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Productivity and Resource Misallocation in Latin America

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Abstract[*]

Total factor productivity (TFP) in Latin America has not increased relative to the US since the mid-1970s, and in many countries it has declined. Resource misallocation can lower aggregate TFP. This paper presents evidence based on firm-level data from 10 Latin American countries to quantify the heterogeneity of firm productivity and the degree of resource misallocation within countries. Productivity heterogeneity and resource misallocation are found to be much larger than in the United States. Achieving an efficient allocation of resources could boost manufacturing TFP between 45 percent and 127 percent depending on the countries and years considered.

JEL classifications: D24, O47, L25, O54

Keywords: Total factor productivity, Firm productivity, Firm heterogeneity, Distortions, Misallocation costs, Latin America

[*] The views expressed here are those of the authors and do not necessarily reflect the opinions of the Inter-American Development Bank. Corresponding author: Matías Busso (mbusso@iadb.org).

1. Introduction

The gap between Latin America and the developed world has widened dramatically in the last 50 years. In 1955, GDP per capita in Latin America relative to the US was 28 percent. In 2005, it was 19 percent. Growth accounting exercises indicate that the main reason behind this divergence has been the low productivity growth experienced by Latin American economies since the mid-1970s (Hopenhayn and Neumeyer, 2004; Restuccia, 2008; Daude and Fernández-Arias, 2010).

Aggregate productivity gains are usually thought to be driven mostly by upgrades in the processes, products or machinery used by firms, affected in turn by investments in human capital and R&D. In that context, low TFP growth is usually caused by barriers that prevent diffusion and implementation of new technologies (Parente and Prescott, 2002). However, recent studies such as Banerjee and Duflo (2005), Restuccia and Rogerson (2008) and Hsieh and Klenow (2009a) propose an alternative explanation. Low aggregate TFP growth can be also explained by a number of policy and market failures that determine the selection of firms in the market as well as the allocation of resources across firms. In the presence of distortions, productive firms are smaller than they would be in an undistorted economy, therefore lowering aggregate TFP.

In this paper we use micro-data from manufacturing firms in 10 Latin American countries to measure the extent by which misallocation of resources can explain differences in productivity between Latin America and the United States. We show that firms' productivity in Latin America is very heterogeneous, even within narrowly defined sectors, with a few very productive firms and many firms of extremely low productivity. We follow the Hsieh and Klenow (2009b) framework to quantify the potential gains in TFP of reallocating resources across firms in Latin American countries. We find that reallocating capital and labor to equalize marginal products in manufacturing would raise aggregate TFP in Latin America between 45 and 127 percent, depending on the countries and years considered.

The results presented in this paper are obtained from the analysis of establishment-level data produced by countries' statistical offices. Unfortunately, only a subsample of countries in Latin America collects establishment-level data and, of those, even a smaller number make data available to researchers. We are, however, able to use data for 10 Latin American countries:

Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, El Salvador, Mexico, Uruguay and Venezuela.[1]

Data coverage varies across countries but, in general, data are drawn from censuses of the largest, formally established firms, with a random sample of smaller firms. The datasets are representative at the national level and span a period of nearly 10 years. In most cases, coverage is restricted to the manufacturing sector, although in Mexico and Uruguay data coverage extends beyond manufacturing to other economic sectors. Most of the analysis is restricted to firms of 10 or more employees. When it is available, however, information is also provided on how measurements change when the smallest firms are added.

2. Firm Productivity and Distortions

Economy-wide productivity growth is typically estimated as the portion of GDP growth that cannot be explained by either the accumulation of physical and human capital or the growth of employment. This unexplained part reflects how well countries are able to extract more output out of a given set of inputs. In recent years, however, a number of new studies are beginning to look beyond aggregated figures to better understand what drives aggregate productivity (Barstelman, Haltiwanger, and Scarpetta, 2004; Eslava et al., 2004; Foster, Haltiwanger and Syverson, 2008; and Syverson, 2004 and 2008). With a few exceptions, this work has been mostly confined to developed economies.

We measure productivity heterogeneity and distortions across firms in a set of developing economies in Latin America, following the methodology developed by Hsieh and Klenow (2009b). In this section we briefly outline their model. Consider a standard model of monopolistic competition with heterogeneous firms that face distortions in the prices they observe. These distortions drive wedges between the marginal products of capital and labor across firms, lowering aggregate TFP.

There is a single final good produced by a representative firm out of a set of goods *Ys* in a perfectly competitive final output market with a Cobb-Douglas production technology:

[1] The computations in each country were made by the following teams: for Argentina, A. Neumeyer and G. Sandleris; for Bolivia, C.G. Machicado and J.C. Birbuet; or Brazil, C. Ferraz; for Chile, M. Busso, L. Madrigal, and C. Pagés; for Colombia, by A. Camacho and E. Conover; for Ecuador, C. Arellano; for El Salvador, J.P. Atal, M. Busso and C. Cisneros; for Mexico, C. Hsieh, P. Klenow and P. Martínez; for Uruguay, C. Casacuberta and N. Gandelman; and for Venezuela, L. Kolovitch. In all cases the computations were done using a common program which is available from the authors upon request.

$$Y = \prod_{s=1}^{S} Y_s^{\theta_s}$$

with constant returns to scale (so $\sum \theta_s = 1$). In turn, each sector output Y_s is produced by combining M differentiated goods Y_{si} produced by individual firms using a CES technology

$$Y_s = \left[\sum_{i=1}^{M} Y_{si}^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma-1}{\sigma}}$$

Each good Y_{si} is produced with a Cobb-Douglas technology with capital share α_s and productivity A_{si}

$$Y_{si} = A_{si} K_{si}^{\alpha_s} L_{si}^{1-\alpha_s}$$

where Y_{si}, L_{si}, K_{si}, denote output, labor services and capital services. The parameter α_s is the capital share, which is assumed to be constant for all firms within a given industry. As the elasticity of substitution between plant value-added σ increases, intermediate inputs become closer to perfect substitutes. At the limit, only the highest-productivity good is produced. The elasticity of substitution is assumed to be the same for all industries.

