiency as proximate determinants of labor productivity. Section 5 discusses one of the main sources of aggregate efficiency: labor misallocation across sectors. Finally, Section 6 offers some concluding remarks.

2. The Development Gap: Production and Welfare

Lucas (1988) famously points that differences in production across countries imply staggering consequences for human welfare. After the World War II, GDP per capita in East Asia rapidly converged to the levels of advanced economies, while Latin America first remained stagnated and then diverged (Figure 1). Following Lucas's observation, these convergence and divergence experiences suggest not only an increasing production gap, but also a welfare gap between the two regions. This large gap in production per capita and its welfare consequences constitute what I call the development gap between Latin America and East Asia.

Figure 1 The Production Gap, 1960–2013



Note: East Asia (EA4) is composed by: Hong Kong, Japan, South Korea, and Singapore. Latin America (LA7) is composed by: Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. Both figures are in log scale. Regional values are unweighted geometric averages.
Source: Author's calculations using data from the Conference Board (2013).

When evaluating a set of standard welfare indicators, the overall welfare gap between the two regions is not immediately clear, at least quantitatively. Table 1 shows that, on the one hand, welfare in East Asia tend to be higher due to its higher life expectance and lower inequality. On the other, welfare in Latin America could be higher due to its higher consumption share and leisure time. Adding these differences, and having and overall picture is not a straightforward task, since all these indicators are qualitatively different.[12]

In an attempt to add up and compare different measures of welfare, Jones and Klenow (2011) use an expected utility framework. They constructed and aggregate welfare statistic which includes differences in life expectancy, consumption share in GDP, leisure per adult, and consumption inequality. An attractive feature of their methodology is that each welfare component is measured in consumption-equivalent units, and therefore, quantitative comparability and additivity seems reasonable. Also, one can use this overall welfare measure to evaluate differences in welfare-adjusted development and then compare such differences with those predicted by GDP per capita.[13]

Table 2 presents the results of the decomposition of the development gap into its production and welfare components following Jones and Klenow (2011)'s methdology. The most important finding is

Table 1 Production and Welfare Indicators, 2000

	GDP per capita	Life Expectancy	Consumption Share in GDP	Leisure per adult	Consumption Inequality
Brazil	21.80	70.40	0.86	0.79	52.10
Chile	37.40	76.90	0.65	0.79	49.60
Colombia	17.00	71.10	0.86	0.76	50.50
Mexico	25.90	74.00	0.75	0.78	50.90
Peru	12.90	69.30	0.79	0.77	44.00
Venezuela	27.40	73.30	0.54	0.79	47.70
Hong Kong	82.10	80.90	0.71	0.76	41.70
Japan	72.40	81.10	0.66	0.81	28.50
Singapore	82.90	78.10	0.43	0.74	37.90
South Korea	47.10	75.90	0.58	0.75	31.50
Latin America	22.42	72.46	0.73	0.78	49.06
East Asia	69.41	78.97	0.58	0.76	34.51
EA/LA	3.10	1.09	0.80	0.98	0.70

Note: GDP per capita is measured relative to that in the United State (USA = 100). C/GDP includes both private and government consumption. Leisure is measured as 1 − (annual hours worked per worker/(16 365))x(employment/adult population). Inequality is measured in terms of the consumption Gini coefficient. Regional averages are unweighted geometric averages.
Source: Jones and Klenow (2011)

Table 2 The Development Gap: Welfare and Production in 2000

Countries	Log DEV (wa)	Life Exp.	C/GDP	Leisure per adult	Inequality	Log GDPpc
Brazil	2.49	−0.38	0.12	−0.03	−0.3	3.08
Chile	3.19	−0.01	−0.16	−0.02	−0.24	3.62
Colombia	2.24	−0.33	0.12	−0.12	−0.26	2.83
Mexico	2.75	−0.17	−0.02	−0.05	−0.27	3.25
Peru	1.96	−0.42	0.04	−0.08	−0.13	2.56
Venezuela	2.54	−0.21	−0.35	−0.01	−0.2	3.31
Hong Kong	4.36	0.23	−0.06	−0.12	−0.1	4.41
Japan	4.48	0.25	−0.15	0.03	0.07	4.28
Singapore	3.67	0.06	−0.58	−0.19	−0.04	4.42
South Korea	3.37	−0.07	−0.27	−0.18	0.04	3.85
Latin America	2.53	−0.25	−0.04	−0.05	−0.23	3.11
East Asia	3.97	0.12	−0.27	−0.12	−0.01	4.24
EA/LA	1.57					1.36

Note: Regional averages are unweighted arithmetic averages. DEV (wa) refers to welfare-adjusted development. Inequality refers to consumption inequality. GDPpc refers to per-capita GDP.
Source: Jones and Klenow (2011)

that this gap is actually larger than that predicted by GDP per-capita. The log of the development gap is 1.57 whereas the log of the production gap is 1.36. The main driving forces behind these differences are also tractable. Higher inequality and lower life expectancy have large negative effects in Latin America. While lower consumption and leisure in East Asia are partially compensated by a longer life expectancy.

Though the qualitative aspects of the Jones and Klenow (2011) decomposition are already observable in the standard welfare indicators of Table 1, their quantitative approach may help us evaluate the contribution of labor productivity, capital accumulation and aggregate efficiency beyond their production scope. For instance, Section 4 quantifies what fraction of the welfare-adjusted development gap is explained by the efficiency with which the economies use their resources.

To summarize the results of this section, in 2000, differences in welfare-adjusted development between East Asia and Latin America (4.22)[14] were larger than those implied by per-capita GDP (3.10). However, the GDP gap is still the main determinant of the welfare-adjusted development gap, since it explains 78 percent (log 3.10/log 4.22) of its variation. Given this large contribution, what factors account for differences in per-capita GDP between the regions?

3. Decomposing Production

To further understand the evolution of GDP per capita we can decompose it into tree components: labor productivity, employment-to-population ratio, and worked hours. Following Restuccia (2013), production per capita for an economy at any time can be written as:

$$\frac{Y}{Pop}=\frac{Y}{nE}\times\frac{E}{Pop}\times n, \tag{1}$$

where Y/Pop is GDP per capita, n is the average annual worked hours, E/Pop is the employment-to-population ratio, and Y/nE is labor productivity (GDP per labor hour). Then taking two economies i and j, and dividing their GDP per capita we can rewrite the previous decomposition in ratio form:

$$\frac{(Y/Pop)_i}{(Y/Pop)_j}=\frac{(Y/nE)_i}{(Y/nE)_j}\times\frac{(E/Pop)_i}{(E/Pop)_j}\times\frac{(n)_i}{(n)_j} \tag{2}$$

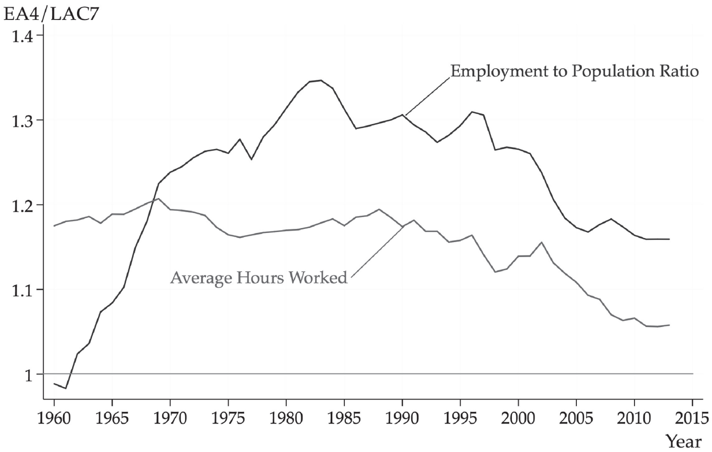
The interpretation of Equation (2) is intuitive. The per-capita GDP gap between economy i and j is the product of their gaps in labor productivity, employment, and worked hours. Results from Figure 1 indicate that the per-capita GDP gap between East Asia (economy i) and Latin America (economy j) increased from 0.75 in 1960 to 3.62 in 2010.[15] Which factors from the above decomposition would mostly account for this increase? To answer this question I compute and discuss the evolution of each factor in turn.

Hours Gap

The main finding regarding gap in worked hours is that due to its decline over time, differences in hours cannot explain the gap in per-capita GDP. Figure 2 documents that since late 1980s there has been convergence in worked hours.[16] In 1988, the average worker in East Asia worked 18 percent more hours than the average worker in Latin America. By 2010, however, the average worker in East Asia only worked 6 percent more.

Over time, with the exception of Argentina, economies in both regions declined their number of hours worked, however Latin America experienced a much slower decline.[17] Note that during the whole 1960–2010 period, East Asian workers have worked more hours than their Latin American counterparts. Yet, by 2010 worked hours only accounted for 5 percent of gap in per-capita GDP between the regions. Given these results, most of the per-capita GDP differences must be explained by employment and labor productivity differences.

Figure 2 Worked-Hours Gap and Employment-to-Population Gap, 1960–2013



Note: East Asia (EA4) is composed by: Hong Kong, Japan, South Korea, and Singapore. Latin America (LA7) is composed by: Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. Regional values are unweighted geometric averages.
Source: Author's calculations using data from the Conference Board (2013).

Employment-to-Population Gap

The main finding regarding the employment to population ratio is that despite its initial divergence, the following convergence episode significantly reduced its contribution to the gap in per-capita GDP. Figure 2 documents the inverted-U pattern in employment.[18] In 1960, both regions had almost the same employment to population ratio. Since 1962, however, employment grew faster in East Asia, and by 1983 it was 30 percent higher relative to that in Latin America. After its lost decade (1980s), employment in Latin America started recovering, and by 2010 employment in East Asia was 15 percent larger.

As in worked hours, an implication of the previous convergence episode is that it reduces the explanatory power of employment. For instance, in 1983, differences in employment explained 39 percent of their per-capita GDP gap. By 2010, however, it explained only 12 percent. As a result, given these findings, differences in labor productivity must explain most of the current differences in per-capita GDP.

Figure 3 Labor Productivity Gap, 1960–2013

Note: East Asia (EA4) is composed by: Hong Kong, Japan, South Korea, and Singapore. Latin America (LA7) is composed by: Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. Regional values are unweighted geometric averages.
Source: Author's calculations using data from the Conference Board (2013).

Labor Productivity Gap

The main findings regarding labor productivity point to both the continuous divergence in Latin America and its large contribution to per-capita GDP. Figure 3 documents that first East Asia caught up with the productivity of Latin America in 1976, and then left it far behind. By 2010, labor productivity in East Asia was almost three times larger (See Table 3) than its Latin American counterpart. In this process, note that it was not only fast convergence of East Asia, but also fast divergence of Latin America what drove the evolution of the productivity gap. For instance, in 1960 labor productivity relative to that in the United States was 8 percent in South Korea and 71 percent in Venezuela. By 2010, productivity in the former increased to 44 percent and in the latter decreased to 22 percent. Table 3 reports that these type of convergence-and-divergence patterns still hold for the regional averages during the 1960–2010 period, though they are less severe.

Overall, the gap in labor productivity mirrors the behavior of the gap in per-capita GDP (See Figure 3). It also explains most of the differences in per-capita GDP between the regions. By 2010, labor productivity differences explained 83 percent of the per-capita GDP differences between East Asia and Latin America.

Table 3 Relative GDP per hour, 1960–2010

Countries	1960	1970	1980	1990	2000	2010
Argentina	37.30	40.11	41.17	28.94	30.49	21.69
Brazil	16.86	17.54	24.01	17.99	17.41	16.22
Chile	25.05	26.13	24.98	20.64	25.27	26.75
Colombia	19.62	19.06	20.91	19.85	16.37	15.19
Mexico	37.84	42.50	41.56	30.78	26.65	23.88
Peru	27.41	30.53	28.74	15.94	13.32	15.48
Venezuela	71.17	68.30	48.21	34.19	27.24	21.93
Hong Kong	31.94	25.63	38.15	52.24	51.52	60.27
Japan	23.50	43.40	56.74	67.37	66.88	65.32
Singapore	22.39	31.96	42.51	51.88	61.16	62.62
South Korea	8.48	10.77	14.78	24.55	34.44	44.43
Latin America	30.18	31.54	31.34	23.16	21.50	19.72
East Asia	19.43	24.87	34.15	46.01	51.90	57.53
EA/LA	0.64	0.79	1.09	1.99	2.41	2.92

Note: Regional values are unweighted geometric averages. Country values are expressed relative to those in the United States (USA = 100).
Source: Authors calculations using data from the Conference Board (2013).