Individual firm profits are given by:

$$\pi_{si} = (1-\tau_{Ysi}) P_{si} Y_{si} - w L_{si} - (1+\tau_{Ksi}) R K_{si}$$

where w, and R denote wages and the rental cost of capital, respectively. There exist two types of distortions in this economy that affect the decisions of the firms. Output distortions τ_{Ysi} distort the output price observed by the firm. These distortions affect both capital and labor. Examples of these are high transportation costs, bribes/costs that have to be paid in order to operate or government-issued size restrictions. In turn, capital distortions τ_{Ksi} change the marginal product of capital relative to labor. Examples of these are credit constraints and labor market regulations that due to different credit histories or evasion patterns differ across firms. In the presence of distortions the marginal revenue products are given by:

$$MRPK_{si} = R\frac{1+\tau_{Ksi}}{1-\tau_{Ysi}} \quad ; \quad MRPL_{si} = w\frac{1}{1-\tau_{Ysi}}$$

At this point, it is important to distinguish between physical total factor productivity ($TFPQ_{si}$), measured by A_{si}, and total factor revenue productivity ($TFPRsi$), measured by $P_{si}A_{si}$.. It can be shown that:

$$TFPR_{si} \propto \left(MRPK_{si}\right)^{\alpha_s}\left(MRPL_{si}\right)^{1-\alpha_s} \propto \left(\frac{R}{\alpha_s}\right)^{\alpha_s}\left(\frac{1}{1-\alpha_s}\right)^{1-\alpha_s}\frac{\left(1+\tau_{Ksi}\right)^{\alpha_s}}{1-\tau_{Ysi}}$$

In an economy with no distortions, more inputs should be allocated to firms with the highest productivity, A_{si} until $TPPR_{si}$ is equated across firms within a sector. In such an economy, there should be no dispersion in the distribution of *TFPR*. Departures from this benchmark determine the magnitude of distortions, which are then measured through the dispersion of *TFPR*.

It is then possible to relate aggregate *TFP* to firms' productivities and firm-level distortions. Industry *TFP* can be expressed as a weighted geometric average of firms A_{si}. Firms with *TFPR* smaller than the sector average, that is firms that use more inputs than they would in an undistorted economy, receive a higher weight. Given the assumed aggregate production function, aggregate *TFP* can be expressed as:

$$TFP = \prod_{s=1}^{S}\left[TFP_s\right]^{\theta_s} = \prod_{s=1}^{S}\left(\sum_{i=1}^{M_s}\left\{A_{si}\frac{\overline{TFPR_s}}{TFPR_{si}}\right\}^{\sigma-1}\right)^{\frac{\theta_s}{\sigma-1}}$$

In the absence of distortions, aggregate *TFP* will be higher because resources are reallocated from less to more productive firms. There will, however, be some dispersion in the distribution of firms' productivities. The efficient *TFP* becomes a geometric average of A_{si}

$$TFP^* = \prod_{s=1}^{S}\left[TFP_s\right]^{\theta_s} = \prod_{s=1}^{S}\left[\overline{A}_s\right]^{\theta_s} = \prod_{s=1}^{S}\left(\sum_{i=1}^{M_s}A_{si}^{\sigma-1}\right)^{\frac{\theta_s}{\sigma-1}}$$

TFP^* can then be used as a benchmark to compute the output cost of deviations from the efficient allocation of resources.[2] In particular, the gap between the efficient and the actual level of total factor productivity can be shown to be:

2

$$\overline{TFPR}_s = \left[\frac{R}{\alpha_S}\sum_{i=1}^{M_s}\left(\frac{1+\tau_{Ksi}}{1-\tau_{Ysi}}\right)\cdot\left(\frac{P_{si}Y_{si}}{P_sY_s}\right)\right]^{\alpha_s}\left[\frac{1}{1-\alpha_S}\sum_{i=1}^{M_s}\left(\frac{1}{1-\tau_{Ysi}}\right)\left(\frac{P_{si}Y_{si}}{P_sY_s}\right)\right]^{1-\alpha_s}$$

$$\frac{TFP}{TFP^*}=\prod_{s=1}^{S}\left(\sum_{i=1}^{M_s}\left\{\frac{A_{si}}{\overline{A}_s}\frac{\overline{TFPR}_s}{TFPR_{si}}\right\}^{\sigma-1}\right)^{\frac{\theta_s}{\sigma-1}}$$

Most establishment-level surveys do not record individual, plant or product level prices. Assuming the model set forth, however, allows estimating physical productivity by means of the following expression which can be observed in the data.

$$A_{si}=\frac{Y_{si}}{K_{si}^{\alpha_s}(wL_{si})^{1-\alpha_s}}=\frac{(P_{si}Y_{si})^{\frac{\sigma}{\sigma-1}}}{K_{si}^{\alpha_s}(wL_{si})^{1-\alpha_s}}$$

This result is derived from the fact that product demand is given by $P_{si}=Y_{si}^{-1/\sigma}$. In addition, since workers' human capital levels are not observable, the plant wage bill is used instead of labor input as a way of adjusting for differences in human capital across plants. Finally, α_s is measured as one minus the labor share in industry s in the United States.[3] This is a simple way to control for distortions that could affect the capital share differently in different countries while the United States is taken as a benchmark of an undistorted economy. The elasticity of substitution σ is taken to be equal to three across sectors and countries. In the Appendix, we assess the robustness of the main results to alternative hypothesis about these parameters.

3. Main Results

Table 1 shows three measures of dispersion of the distribution of $\log(A_{si}/\overline{A}_s)$: the difference between the 90th and the 10th percentile, the inter-quartile range and the standard deviation.[4] In the calculations, sectors are defined at the 4-digit level of disaggregation in the International Standard Industrial Classification (ISIC). This permits comparison of firms that produce similar goods.

First note that, while all countries experience some degree of productivity inequality, the dispersion appears to be greater in Latin America than in the United States. In Colombia and Venezuela, firms in the 90th percentile of productivity are more than 500 percent more

[3] As reported by the Manufacturing Industry Database hosted by the NBER.
[4] In the analysis we trim the lowest 1 percent and top 1 percent of the distribution of TFPQ.

productive than firms in the 10th percentile, while in the rest of the countries this difference is on the order of 300 percent, and in the United States the difference is 200 percent. However, because data coverage varies across countries and dispersion measures are sensitive to the sample used, direct comparison between results could be misleading. In the United States, data cover all establishments of one or more employees; in China, establishments with sales above six hundred thousand dollars per year; and in Latin America, establishments with 10 employees or more. The bottom panel shows results for all Latin American manufacturing establishments, for those countries where such figures are available (Mexico and El Salvador) and they also suggest more dispersion in productivity in Latin America than in the United States.

Table 1. Dispersion of TFPQ (A_{si}):
Percentile Differences and Standard Deviation (s.d.)

	90-10		75-25		s.d	
Period	Initial	Final	Initial	Final	Initial	Final
Sample 10 or more workers						
Colombia (1982-1998)	4.55	5.51	2.52	2.58	1.77	2.14
Venezuela (1995-2001)	4.42	5.08	2.29	2.68	1.71	1.91
El Salvador (2005)	n.a.	3.09	n.a.	1.54	n.a.	1.30
Chile (1996-2006)	2.65	2.92	1.32	1.50	1.06	1.17
Uruguay (1997-2005)	2.56	3.01	1.47	1.66	1.00	1.20
Bolivia (1988-2001)	3.26	2.94	1.57	1.71	1.25	1.20
Ecuador (1995-2005)	2.78	2.86	1.48	1.47	1.10	1.11
Argentina (1997-2002)	1.82	2.46	1.00	1.31	0.71	0.94
Mexico (1999-2004)	3.60	3.33	2.05	1.73	1.41	1.30
Sample 30 or more workers						
Brazil (2000-2005)	3.18	3.10	0.71	0.74	1.37	1.32
El Salvador (2004)	n.a.	2.70	n.a.	1.42	n.a.	1.12
Mexico (1999-2004)	3.48	3.17	1.84	1.72	1.35	1.23
Chile (1996-2006)	2.60	2.80	1.27	1.45	1.03	1.12
Sample: All workers						
Mexico (1999-2004)	4.45	3.89	2.42	2.08	1.73	1.66
El Salvador (2004)	n.a.	2.88	n.a.	1.49	n.a.	1.15
China (1998-2005)	2.72	2.44	1.41	1.28	1.06	0.95
US (1977-1997)	2.22	2.18	1.22	1.17	0.85	0.84

This large dispersion implies that, within fairly narrowly defined industries, certain firms are able to produce much more output than others from the same amount of inputs. This disparity may be due to extreme variations in the processes and technologies used by firms to produce and compete in the same industry, or it could be related to differences in the human capital or managerial skill of the managers/owners of firms. Appendix Table A1 shows that differences in productivity within narrowly defined industries appear to be much higher in non-manufacturing sectors. While such data are available only for Mexico and Uruguay, in both countries differences in productivity across firms are much higher in the service sector, particularly in communication and transportation in Uruguay, and in retail in Mexico.

Using the first-order conditions and assuming that value added does not include any taxes or subsidies that differentially affect firms within the same industry, we can compute a measure of the distortions faced by firms:

$$1+\tau_{Ksi} = \frac{\alpha_s}{1-\alpha_s}\frac{wL_{si}}{RK_{si}} \quad ; \quad 1+\tau_{Ysi} = \frac{\sigma}{\sigma-1}\frac{wL_{si}}{(1-\alpha_s)P_{si}Y_{si}}$$

Table 2 shows the dispersion of the distribution of $\log(TFPR_{si}/\overline{TFPR_s})$, $\log(\tau_{Ksi}/\overline{\tau_{Ks}})$ and $\log(\tau_{Ysi}/\overline{\tau_{Ys}})$ measured as the difference between the 90th and the 10th percentiles.[5] In an efficient allocation, marginal returns are equated across firms and therefore the dispersion of marginal returns and thus of TFPR would be zero. Higher dispersion suggests more misallocation of resources across plants as a result of heterogeneous policy treatment of firms in the same sector. Clearly, according to this metric Latin America suffers from a substantial degree of misallocation. Dispersion in TFPR is lower in the United States, indicating a lower level of misallocation in this country. Within Latin America, dispersion is higher in Venezuela, Colombia, Uruguay, and Mexico, all with differences between high and low marginal products within sectors above 200 percent. Therefore, high levels of dispersion highlight potential gains in productivity that could be achieved by reallocating factors from firms with low marginal revenues to those with high marginal revenues.[6]

It is worthwhile noting that there exists a higher dispersion in τ_{Ks} than in τ_{Ys} suggesting there are more distortions in input than in product markets. Despite being higher, input markets

[5] In the Appendix we provide other dispersion methods for the distributions of the three variables. Also, we trim the top 1 percent and the bottom 1 percent of the distribution of TFPR. See Appendix Tables A2, A3, and A4.

[6] Again, care should be taken in comparing countries with different data coverage. In this case, comparisons for Mexico and El Salvador, including and excluding the smallest firms, suggest that including these firms may increase or reduce the estimated degree of misallocation. In Mexico, for example, the dispersion in marginal revenues is 227 percent when all firms are included and only 208 percent for firms of 10 or more employees. In contrast, in El Salvador, dispersion is 135 percent for all firms and 138 percent for firms of 10 or more employees.

distortions were reduced in all countries except in Chile between the initial and the final period. On the other hand, scale distortions increased everywhere except in Mexico and Bolivia.

Table 2. Dispersion of Distortions (TFPRsi, τ_{Ysi} and τ_{Ksi}):

Percentile Difference p90-p10

	TFPR		$1+\tau_K$		$1-\tau_Y$	
Period	Initial	Final	Initial	Final	Initial	Final
Sample 10 or more workers						
Venezuela (1995-2001)	2.60	3.28	3.60	3.17	2.04	2.77
Colombia (1982-1998)	2.50	2.90	n.a.	n.a.	0.94	1.41
Uruguay (1997-2005)	2.12	2.47	3.24	3.16	1.00	1.48
Mexico (1999-2004)	2.33	2.08	3.50	3.25	2.33	2.18
Bolivia (1988-2001)	2.16	2.06	2.65	2.22	1.70	1.53
Chile (1996-2006)	1.57	1.77	2.93	3.23	1.37	1.55
Argentina (1997-2002)	1.04	1.56	2.02	1.43	1.11	2.20
Ecuador (1995-2005)	1.49	1.48	2.81	2.64	1.29	1.34
El Salvador (2005)	n.a.	1.39	n.a.	3.31	n.a.	1.30
Sample 30 or more workers						
Brazil (2000-2005)	1.97	2.10	2.89	3.19	1.91	1.98
El Salvador (2004)	n.a.	1.33		2.58	n.a.	1.21
Mexico (1999-2004)	2.26	2.04	3.57	3.16	n.a.	n.a.
Chile (1996-2006)	1.55	1.73	2.69	2.96	1.40	1.56
Sample: All workers						
El Salvador (2004)	n.a.	1.35	n.a.	4.11	n.a.	1.29
Mexico (2004)	2.57	2.27	3.31	3.22	2.68	2.38
China (1998-2005)	1.87	1.59	n.a.	n.a.	n.a.	n.a.
US (1977-1997)	1.04	1.19	n.a.	n.a.	n.a.	n.a.

The large dispersion in both physical productivity and distortions suggests that resources are not efficiently allocated. We next quantify how costly misallocation is for aggregate productivity in Latin America. To do so, we compute how much output an economy loses by allocating the resources inefficiently. In particular, the cost of misallocation is defined as

$$C = \left[\left(\frac{TFP^*}{TFP} \right) - 1 \right] \times 100 .$$

Table 3 shows the results. It turns out that by reallocating existing capital and labor across firms, aggregate productivity in Latin America could increase output between 45 and 127 percent depending on the countries, years or samples considered. For most countries the gains would be around 50-60 percent, with the exception of Mexico, where TFP and GDP per capita could approximately double if misallocation were to be corrected. These gains consider reallocation only *within* four-digit industries. There could be further sizable gains from reallocating labor and capital *across* industries.