To briefly summarize the results of this section, the per-capita GDP gap between East Asia and Latin America in 1960 can be accounted for as follows:

$$\underbrace{\frac{(Y/Pop)_{EA}}{(Y/Pop)_{LA}}}_{0.75}=\underbrace{\frac{(Y/nE)_{EA}}{(Y/nE)_{LA}}}_{0.64}\times\underbrace{\frac{(E/Pop)_{EA}}{(E/Pop)_{LA}}}_{0.99}\times\underbrace{\frac{(n)_{EA}}{(n)_{LA}}}_{1.18},$$

and in 2010:

$$\underbrace{\frac{(Y/Pop)_{EA}}{(Y/Pop)_{LA}}}_{3.62}=\underbrace{\frac{(Y/nE)_{EA}}{(Y/nE)_{LA}}}_{2.92}\times\underbrace{\frac{(E/Pop)_{EA}}{(E/Pop)_{LA}}}_{1.16}\times\underbrace{\frac{(n)_{EA}}{(n)_{LA}}}_{1.07}.$$

Finally, the decomposition for the year 2000 is also particularly useful for extending the results of the decomposition implemented in Section 2. Since differences in per-capita GDP accounts for 78 percent of development gap, and labor productivity accounts for 71 percent of the per-capita GDP, then by composition, labor productivity could potentially account for 55 percent of the development gap. Give its large contribution, what factors account for differences in labor productivity?

4. Decomposing Labor Productivity

Labor productivity is determined by the inputs that workers have at their disposal (i.e., physical and human capital) and the way in which they use those inputs (i.e., efficiency). Following Caselli (2005), labor productivity for an economy at any point in time can be written as:

$$\frac{Y}{nE}=A\times\left(\frac{K}{nE}\right)^{\alpha}\times h^{1-\alpha} \tag{3}$$

where Y/nE is labor productivity, K is the aggregate stock of physical capital, nE is the employed labor force, h is a measure of human capita per worker, A is the level of aggregate efficiency[19] and α is a technological parameter (typically[20] set to 1/3)

While data on physical capital can be constructed from the investment series of GDP[21], data on human capital requires further elaboration. Motivated by the extensive micro literature on the returns of schooling, Hall and Jones (1999) suggest the following production function for human capital:

$$h=n\times E\times e^{\phi(s)}, \tag{4}$$

$$\phi(s)=\begin{cases} 0.134s & \text{if } s\leq 4 \\ 0.134(4)+0.101(s-4) & \text{if } 5\leq s\leq 8 \\ 0.134(4)+0.101(4)+0.068(s-8) & \text{if } s>8 \end{cases} \tag{5}$$

where s is the average years of schooling of the workforce and $\phi(s)$ is a piecewise linear function in which the coefficients represent world averages of the returns to schooling for different levels of education.[22] Given the previous economic framework, let us consider two economies i and j. We can divide their GDP per worker and rewrite Equation (3) as:

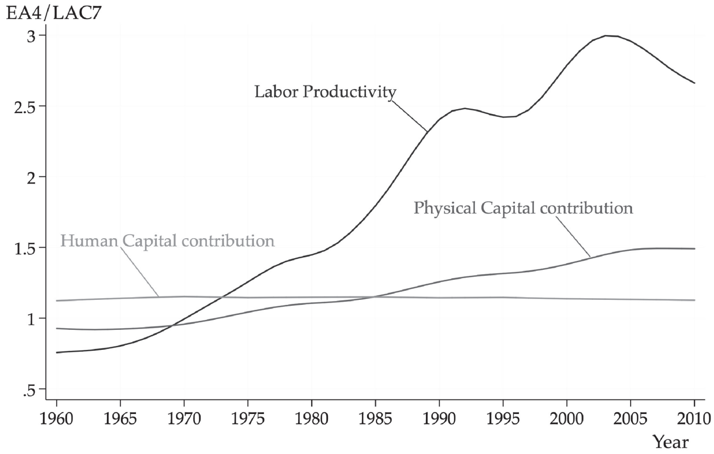
$$\frac{(Y/nE)_i}{(Y/nE)_j}=\frac{A_i}{A_j}\times\left(\frac{(K/nE)_i}{(K/nE)_j}\right)^{1/3}\times\left(\frac{h_i}{h_j}\right)^{2/3} \tag{6}$$

The interpretation of Equation (6) is intuitive. The gap in labor productivity between economy i and j is the product of their gaps in aggregate efficiency, physical capital, and human capital. Results from Table 3 indicate that the gap in labor productivity between East Asia (economy i) and Latin America (economy j) increased from 0.64 in 1960 to 2.92 in 2010. Which factors from the above decomposition would mostly account for this increase? To answer this question I compute the contribution of each factor and discuss its evolution in turn.

Physical Capital Gap

Over time the gap in physical capital gap increases monotonically (See Figure 4). In 2010, this gap had a quantitatively large effect (37 percent) on the labor productivity gap. This effect, however, becomes relatively small once the endogeneity of physical capital to aggregate efficiency is taken into account (See Restuccia 2013 for details). Note that in 1973 both regions had similar capital stocks per worker. Thereafter, it grew much faster in East Asia, and as a result, by 2010 the average worker in East Asia had 40 percent more physical capital at his disposal than his Latin American counterpart.

Figure 4 Physical and Human Capital Gap, 1960–2010



Note: East Asia (EA4) is composed by: Hong Kong, Japan, South Korea, and Singapore. Latin America (LA7) is composed by: Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. Regional values are unweighted geometric averages.