Table 3. TFP Gains from Equalizing TFPR within Industries

Period	**Initial**	**Final**
Sample 10 or more workers		
Venezuela (1995-2001)	55.2	64.7
Bolivia (1988-2001)	52.5	60.6
Uruguay (1997-2005)	61.8	60.2
Argentina (1997-2002)	52.2	60.0
Ecuador (1995-2005)	52.7	57.6
El Salvador (2005)	n.a.	60.6
Chile (1996-2006)	45.0	53.8
Colombia (1982-1998)	48.9	50.5
Sample 30 or more workers		
Brazil (2000-2005)	49.1	41.4
El Salvador (2004)	n.a.	55.1
Mexico (1999-2004)	140.1	109.5
Chile (1996-2006)	47.5	53.7
Sample: All workers		
Mexico (2004)	127.0	95.0
China (1998-2005)	110.5	86.6
El Salvador (2004)	n.a.	56.7
US (1977-1997)	36.1	42.9

Only El Salvador and Mexico have data that cover all firms, which are comparable to the United States. However, the figures for these countries suggest that the potential gains of reallocation are larger than in the United States, or, alternatively, that both countries suffer from more resource misallocation than the United States. Taking the latest figures, improving the allocation of resources across firms could increase total factor productivity by 95 percent in Mexico and 56.7 percent in El Salvador, thus helping to close productivity gaps relative to the United States by a substantial amount. To put these numbers in perspective it is useful to recall that the typical Latin American country's TFP is on the order of 55 percent that of the United

States, yet Duarte and Restuccia (2010) estimate that across countries, productivity gaps are lower in manufacturing than across other sectors or in aggregate TFP. This implies that gains derived from improving the allocation of resources could go a long way towards closing manufacturing TFP gaps. Moreover, the gains in TFP brought about by an improvement in the allocation of resources are likely to motivate an increase in the investment rate, as higher productivity is associated with higher returns of capital and labor.

Appendix Table A5 shows that resource allocation problems appear to be much larger outside manufacturing, particularly in the service sector. In Uruguay, the potential gains of reducing misallocation are higher in retail and in the transport and communication sector than potential gains in manufacturing. In Mexico, the differential in gains across industries is even larger. While in manufacturing they are on the order of 95 percent, in retail they are 267 percent and, in the personal and community service sector, 246 percent. De Vries (2009) analyzes the retail sector of Brazil and finds that the potential gains of reallocating resources towards the most efficient retailers and finds that they are very large, on the order of 257 percent, enough to move the productivity of the service sector in Brazil to levels close to those in the United States. These large gains underscore that a good part of the extremely low productivity in services lies not only in the low productivity of firms, but also in the poor way resources are allocated across them.

Duarte and Restuccia (2010) point to the lower degree of competition in the service sectors in relation to manufacturing as one potential reason why across countries there is more convergence to the world frontier in manufacturing than in the service sector. Services are generally non-tradable and often heavily protected by a myriad of regulations; moreover, variables like location play a much more important role in services than in manufacturing. Extensive misallocation is a symptom of lack of fair competition for resources, as policies, market failures, or location advantages favor some firms relative to others for reasons other than their relative efficiency Given the growing importance of the service sector in all economies and the more rapid growth in productivity of the service sector in the developed world, failure to improve allocation in this sector could contribute to enlarging the gap in aggregate productivity relative to higher income countries.

4. Firm Size, Distortions and Productivity

We have argued that in economies where workers and capital are poorly allocated across firms, improving the allocation of resources could provide a boost to productivity comparable to decades of technological growth. However, making gains effective requires finding out the sources of misallocation.

In a well-functioning economy, firms that are more productive than their competitors should win market share over time, hiring more labor and capital and expanding their production. This implies that firm size (measured either by value added, employment, or assets) should be strongly positively correlated with firm productivity.[7] Nonetheless, firms do not grow indefinitely because in order to sell more, they would need to cut prices to a point where they would make lower profits. The relationship between firm size and productivity breaks down or becomes weaker if market or government failures favor some firms over others, allowing some firms to gain market share (size) even if they are less productive, or preventing some firms from gaining market share even if they are highly productive. This distorts the allocation of resources across firms, reducing the output that can be attained with existing capital and labor. In this section we investigate the relation between productivity, distortions and firm size in order to further understand what is behind the misallocation of resources in Latin America.

We start by establishing the presence of a positive relationship between productivity and firm size. In table 4 we present simple OLS regressions of $\log(A_{si}/\overline{A}_s)$ on firm size dummies.[8] Compared to manufacturing firms employing 10–19 workers, manufacturing firms in the 20–49 range are about 50 percent more productive. Productivity more than doubles in firms of more than 100 workers. In Bolivia, Venezuela, and El Salvador, productivity in the largest firms is about 150 percent higher than for firms in the 10–19 category. Only in Ecuador does productivity seem to be completely unrelated to size.

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[7] The argument is that productivity determines size, with more productive firms growing to be larger, rather than the other way around: i.e., larger firms become more productive as a result of their size. Yet a positive relationship between total factor productivity and size can also be driven by economies of scale. This is because most methods of computing TFP assume constant returns to scale; therefore, increasing returns to scale would wrongly show up as higher TPF for bigger firms.

[8] The data for the selected group of countries presented here also suggest that, in addition to size, productivity increases with age and with exporting status, although the direction of the causality between exports and productivity tends to be the reverse: high productivity facilitates exports, and not the other way around. See Appendix Table A6.