Source: Author's calculations using data from the Conference Board (2013) and Fernandez-Arias (2014).

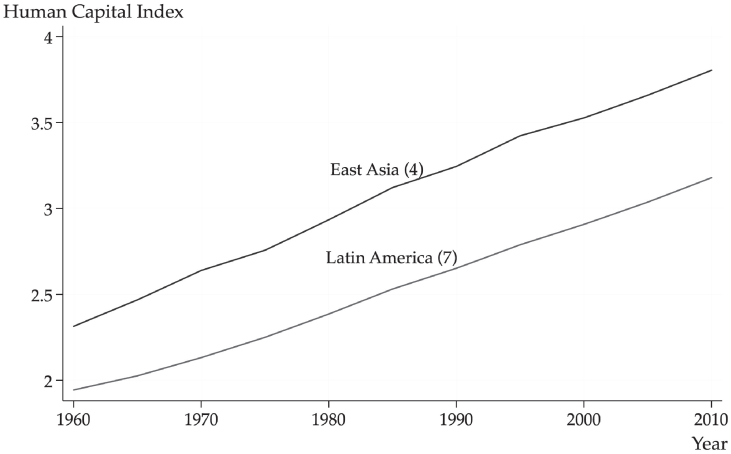
Human Capital Gap

Over time there has been considerable progress in human capital accumulation, both in East Asia and Latin America (See Figure 5). Since both regions have been accumulating human capital at a fairly similar speed, the initial gap remains stable. For instance, in 1960 human capital was 12 percent higher in East Asia. Since then this gap fluctuated between 12 and 15 percent, in 2010 human capital was 12 still percent higher in East Asia. As a result, Figure 5 documents this gap as a horizontal line. In terms of its contribution to productivity, human capital explains only 11 percent of the labor productivity gap.[23]

Aggregate Efficiency Gap

Figure 6 documents that the efficiency divergence between the regions started in the early 1970s. Similar to the labor productivity gap, the post–1980 evolution of aggregate efficiency not only reflects an acceleration of efficiency growth in East Asia, but also lower efficiency in Latin America. As a result, in 2010, aggregate efficiency in East Asia was 55 percent larger relative to that in Latin America. In terms of its effect on the labor productivity gap, in 2010 differences in aggregate efficiency explained 52 percent of the differences in labor productivity.

Figure 5 Human Capital, 1960–2010



Note: East Asia (EA4) is composed by: Hong Kong, Japan, South Korea, and Singapore. Latin America (LA7) is composed by: Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. Regional values are unweighted geometric averages.

Source: Author's calculations using data from the Conference Board (1993) and Fernandez-Arias (2014).

To briefly summarize the results of this section, the gap in labor productivity between East Asia and Latin America in 1960 can be accounted for as follows:

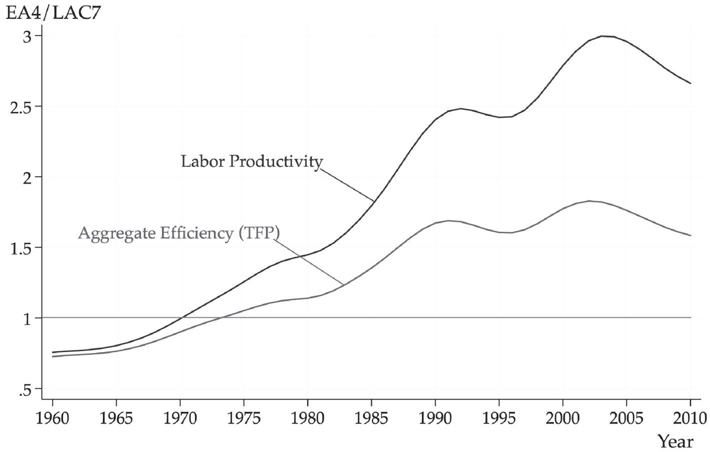
$$\underbrace{\frac{(Y/L)_{EA}}{(Y/L)_{LA}}}_{0.64}=\underbrace{\frac{(A_{EA})}{(A_{LA})}}_{0.62}\times\underbrace{\left(\frac{(K/L)_{EA}}{(K/L)_{LA}}\right)^{1/3}}_{0.93}\times\underbrace{\left(\frac{h_{EA}}{h_{LA}}\right)^{2/3}}_{1.12}$$

and in 2010:

$$\underbrace{\frac{(Y/L)_{EA}}{(Y/L)_{LA}}}_{2.92}=\underbrace{\frac{(A_{EA})}{(A_{LA})}}_{1.74}\times\underbrace{\left(\frac{(K/L)_{EA}}{(K/L)_{LA}}\right)^{1/3}}_{1.49}\times\underbrace{\left(\frac{h_{EA}}{h_{LA}}\right)^{2/3}}_{1.13}$$

Finally, the last paragraph of the previous section points out that labor productivity in the year 2000 could potentially account for 55 percent of the welfare-adjusted development gap between East Asia and Latin America. Adding the results of the current section, aggregate efficiency could potentially account for 27 percent of the welfare-adjusted development gap. Given this relatively large contribution (compared to physical and human capital), what factors can explain the differences in aggregate efficiency?

Figure 6 Aggregate Efficiency Gap, 1960–2010



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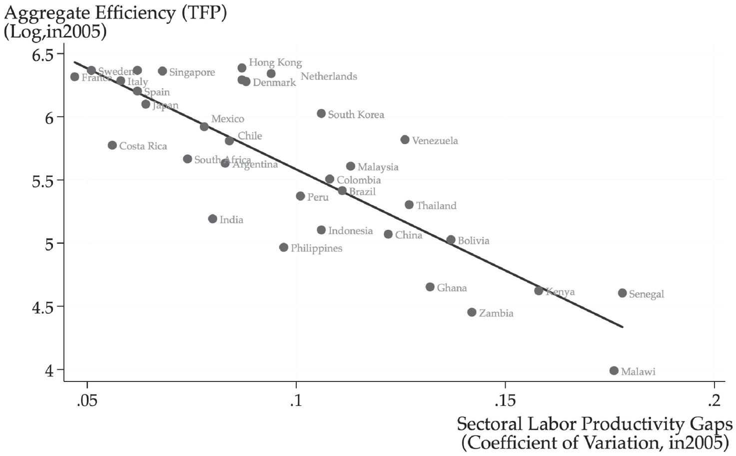
Source: Author's calculations using data from the Conference Board (2013) and Fernandez-Arias (2014).

5. Exploring Aggregate Efficiency

The literature on economic growth and development typically emphasizes two main determinants of aggregate efficiency: technological progress and resource misallocation. On the one hand, an economy-wide efficiency increases when there are new production methods (e.g., new blueprints, new production processes, new organizational structures, new management techniques). On the other, efficiency gains occur when there are improvements in the allocation of resources (e.g., capital, labor, and technologies) across production units (e.g., when resources move from less productive units to more productive ones). The distinction between technological progress and resource misallocation matters because the policy implications of each factor could be totally different.

This section explores the role of resource misallocation on aggregate efficiency. The motivation comes from the fact that developing countries are characterized by a large variety of allocation problems, which arise from both government and market failures. Latin America, in particular, shows a history of protectionist policies and recurrent crises that may have drastically altered the allocation of resources.

Figure 7 Aggregate Efficiency and Sectorial Productivity Gaps, 2005



Source: Author's calculations using data from the Conference Board (2013), Fernandez-Arias (2014), and McMillan and Rodrik (2011).

To introduce the discussion the negative effects of resource misallocation on aggregate efficiency, Figure 7 documents the strong negative relation between these variables. Here, large variation in average labor productivity across sectors could potentially reflect differences in marginal productivities,[24] which ultimately provide prima face evidence for labor misallocation.[25] Though this correlation could prove useful as a starting point, we need a model (and further evidence) to clarify the mechanisms by which sectorial productivity gaps affect aggregate efficiency.

Based on the simple misallocation model suggested by Jones (2011), consider an economy composed by two sectors (manufacturing and services):

$$\text{Production in Sector 1}: X_{man}=2L_{man}, \quad (7)$$

$$\text{Production in Sector 2}: X_{serv}=L_{serv}, \quad (8)$$

$$\text{Resource Constraint}: \overline{L}=L_{man}+L_{serv}, \quad (9)$$

$$\text{GDP (Aggregation)}: Y=X_{man}^{0.8}X_{serv}^{0.2}. \quad (10)$$

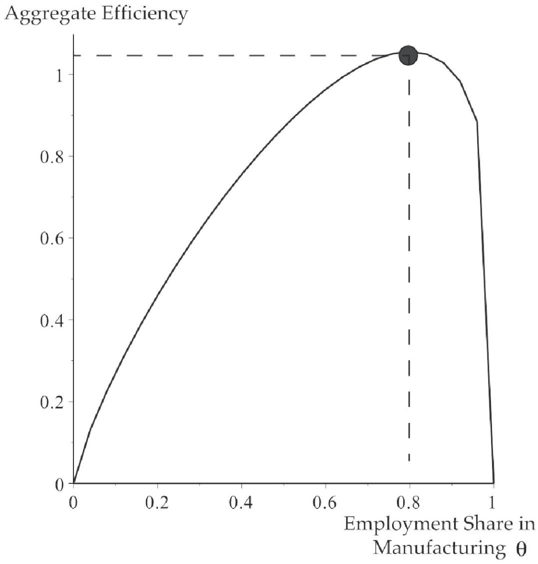
The only difference between them is their labor productivity. In particular, assume that labor productivity in manufacturing is two times the productivity of services. Then, define the employment share allocated to manufacturing as $\theta=L_{man}/\overline{L}$, where $\overline{L}$ is the total labor force and L_{man} is the number of employed workers in manufacturing. Note that θ could be either an outcome of competitive free markets or government planning. Given the resource constraint (Equation 9) and the aggregation of output across sectors (Equation 10), total GDP in this economy is

$$Y=A(\theta)\overline{L}, \quad (11)$$

and the equilibrium aggregate efficiency, $A(\theta)$, is only determined by allocation of workers across sectors:

$$A(\theta) = (2\theta)^{0.8}(1-\theta)^{0.2}. \tag{12}$$

Figure 8 Sectorial Misallocation Reduces Aggregate Efficiency

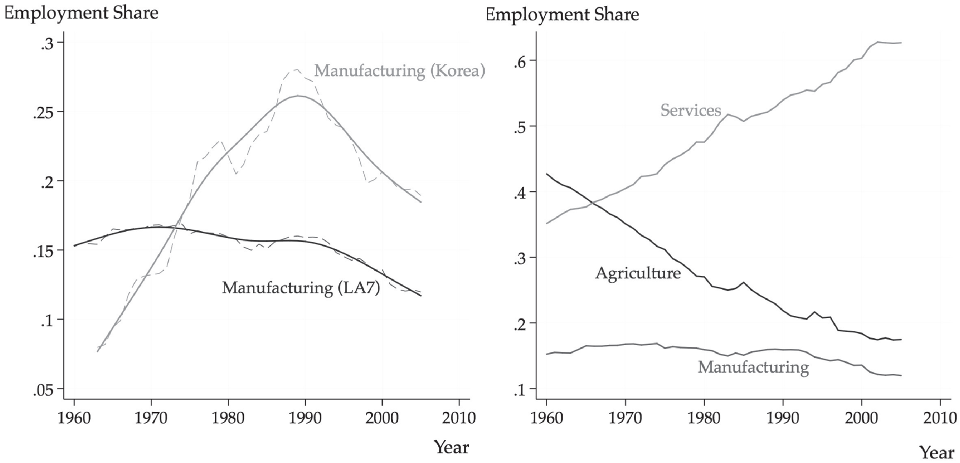


Source: Author's calculations

Figure 8 shows the nonlinear behavior of Equation (12). Aggregate efficiency attains its maximum value, 1.06, when 80 percent of the labor force works in manufacturing and 20 in services. But if 80 percent were employed in services, aggregate efficiency would fall to 0.46. From Figure 8 it is clear that--given the relatively low productivity of services--increasing its employment share would reduce aggregate efficiency. In other words, reallocating workers from relatively high-productivity sectors into relatively low-productivity sectors reduces overall efficiency.