Table 4. OLS Regression of Log($A_{si}/\overline{A}_s$) on Size Dummies

SIZE	Colombia Average	Ecuador 2005	Chile 2006	Uruguay 2005	El Salvador 2004	Bolivia 2000	Venezuela 2001	Brazil 2005	Argentina
Size 20-49	0.439***	-0.019	0.2684***	0.5543**	0.5478***	0.5775**	0.384	0.473	-0.121***
	[0.021]	[0.0486]	[0.0789]	[0.2321]	[0.1025]	[0.2449]	[0.3025]	[0.1626]**	(.0126)
Size 50-99	1.006***	-0.015	0.3534*	0.6179**	1.0651***	1.3212***	0.7462***	0.849	0.612***
	[0.028]	[0.0550]	[0.1920]	[0.2407]	[0.1375]	[0.2930]	[0.2639]	[0.1554]**	(.028)
Size 100-249	1.426***	0.073	0.7941***	1.0523***	1.7283***	2.1632***	1.8532***	1.324	0.682***
	[0.051]	[0.0782]	[0.1968]	[0.2111]	[0.1522]	[0.2746]	[0.2459]	[0.1479]**	(.194)
Size 250-499	1.599***	-0.003	0.8344***	1.3739***	1.8928***		2.1634***	1.905	
	[0.123]	[0.0610]	[0.2345]	[0.2023]	[0.2379]		[0.3165]	[0.1903]**	
Size 500-999	2.122***	0.012							
	[0.043]	[0.0557]							
Size 1000+	2.338***								
	[0.053]								

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

In order to assess whether distortions affect firms across different size categories we calculate the percentage of firms that are currently small, medium and large that would decrease in size if all distortions were eliminated and TFPR was equalized between firms in any given sector. The results are shown in Table 5. “Small” here means the bottom 25 percent of firms in the distribution of value added, “large” means the top 25 percent and “medium” the 50 percent in the middle of the distribution. In general, firms that are currently small are more likely than large firms to shrink in an efficient allocation of resources. The only exception is Colombia. We interpret this result as an indication that most distortions affect small firms and that these distortions go in the direction of favoring larger than efficient sizes for firms that are currently small firms. In other words, the results suggest that the majority of small firms are not too small but rather too large given their productivity.

The previous result, combined with the fact that Latin America is a region of very small firms, at least compared to the United States, helps to explain the productivity gap. When comparing the subsample of manufacturing establishments with 10 or more workers, the size distribution of firms across Latin American countries and the United States is quite similar. This is shown in panel 1 of Table 6. Although in Bolivia, Argentina, Mexico, and El Salvador the share of small establishments (10–49 workers) is larger than in the United States, in other Latin American countries this share appears to be at similar or lower levels. It is also interesting to note that the majority of employment is generated by large firms.

Table 5. Percent of Firms That Would Reduce Size in an Efficient Allocation

	Small	Medium	Large
Venezuela 2001	82.5	72.5	55.0
Brazil 2005	81.8	57.1	40.1
El Salvador 2004	75.8	47.7	30.6
Chile 2006	64.2	54.3	51.2
Ecuador 2005	52.9	45.2	35.7
Uruguay	49.4	41.4	39.0
Bolivia 1997	41.6	43.0	31.2
Colombia	31.4	44.0	69.0
China 2005	65.6	55.4	52.4
US 1997	66.8	56.6	57.6

Differences across Latin America and the United States appear starker once the smallest firms are also considered. This is shown in the second panel of Table 6. In Mexico and Bolivia, 91 percent of manufacturing establishments employ fewer than 10 workers. These figures are lower in Argentina and El Salvador, but still considerably above the percentage of micro firms in the United States. The share of employment for very small firms is considerably larger in Latin America than in the United States: about 43 percent of manufacturing employment in Bolivia, and around 20 percent in Argentina, El Salvador, and Mexico, compared to a mere 4.2 percent in the United States.

While very few countries have data for all sectors of the economy, when available they suggest that the percentage of microenterprises is even higher outside manufacturing. In Mexico, 97 percent of establishments in retail and 94 percent in the services sector have fewer than 10 employees, with an average for the whole economy of 95 percent. In retail, 72 percent of establishments have 2 workers or less (Hsieh and Klenow, 2009b).

Table 6. Size Distribution of Establishments and Employment

Panel 1. Establishments of 10 or more Employees

Firm size	Argentina 1993		Bolivia 1992		Chile 2006		Colombia 1998		Ecuador 2005	
	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.
[10-19]	56.9	17.2	51.3	17.7	26.8	4.0	28.7	4.56	30.3	3.9
[20-49]	21.6	14.4	31.6	24.0	34.3	10.6	31.6	11.07	31.2	8.9
[50-99]	15.4	24.3	9.9	17.5	17.3	12.3	18.2	14.49	16.0	10.2
[100-249]	2.9	10.6	7.2	40.8	12.5	19.8	13.9	24.48	13.4	19.8
[250+]	3.3	33.5	n.a.	n.a.	9.2	53.3	7.6	45.4	9.1	57.3

Firm size	El Salvador 2005		Mexico 2004		Uruguay 2005		Venezuela 2001		US 2003	
	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.
[10-19]	40.8	8.1	44.3	7.1	15.4	2.1	16.5	1.5	31.9	5.0
[20-49]	29.4	13.4	28.1	10.4	34.9	11.2	25.3	5.2	32.4	11.5
[50-99]	14.3	15.0	11.4	9.7	23.4	16.0	15.9	7.0	16.2	12.9
[100-249]	9.5	23.0	9.3	17.3	17.5	25.2	25.1	26.9	12.8	22.2
[250+]	6.0	40.5	6.9	55.5	8.8	45.5	17.3	59.4	6.8	48.4

Panel 2. All establishments

Firm Size	Argentina 1994		Bolivia 1992		El Salvador 2005		Mexico 2004		US 2003	
	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.	Est.	Emp.
[1-9]	84.0	22	91.7	43.6	82.0	17.7	90.5	22.7	54.5	4.2
[10-19]	12.9	25	4.2	10.0	8.3	6.2	4.2	5.5	14.5	4.8
[20-49]	2.5	19	2.6	13.6	3.9	6.2	2.7	8	14.7	11
[50-99]	0.8	35	0.8	9.8	2.8	10.2	1.1	7.5	7.4	12.3
[100+]	0.2	18	0.6	23.0	2.9	59.7	1.6	56.3	8.9	67.7

This higher prevalence of smaller firms is underestimated in establishment-level data, even if it comes from a census, as in this case, since it takes into account only establishments with a fixed location. Itinerant businesses or street vendors are not usually included in census data. In Mexico, establishments covered by the economic census account for only 40 percent of the labor force. Another 26 percent are employed in sectors such as agriculture or government that are not surveyed. This leaves a very sizeable 13.6 million workers (33.5 percent of the labor force) unaccounted for. Data from employment surveys (INEGI, 2003) indicate that these workers work in mobile locations without a fixed establishment, of which 5 million work on their own, and 6 million in firms with fewer than five workers. By sector, the percentage of workers without a fixed establishment not accounted for in the census is 8.4 percent for manufacturing, 17 percent for retail and commerce, and 95 percent for non-financial services.[9]

[9] Calculations from INEGI (2002).