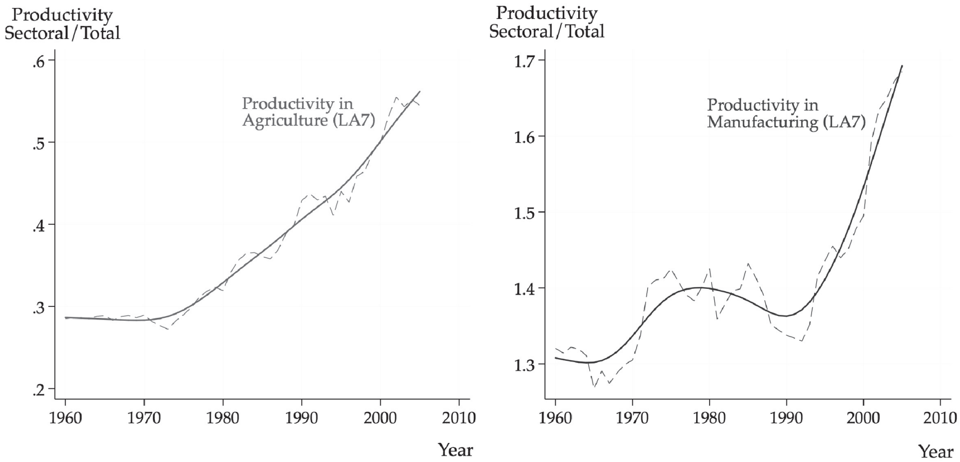
The main prediction of the above model describes fairly well the industrial dynamics of Latin America in the post-World War II period. Figure 9 shows the continuous raise of the employment share in the service sector. Relative to the economy-wide level, however, productivity in the service sector had been rapidly falling (See Figure 11). As a result, this large reallocation of labor to relative low productivity sectors should reduce the overall efficiency of the region.

Figure 9 Premature Deindustrialization and the Raise of Services, 1960–2005



Source: Author's calculations using data from McMillan and Rodrik (2011).

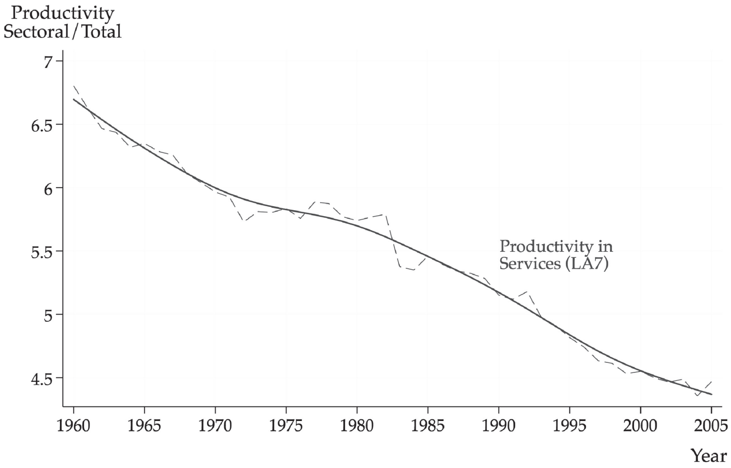
Figure 10 Raising Productivity in Agriculture and Manufacturing, 1960–2005



Source: Author's calculations using data from McMillan and Rodrik (2011).

Figures 9, 10 and 11 describe the structural transformation patterns of Latin America and how this process deteriorated aggregate efficiency in the region. Three patterns require particular attention. First, contrasting the typical structural transformation process exhibited by South Korea (and other fast growing and developed economies), the region transitioned into a service economy without a consolidated industrial base.[26] Second, although labor productivity had been raising in both agriculture and manufacturing (Figure 10), by 2010 these sectors employed less than one third of the labor force. Third, between 1960 and 2005, the employment share in the service sector increased by 80 percent,[27] yet productivity in this sector decreased by 35 percent.

Figure 11 Falling Productivity in Services, 1960–2005



Source: Author's calculations using data from McMillan and Rodrik (2011).

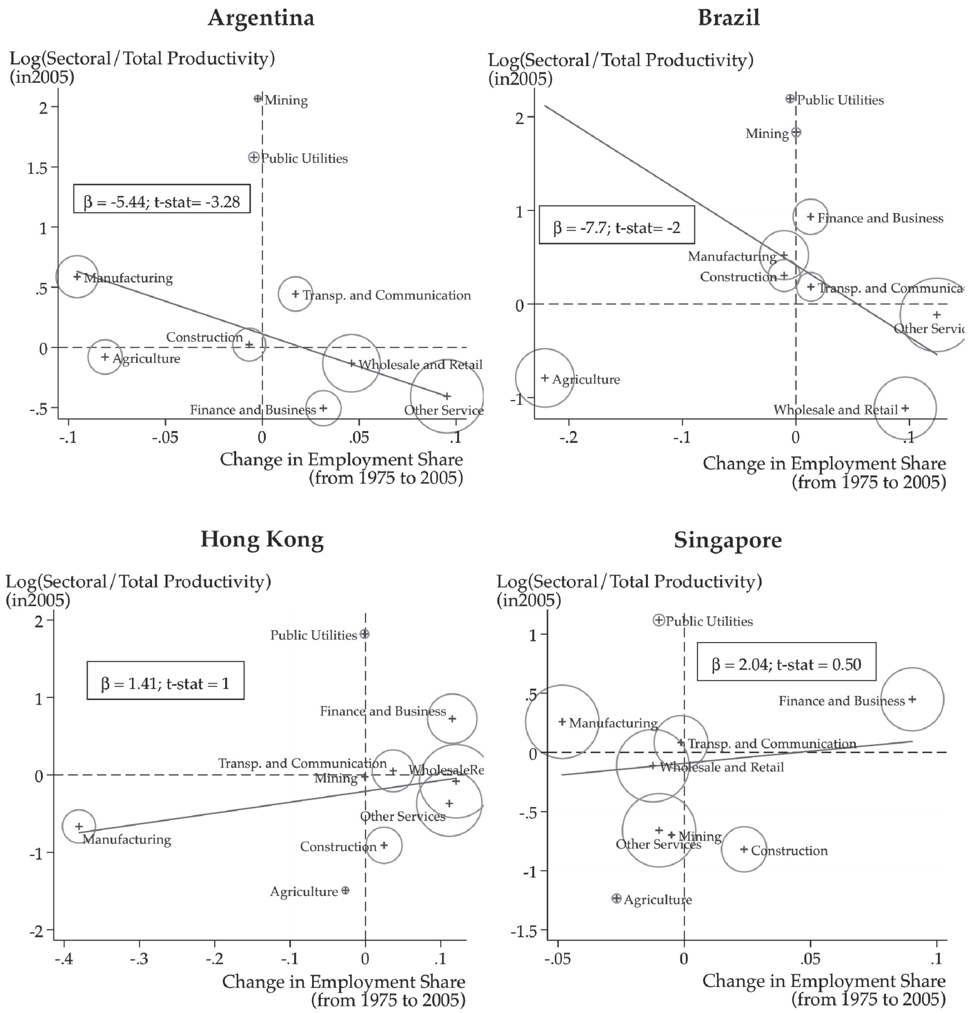
Following McMillan and Rodrik (2011), Figure 12 provides a more detailed sectorial view that summarizes two contrasting patterns of structural transformation.[28] Similar to Latin America, most of the labor force of Hong Kong and Singapore transitioned to the service sector, in particular wholesale and retail. Yet, Latin American productivity in these sectors is considerably lower; arguably due to the abundance of very small and low productivity firms, which are typically associated with the informal sector (Pages 2010). Although productivity in business and financial services is relative high in Brazil, its employment absorption is much smaller compared with Hong Kong and especially with Singapore. Over time, poorly educated and rural workers from Latin America kept gravitating to sectors in which the scale of production is minuscule (e.g., informal retail trade), mostly non-tradable (e.g., community and personal services), and hardly standardizable.