5. Discussion: Misallocation and Policies

What are the potential sources of misallocation? One of the most obvious culprits in resource misallocation is the financial market. Financial markets in Latin America are underdeveloped and leave many firms underserved. If financial institutions are unable or unwilling to provide credit to firms that are highly productive but that have no credit history or insufficient guarantees, then these firms cannot expand as far as their ideas/projects could take them if markets worked properly. In an economy where good firms are credit-constrained, transferring additional resources to these firms can yield very high returns. Resource misallocation can also occur if directed credit provides cheap credit to inefficient firms, thereby allowing inefficient firms to expand.[10]

The second suspect in resource misallocation is the tax collection system. The combination of high taxes and poor enforcement creates strong incentives for tax evasion in Latin America. Moreover, in many countries, tax authorities searching for ways to improve the efficiency of tax collection focus their enforcement activity on the largest and most productive firms, virtually ignoring tax collection from micro, small, and medium enterprises. Since the sum of taxes and regulation compliance may be high in Latin America (particularly in the highest-income countries), noncompliance with taxes is equivalent to a substantial subsidy to noncompliant, less productive firms. Since large firms tend to be more productive than smaller firms, selective noncompliance amounts to a potentially large subsidy to less productive, smaller firms, thereby artificially increasing their size and weight in the economy while constraining the size of larger, more productive firms.

A third suspect is the poor enforcement and incomplete coverage of social security systems. In addition to leaving many workers unprotected, uneven enforcement of those who are covered can also have negative effects on resource allocation and productivity. By evading taxes, some firms can save on a number of costs associated with taxes and regulatory mandates, and therefore compete on unfair terms with more productive firms. To the extent that firm evasion is triggered by a deliberate attempt to compete with more productive firms, resources may be diverted from the best firms, promoting instead the expansion and/or survival of less efficient ones. By evading labor and social security regulations, less productive firms can divert resources away from larger, more productive firms. These effects can be magnified by the fact that

[10] Another reason a firm may be inefficiently small is that it exerts some form of monopoly power.

governments increasingly provide some benefits (health, pension) free of charge to workers conditional on their not being affiliated with social security (Levy, 2008). While the benefits of such programs for the underserved population may be large, the adverse effects on productivity may be also sizeable if they simply fuel the fire and help many workers—not satisfied with the value of services offered by social security—to switch toward self-employment or very small firms where they can avoid paying social security contributions and still get some of the benefits free of charge, provided that they remain informal.

These three possible drivers of misallocation suggest predictions regarding the relationship between misallocation and firm size that can help identify the source of misallocation. If misallocation is due to financial market failures, this would be reflected in the presence of many small firms that have difficulty growing—even though they have good projects—because they cannot secure access to credit. For these firms, the returns of additional capital would be very large—much larger than for firms whose demands for funding have been met by the capital market and therefore do not have any high return projects left to fund. If credit markets are the problem, then on average returns to additional factors would be higher in small firms than in larger ones. On the other hand, if distortions are due to unequal enforcement of taxes, social security contributions, or labor regulations, then the returns of additional capital and labor would be expected to be lower in smaller firms. This is because noncompliant firms are generally small, and tax evasion works as a subsidy that helps them expand beyond what they would have had they paid taxes, lowering the marginal returns of factors relative to compliant firms.

What does the relationship between marginal products of factors and firm size reveal about the origins of misallocation? We explore this in Table 7. This relationship varies across countries, but more often than not returns are increasing in relation to firm size. In some countries, such as Colombia, El Salvador, and Mexico, the marginal revenue product of an extra unit of resources tends to be larger in medium and large firms than in the smallest ones. In these countries, evidence suggests that providing extra resources to medium or large firms would yield higher returns than providing resources to smaller ones. The implication is that in these countries, most small firms are not too small, but rather too large relative to what they should be in an efficient allocation. In contrast, medium and large firms appear to be too small relative to what they would be if resources were assigned following relative productivities. In these countries it is difficult to argue that the main source of such distortions are capital market constraints, unless it can be shown that medium or large firms are the most constrained by lack of financial access. Instead, it might well be that small firms are credit constrained but compensate for these higher costs—or for greater difficulty in accessing credit—by not paying taxes and circumventing regulations. This latter effect seems to dominate. In this set of countries, tax evasion and informality concentrated in the smallest firms are very plausible sources of misallocation.

Table 7. OLS Regression of Log($TFPR_{si}/\overline{TFPR_s}$) on Size Dummies

SIZE	Colombia Average	Ecuador 2005	Chile 2006	Uruguay 2005	El Salvador 2004	Bolivia 2000	Venezuela 2001	Brazil 2005	Argentina
Size 20-49	0.010	-0.0930*	-0.0801**	0.091	0.1227*	0.053	-0.136	0.141	-0.121***
	[0.015]	[0.0519]	[0.0376]	[0.1736]	[0.0667]	[0.1798]	[0.2177]	[0.0797]	(0.0126)
Size 50-99	0.099***	-0.2033***	-0.2241***	-0.3159*	0.138	-0.208	-0.291	0.248	0.612***
	[0.019]	[0.0587]	[0.0754]	[0.1806]	[0.0875]	[0.2041]	[0.1968]	[0.0939]**	(0.028)
Size 100-249	0.169***	-0.021	-0.0772	-0.179	0.3390***	-0.029	0.126	0.303	0.682***
	[0.030]	[0.0688]	[0.0508]	[0.1878]	[0.1009]	[0.1789]	[0.1464]	[0.0978]**	(0.194)
Size 250-499	0.085	-0.2797***	-0.5109***	-0.3216*	0.188		0.075	0.408	
	[0.061]	[0.0800]	[0.1160]	[0.1759]	[0.1458]		[0.2139]	[0.1472]**	
Size 500-999	0.212***								
	[0.026]								
Size 1000+	0.237***								
	[0.046]								

Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1

Patterns differ in some countries, however. Credit market constraints, for instance, seem a more likely source of distortions in Uruguay and Chile. In these two countries, the returns to an extra unit of capital and labor tend to decline with firm size, indicating that the smallest firms tend to be size constrained, while the largest firms appear subsidized, given their productivity. The lower level of evasion and higher level of formality in Uruguay and Chile may also explain why in these two countries small firms are relatively more size constrained, as they cannot easily compensate for low access to credit with tax and social security evasion. However, tax evasion favoring the largest firms could also explain these patterns. In Chile, larger firms evade taxes more than smaller ones (see Busso, Madrigal, and Pagés, 2010). In addition, in Chile, larger manufacturing firms appear to receive more state subsidies than smaller firms, leading again to higher implicit subsidies for larger firms.