Although a comprehensive discussion of the factors and policies driving the patterns of Figures 9–12 goes beyond the scope of this article, the regression results of McMillan and Rodrik (2011) are a good starting point. Using a sample of developing countries from Latin America, Asia, and Africa, the authors show that there is a strong (consistently significant) negative association between growth-enhancing structural and the reliance on exports of primary products. They also show that both currency overvaluation (a symptone of Dutch disease[29]) and employment market rigidities are associated with the movement of labor[30] towards relatively less productive activities.

In the context of Latin America, increasing concentration exports in primary products, historical prevalence of overvalued currencies,[31] and rigid labor markets are well documented features of the region (See Bertola and Ocampo, 2012; Edwards, 2010; Franko, 2007; and the references therein). Detailed quantitative evaluations of policy efforts in these and other related areas, however, are less studied. In this context of scarcity, the works of Lora (1997, 2001, 2012) are noticeable contributions.

In these studies, the author evaluates the progress in the structural reforms that were implemented in Latin America during the 1985–2010 period. It stands out that among the five areas of structural reform (trade policy, financial policy, privatizations, tax policy, and labor regulation), there has been the least progress in policy initiatives dealing with the flexibility of labor markets. This result is consistent across most countries in the region and over the last three decades.

Figure 12 Patterns of Structural Change, 1975–2005



Note: Size of the circle represent employment share in 2005. Since movements from agriculture initiate the process of structural change, the fitted line excludes agriculture from the regression.

Source: Author's calculations using data from McMillan and Rodrik (2011)

6. Concluding Remarks

Rapid growth and convergence in East Asia and stagnation and divergence in Latin America imply a rapidly raising development gap between the two regions. In fact, this gap is larger than that predicted by differences in per-capita GDP. Higher inequality and lower life expectancy have large negative effects in Latin America.

Despite large differences in welfare and production, the latter still accounts for most of the variation of the welfare-adjusted development index suggested by Jones and Klenow (2011). Further analysis suggests that labor productivity is the main force driving the production gap between the regions. Although physical and human capital per worker is relatively low in Latin America, the lack of investment is not the main productivity problem. Inefficient production is the main factor holding down labor productivity.

A more detailed view of the sectorial dynamics suggests that labor misallocation across sectors had been reducing economy-wide efficiency in Latin America. In particular, premature de-industrialization (i.e., workers moving from manufacturing into services) and falling productivity in the service sector had potentially large negative effects on efficiency, labor productivity, and welfare-adjusted development. Over time, workers kept gravitating to sectors and firms in which the scale of production is minuscule, mostly non-tradable, and hardly standardizable.

Looking ahead, Latin America still faces three policy challenges. First, the region should gradually diversify its export base away from primary commodities. Progress in this domain not only creates new and more productive jobs, but also reduces both pressures toward the overvaluation of local currencies and the prevalence of Dutch-disease concerns. Second, the region should flexibilize its labor markets. Progress in this domain generates incentives for the creation of larger and more productive firms. Third, when implemented, industrial policy should be pragmatic and experimental. It should be guided by careful diagnostics and identification of public and private constraints.

Endnotes

1 Economies in this sample include: Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela.

2 Economies in this sample include: Hong Kong, Japan, Singapore, and South Korea.

3 In this article, all GDP measures are expressed in purchasing power parity (PPP) terms. Also, regional measures are un-weighted geometric averages, unless otherwise specified.

4 The development index used in this paper is based on the expected utility framework proposed by Jones and Klenow (2011). This approach differs from the United Nations' Human Development Index, not only from a theoretical perspective (a.i., aggregation method), but also in the type of social indicators that are used to construct the index.

5 Also known in the growth literature as total factor productivity (TFP) or Solow Residual.

6 Welfare-adjusted decompositions are only available for the year 2000. Production decompositions, however, are

implemented for the periods 1960–2013 and 1960–2010.

7 Both studies, however, focalize its analysis on the development gap between Latin America and the United States.

8 When decomposing the contribution of physical capital, Restuccia (2013) uses the capital-output ratio instead of the more intuitive capital-labor ratio. This adjustment aims to control for the endogeneity of physical capital to improvements in aggregate efficiency. This paper follows the production decomposition suggested by Caselli (2005), and thus it uses the capital-labor ratio.