The evidence presented provides some interesting clues as to the likely sources of misallocation in Latin America. Contrary to the conventional wisdom, there is not much evidence for the hypothesis that very small firms are too small, or that they are size constrained. Only in Chile and Uruguay are marginal products of capital clearly declining in size, as this hypothesis would imply, and in Chile tax avoidance of larger firms can also account for this pattern. As indicated, even if small firms suffer from capital access constraints, other factors, such as their partial or total noncompliance with taxes and social security mandates, provide them with an implicit subsidy that allows them to be larger than the size that would be warranted by their productivity.

6. Conclusion

In this paper we apply the methodology developed by Hsieh and Klenow (2009a) to assess the extent of heterogeneity of firm productivity and distortions within narrowly defined sectors. We found that dispersion in these two measures is much larger than in the United States, suggesting the possibility of gains from moving to an efficient allocation of resources in manufacturing. We show that indeed those gains are on the order of 60 percent. These large disparities in productivity and substantial resource misallocation open important avenues for productivity growth. While the gains from improving resource allocation and the mix of firms would provide only temporary sources of growth, they could provide a huge leap forward similar to what the region enjoyed during the period of rapid urbanization and structural transformation during the 1950s and 1960s. This transformation would require reforms aimed at reducing the distortions created by differences in tax codes and uneven enforcement of taxes and regulations, improving social insurance policies, improving the functioning of capital markets, and stimulating competition, particularly in service sectors.

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Appendix

1. Robustness

Table A1 compares the hypothetical TFP gains in our "benchmark" assuming an elasticity of substitution within industries of 3, with TFP gains calculated with a higher elasticity of 5. As expected, in most countries, TFP gains increase. When the elasticity of substitution is higher the process of reallocation of resources within industries is slower, which explains potential higher TFP gains. Hsieh and Klenow (2009a) found that, changing the same assumption, China's hypothetical TFP gain in 2005 climbs from 87 percent under $\sigma = 3$ to 184 percent with $\sigma = 5$, and India's in 1994 from 128 percent to 230 percent. Results in Latin American countries increase but not so dramatically, showing that gains are indeed sensitive to the elasticity of substitution.

Table A1. TFP Gains, Robustness

	Benchmark		sigma=5		local shares	
	Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**
Sample 10 or more workers						
Bolivia (1988-2001)	52.5	60.6	98.6	99.8	55.4	48.6
El Salvador (2005)	n.a.	48.2	n.a.	77.8	n.a.	107.0
Uruguay (1997-2005)	61.8	60.2	74.4	77.8	51.8	49.0
Argentina (1997-2002)	52.2	60.0	74.0	80.5	46.9	54.6
Ecuador (1995-2005)	52.7	57.6	36.0	59.0	52.0	55.0
Chile (1996-2006)	45.0	53.8	40.3	50.7	71.6	69.2
Colombia (1982-1998)	48.9	50.5	75.5	78.6	83.4	73.3
Mexico (1999-2004)						
Sample 30 or more workers						
Brazil (2000-2005)	49.1	41.4	44.3	52.1	57.7	61.5

When estimating TPF gains in order to control for distortions that could affect the capital share differently in different countries, we use α_s, which is measured as one minus the labor share in industry s in the United States, which is assumed to be undistorted. In Table A1, we present TFP gains using the actual distribution of capital in each country. The results are somewhat mixed: in some countries TFP gains increase with local shares, and in some of the others the gains are roughly the same or decrease.

We also calculated the dispersion of TFPQ with an elasticity of substitution within industries of 5 and using local capital shares, as is shown in Table A2. The dispersion consistently diminishes when assuming intermediate inputs become closer to perfect substitutes. When assuming capital shares of the country instead of US shares, in most countries the results are unchanged with respect to the benchmark estimation.

Table A2. Dispersion of TFPQ, Robustness

	Benchmark		sigma=5		local shares	
	90-10		90-10		90-10	
Period	Initial	Final	Initial	Final	Initial	Final
Sample 10 or more workers						
Mexico (1999-2004)	3.60	3.33	n.a.	n.a.	n.a.	n.a.
El Salvador (2005)	n.a.	2.46	n.a.	1.79	n.a.	2.82
Uruguay (1997-2005)	2.56	3.01	2.42	2.87	2.30	2.73
Chile (1996-2006)	2.65	2.92	2.20	2.51	3.04	3.04
Ecuador (1995-2005)	2.78	2.86	n.a.	n.a.	2.87	2.78
Argentina (1997-2002)	1.82	2.46	1.50	2.00	1.84	2.44
Sample 30 or more workers						
Brazil (2000-2005)	3.18	3.10	2.89	2.58	3.30	3.35

In Table A3 we present the results for TFPR and the capital and output wedges. Overall, the results are robust to changes in the assumptions of the model. TFPR dispersion remains more or less the same, and changes over time are also as previously found when assuming an elasticity of substitution of 5. This results hold for capital and output wedges as it is shown in Table A3. Likewise, when using local shares in the estimation of the TFPR, $\mathbf{1+\tau_K}$, and $\mathbf{1-\tau_Y}$ the results are broadly unchanged.

Table A3. Dispersion of Distortions, Robustness

Measured as p90-p10

TFPR	Benchmark		sigma=5		local shares	
Period	Initial	Final	Initial	Final	Initial	Final
Sample 10 or more workers						
Uruguay (1997-2005)	2.12	2.47	2.12	2.50	1.69	2.05
Mexico (1999-2004)	2.33	2.08	n.a.	n.a.	n.a.	n.a.
Chile (1996-2006)	1.57	1.77	1.64	1.93	2.26	2.28
Argentina (1997-2002)	1.04	1.56	1.19	1.60	1.24	1.59
Ecuador (1995-2005)	1.49	1.48	n.a.	n.a.	1.49	1.47
El Salvador (2005)	n.a.	1.29	n.a.	1.29	n.a.	2.00
Sample 30 or more workers						
Brazil (2000-2005)	1.97	2.10				

$1+\tau_K$	Benchmark		sigma=5		local shares	
Period	Initial	Final	Initial	Final	Initial	Final
Sample 10 or more workers						
El Salvador (2005)	n.a.	2.43	n.a.	2.43	n.a.	2.42
Mexico (1999-2004)	3.50	3.25	n.a.	n.a.	n.a.	n.a.
Chile (1996-2006)	2.93	3.23	3.28	3.34	3.26	3.45
Uruguay (1997-2005)	3.24	3.16	3.26	3.15	3.28	3.17
Ecuador (1995-2005)	2.81	2.64	n.a.	n.a.	1.30	1.23
Argentina (1997-2002)	2.02	1.43	2.01	2.23	2.01	2.23
Sample 30 or more workers						
Brazil (2000-2005)	2.89	3.19				

$1-\tau_Y$	Benchmark		sigma=5		local shares	
Period	Initial	Final	Initial	Final	Initial	Final
Sample 10 or more workers						
Argentina (1997-2002)	1.11	2.20	1.09	1.50	1.09	1.50
Mexico (1999-2004)	2.33	2.18	n.a.	n.a.	n.a.	n.a.
Chile (1996-2006)	1.37	1.55	1.48	1.73	1.50	1.75
Uruguay (1997-2005)	1.00	1.48	1.00	1.58	1.01	1.49
Ecuador (1995-2005)	1.29	1.34	n.a.	n.a.	2.85	2.71
El Salvador (2005)	n.a.	1.08	n.a.	1.08	n.a.	1.10
Sample 30 or more workers						
Brazil (2000-2005)	1.91	1.98	n.a.	n.a.	n.a.	n.a.

Note: Initial year in Ecuador for other than benchmark is 1997.

2. Dispersion and Correlation Measures

A4. Dispersion of TFPR

	90-10		75-25		s.d	
Period	Initial	Final	Initial	Final	Initial	Final
Sample 10 or more workers						
Venezuela (1995-2001)	2.60	3.28	1.27	1.77	1.16	1.28
Colombia (1982-1998)	2.50	2.90	1.21	1.28	1.00	1.21
Uruguay (1997-2005)	2.12	2.47	1.09	1.24	0.83	0.97
Mexico (1999-2004)	2.33	2.08	1.27	1.09	0.93	0.82
Bolivia (1988-2001)	2.16	2.06	1.06	0.97	0.91	0.88
Chile (1996-2006)	1.57	1.77	0.73	0.86	0.66	0.72
Argentina (1997-2002)	1.04	1.56	0.68	0.87	0.48	0.62
Ecuador (1995-2005)	1.49	1.48	0.73	0.74	0.63	0.62
El Salvador (2005)	n.a.	1.39	n.a.	0.74	n.a.	0.64
Sample 30 or more workers						
Brazil (2000-2005)	1.97	2.10	0.40	0.45	0.89	0.90
El Salvador (2004)	n.a.	1.33	n.a.	0.66	n.a.	0.64
Mexico (1999-2004)	2.26	2.04	1.16	1.05	0.90	0.81
Chile (1996-2006)	1.55	1.73	0.76	0.86	0.64	0.69
Sample: All workers						
El Salvador (2004)	n.a.	1.35	n.a.	0.69	n.a.	0.58
Mexico (2004)	2.57	2.27	1.33	1.18	1.02	0.98
China (1998-2005)	1.87	1.59	0.97	0.82	0.74	0.63
US (1977-1997)	1.04	1.19	0.46	0.53	0.45	0.49

A5. Dispersion of Capital Wedge

	90-10		75-25		s.d	
Period	Initial	Final	Initial	Final	Initial	Final
Sample 10 or more workers						
Chile (1996-2006)	2.93	3.23	1.50	1.68	1.31	1.37
El Salvador (2005)	n.a.	3.31	n.a.	1.54	n.a.	1.38
Mexico (1999-2004)	3.50	3.25	1.84	1.75	1.35	1.27
Uruguay (1997-2005)	3.24	3.16	1.64	1.61	1.23	1.31
Venezuela (1995-2001)	3.60	3.17	1.78	1.51	1.46	1.34
Ecuador (1995-2005)	2.81	2.64	1.37	1.29	1.16	1.13
Argentina (1997-2002)	2.02	1.43	1.06	0.72	0.79	0.86
Bolivia (1988-2001)	2.65	2.22	1.27	1.02	1.07	1.00
Sample 30 or more workers						
Brazil (2000-2005)	2.89	3.19	0.75	0.85	1.31	1.43
El Salvador (2004)	n.a.	2.58	n.a.	1.18	n.a.	1.23
Mexico (1999-2004)	3.57	3.16	1.91	1.64	1.39	1.23
Chile (1996-2006)	2.69	2.96	1.38	1.57	1.15	1.27
Sample: All workers						
Mexico (1999-2004)	3.31	3.22	1.75	1.78	1.29	1.36
El Salvador (2004)	n.a.	4.11	n.a.	2.22	n.a.	1.65

A6. Dispersion of Output Wedge

	90-10		75-25		s.d	
Period	Initial	Final	Initial	Final	Initial	Final
Sample 10 or more workers						
Mexico (1999-2004)	2.33	2.18	1.24	1.13	0.91	0.86
Argentina (1997-2002)	1.11	2.20	0.55	1.22	0.42	0.57
Venezuela (1995-2001)	2.04	2.77	1.06	1.26	0.85	1.13
Chile (1996-2006)	1.37	1.55	0.68	0.73	0.61	0.65
Bolivia (1988-2001)	1.70	1.53	0.85	0.67	0.76	0.62
Colombia (1982-1998)	0.94	1.41	0.45	0.60	0.58	1.25
Uruguay (1997-2005)	1.00	1.48	0.46	0.72	0.47	0.61
Ecuador (1995-2005)	1.29	1.34	0.62	0.61	0.58	0.59
El Salvador (2005)	n.a.	1.30	n.a.	0.63	n.a.	0.60
Sample 30 or more workers						
Brazil (2000-2005)	1.91	1.98	0.49	0.50	0.87	0.88
El Salvador (2004)	n.a.	1.21	n.a.	0.60	n.a.	0.59
Chile (1996-2006)	1.40	1.56	0.69	0.75	0.60	0.66
Sample: All workers						
Mexico (1999-2004)	2.68	2.38	1.40	1.24	1.06	1.02
El Salvador (2004)	n.a.	1.29	n.a.	0.63	n.a.	0.56

A7. Correlates of TFPQ

Dependent variable: log(TFPQ/TFPQ_bar)

AGE	**Colombia Average**	**Chile 2006**	**Uruguay 2005**	**El Salvador 2004**	**Bolivia 2000**	**Venezuela 2001**	**Brazil 2005**	**Argentina**
Age 6 - 10	0.191***	-0.624	1.6152***	n.a.	-0.611	0.140	0.510	-0.119***
	[0.040]	[0.4716]	[0.4332]		[0.3865]	[0.3792]	[0.0484]**	[-0.039]
Age 10 and more	0.414***	-0.107	0.000	n.a.	0.052	0.4806*		-0.062*
	[0.043]	[0.2365]	[0.0000]		[0.3162]	[0.2411]		[0.036]
Observations	74392	3777	432			468	22397	
R-squared	0.020	0.022	0.020			0.009	0.030	
EXPORTER								
Exporter	1.088***	0.1166**	0.000	0.265	0.004	0.101	0.017	0.295***
	[0.028]	[0.0460]	[0.0000]	[6.17]**	[0.0415]	[0.0942]	[0.0249]	[0.032]

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1