9 Daude and Fenandez-Arias (2010) also emphasize the trend of aggregate efficiency of Latin America relative to that of East Asia. However, they leave aside the evolution of physical capital and human capital.

10 Also, the growth literature normally reports specific groups and subgroups originated from the East Asian Miracle. They include Japan, the "Four Tigers" (South Korea, Hong Kong, Singapore, Taiwan), and the high performing NIES (Indonesia, Malaysia, Thailand). Those eight economies together are typically known as the High Performing Asian Economics (HPAE).

11 Recall that these four countries had similar or even lower levels of per-capita GDP than Latin America at the beginning of the period of analysis (1950s).

12 For instance, it is not clear whether differences in life expectancy and leisure time should have the same weight on welfare. Yet, aggregate development indicators such as the United Nations' human development mechanically add up differences in health and education and give them equal weights.

13 Jones and Klenow (2011) find that differences in per-capita GDP are highly correlated with differences in their overall measure of welfare. The correlation coefficient is 0.95 for a sample of 134 countries in the year 2000.

14 To obtain the gap in adjusted-welfare development, first compute the antilog of the regional averages of Table 2, and then take the ratio $((\exp(3.97)/\exp(2.53)) = 4.22)$. Use the similar procedure to compute the production gap.

15 For this and the following two sections, the main time period of analysis is from 1960 to 2010.

16 Note that this convergence pattern of hours contrasts sharply the divergence pattern of GDP per capita (Figure 1). As a result, we can expect that differences in hours explain relatively little of the GDP gap.

17 Both regions, however, still work more hours relative to the United States. For example, in 2010 the average worker in Latin America worked 18 percent more hours than the average worker in the United States. Similarly, the average worker in East Asia worked 24 percent more hours. As noted in Section 2 working more hours affects negatively the suggested welfare measure. Ideally, an economy could both increase its welfare and production by reducing working hours and increasing labor productivity.

18 This gap is after controlling for the effect of population.

19 In the literature, aggregate efficiency is typically know as total factor productivity (TFP). For the purposes of this article, and to emphasize the distinction (and minimize any source of confusion) between labor productivity (Y/L) and total factor productivity (A).

20 See Caselli (2005), Bernanke and Gurkaynak (2001), and Gollin (2002) for a discussion on the robustness of this value.

21 See Caselli (2005) or Hall and Jones (1999) for a detailed description of this procedure.

22 Note the diminishing returns property of the accumulation of human capital.

23 It is important to note that this measure abstracts from differences in the quality of human capital, which are likely to play a large role given the large regional differences in the results of the PISA tests.

24 Recall, for instance, that in a Cobb-Douglas production function the marginal product of labor is proportional to its average product. If the proportionality factor, the elasticity of output with respect to labor, is relative stable across sectors, then differences in average average products reflect differences in marginal products.

25 The recent literature on economic growth and development interprets the differences in marginal products across productive units as prima face evidence for resource misallocation. See, for instance, Banerjee and Duflo (2005) and Restuccia and Rogerson (2008).

26 In addition, since the early 1990s, there has been an acceleration deindustrialization process of the region.

27 From 35 to 63 percentage points.

28 The contrasting patterns of structural change between Latin America and East Asia were originally documented in the seminal work of McMillan and Rodrik (2011). Although similar in nature, Figure 12 describes these patterns using a longer sample period (1975–2005), different countries (Hong Kong and Singapore), and a different regression to fit the line (employment weights are those of the end of the period). Altogether, these results point to the robustness of the previously documented structural change patterns. In Latin America workers moved from relatively high-productivity sectors to low-productivity sectors, whereas in the East Asian sample the opposite holds true.

29 I thank an anonymous referee for pointing out this symptom.

30 Note that labor movement towards and within the informal sector are still possible (and even more likely) when there are rigidities in the formal labor market. In a highly regulated labor market, new and existing firms have more incentives to initiate operations in the informal sector. As a result, entrants to the labor market (e.g., high school and college graduates) have more changes to end up in low productivity firms.

31 Overvaluation of currencies in Latin America reflected one of the negative outcomes of the import substitution industrialization (ISI) policies that were implemented in the region during the 1950–1970 period. More recently, however, noticeable progress has been made due to a better monetary policy framework and more flexible exchange regimes.

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Appendix

Welfare-Adjusted Development: A Brief Summary

Fist, let us define the development gap, $\tilde{\psi}$, between country i and a benchmark country *us* (e.g., the United States) as the sum of their production gap, $\tilde{y}$, and welfare gap λ . In log terms this means:

$$\underbrace{\log\tilde{\psi}_i(e, c, \ell, \sigma, \tilde{y})}_{\text{Development Gap}} = \underbrace{\log \tilde{y}_i}_{\text{Production Gap}} + \underbrace{\log \lambda_i(e, c, \ell, \sigma)}_{\text{Welfare Gap}}, \qquad (1)$$

where e is average life expectancy, c is average consumption per capita, ℓ is average leisure per adult, and σ is the standard deviation of consumption within a country. To add up different welfare measures into one welfare-adjusted development index, Jones and Klenow (2011) suggest the following adjustment:

$$\begin{aligned} \log\frac{\lambda_i}{\tilde{y}_i} = \frac{e_i - e_{us}}{e_{us}}\left(\bar{u} + \log c_i + \nu(\ell_i) - \frac{1}{2}\sigma_i^2\right) & \qquad \text{Life Expectancy} \\ + \log c_i / y_i - \log c_{us} / y_{us} & \qquad \text{Consumption Share} \\ + \nu(\ell_i) - \nu(\ell_{us}) & \qquad \text{Leisure} \qquad (2) \\ + \frac{1}{2}(\sigma_i^2 - \sigma_{us}^2). & \qquad \text{Inequality.} \end{aligned}$$

After computing this expression for a sample of 134 countries in the year 2000, Jones and Klenow (2011) find that differences in per-capita GDP are highly correlated with differences in welfare-adjusted development--the correlation coefficient is 0.95.