Foreign Ownership and Firm Productivity: Evidence from a Large Sample of Countries[*]

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Abstract

This paper analyzes productivity of domestically and foreign-owned firms in a large sample of developing and transition countries. The detailed data allow a characterization of productivity and foreign firm presence across 118 countries, thus moving significantly beyond single country studies. A robust result is that foreign firms are more productive than domestic private firms, regardless of specification and accounting for unobservable heterogeneity across several dimensions. Accounting for observable firm level determinants of productivity, such as skilled labor, reduces the size of, but does not eliminate the statistically significant productivity premium. There is only weak evidence of a positive correlation between foreign firm presence in a sector and domestic firm productivity. However, there is some heterogeneity across regions and especially countries.

Keywords: Foreign Ownership, Productivity, Spillovers.

JEL Classification: F21, F23, O12.

1 Introduction

In recent years, many countries, particularly in the developing world, have sought to attract foreign investment, especially in the form of foreign direct investment (FDI). The touted benefits of increased foreign participation in the economy include the capital brought in, employment opportunities and spillovers, technological and otherwise, which contribute to enhanced economic growth (Blomström and Sjöholm, 1999; Borensztein, De Gregorio and Lee, 1998; De Mello, 1999, Cipollina et al., 2012). It also appears that foreign owned firms have weathered the recent global financial crisis better than local firms (Alfaro and Chen, 2012). For the lowest income developing countries, the manufacturing sector in particular is considered a driving force for modernization and job creation. On the other hand, sceptics point to potential negative competition effects and that spillovers may not materialize when absorptive capacity is low. Indeed, some studies such as Oteng-Abayie and Frimpong (2006) find that FDI may have a negative impact on GDP growth.

One strand of the literature exploring whether foreign investment results in beneficial effects focuses on macroeconomic factors and conducts cross-country analyses using aggregate data. Another strand focuses on productivity (and sometimes wage) impacts at the microeconomic, industry or firm level. While the former is of interest since it is correlated with aggregate welfare, the latter is of interest since under fairly general conditions, increases in micro productivity feed into aggregate productivity (Syverson, 2011). There are many studies of the productivity and wage differences between domestically and foreign-owned firms and spillover effects in various countries. There are some countries with rich firm-level data that have been explored extensively, e.g. Mexico (Blomström, 1986; Blomström and Wolff, 1994, Jordaan, 2005 and 2008), Venezuela (Aitken and Harrison, 1999), Colombia (Kugler, 2006), Morocco (Haddad and Harrison, 1993), Lithuania (Javorcik, 2004), Ghana (Görg and Strobl, 2005; Waldkirch and Ofosu, 2010), Indonesia (Arnold and Javorcik, 2009), or China (Liu, 2008; Xu and Sheng, 2012). Virtually all of these studies, however, focus on one country only, raising questions as to how applicable experiences in that country are to others that have not been examined individually. They also cover very different time periods, going as far back as 1970 (in the case of the earliest Mexican study), the 1980s (Morocco, Venezuela) and the 1990s (Ghana). Moreover, some are based on Census information, whereas other data come from surveys, with no coordination in survey design. All these factors make it very difficult to assess what may be common across a large swath of countries and to base policy recommendations for any other country on these results.

In contrast, the World Bank has since 2002 conducted the Enterprise Surveys which follow the same research design and use the same questionnaire for many countries, thus making the data far more comparable across countries. They also cover roughly the same time period, mostly the latter half of the 2000s. The data have been exploited by a number of researchers for various questions, but to the best of our knowledge, they have hardly been utilized to comprehensively look at productivity of domestic versus foreign-owned enterprises and the impact of foreign presence in an industry across such a large swath of countries in comparable fashion. This paper represents a thorough attempt at shedding light on the question whether results obtained in specific contexts, largely that foreign firms are far more productive than domestically owned firms but that evidence of positive spillovers are difficult to find, are systematically true across a wide array of developing and transition countries.

What is remarkable about the Enterprise Surveys is the large number of countries that have been surveyed. There are potentially 137 countries in the data, although some are dropped from the formal analysis. For example, non-developing countries that have been surveyed such as Germany or Ireland are omitted. A few countries are omitted because they do not have comparable data due to the use of a different survey design, such as Bangladesh and an early survey of China. Surveys that focus specifically on services sectors (such as retail and IT) or survey only micro enterprises are also excluded. Still, that leaves 118 countries with nearly 40,000 observations.

Saliola and Seker (2011) use the Enterprise Survey data and compute total factor productivity for manufacturing firms in 81 countries from surveys conducted between 2005 and 2009. They compute aggregate and average productivity and rank countries according to these, pointing out sometimes large differences in rankings depending on which measure of productivity they look at. They also compare productivity across sectors and within regions. They do not consider domestically versus foreign-owned firms and conduct no regression analysis.

The paper closest to this one is Farole and Winkler (2012). They use the Enterprise Survey data in order to look at intra-industry spillovers from foreign to domestic firms. Their focus is on "mediating factors", essentially factors that help determine whether spillovers occur or not. These may be characteristics of the foreign firms, of the domestic firms, of the sector a firm is operating in, or country characteristics. They find that foreign firm spillover potential, domestic firm absorptive capacity and the host country's institutional framework all affect the extent and direction of spillovers. In addition, this impact depends on the level of the domestic firm's productivity and whether foreign firms are partially or wholly foreign owned. They do not use the most recent survey

data and also use at most one survey per country, leaving them with far fewer observations and less country coverage than this paper. They also do not explore the importance of using survey weights, outliers, unobserved heterogeneity generally and heterogeneity across regions and countries. This paper addresses all of these issues.

One of the downsides of the Enterprise Data are their largely cross-sectional nature. There are some firms in some countries that have been surveyed more than once, but the resulting panel is small and non-representative. Thus, this paper is unable to address issues of self-selection or unobserved heterogeneity at the establishment level via the use of establishment fixed effects. It is possible, however, to account for unobserved heterogeneity in many other dimensions, the year, the industry and regions within countries.

The paper proceeds as follows. The next section contains a brief review of productivity studies conducted for single countries. This is followed by a detailed description of the Enterprise data. Theoretical considerations precede and inform the empirical implementation. A thorough discussion of the empirical results follows. The final section concludes.

2   A Brief Review of the Literature

A detailed discussion of the very large empirical literature on foreign firm presence and foreign direct investment's impact on productivity is well beyond the scope of this paper. Surveys of the literature find that the evidence for spillovers or more generally positive effects of foreign ownership on productivity of domestic and/or foreign firms is mixed. Most studies that use firm-level data focus on one country. Their results are difficult to compare and it is hard to argue that they apply in different contexts. Cross-country studies, in contrast, suffer from a lack of micro data and therefore provide aggregate or at best industry-level analysis. The availability of the detailed firm data from the Enterprise Surveys allows the present paper to remedy these shortcomings in important respects.

Lipsey (2004) contends that while the evidence is strong that foreign firms are more productive and pay higher wages, their effect on domestic firms is much less clear. In their extensive survey of the literature, Görg and Greenaway (2004) find that the evidence on productivity and spillovers is mixed and depends largely on the study methodology and data used. Wooster and Diebel's (2010) meta analysis of developing country studies finds that those using firm-level data are particularly prone to finding insignificant or even negative spillover effects from the presence of foreign-owned

firms. In addition, Görg and Strobl's (2001) meta-analysis finds evidence of publication bias, which suggests that the evidence is even more mixed than a review of published studies indicates.

An example of a recent cross-country industry study is Fillat and Woerz (2011) who investigate the relationship between FDI and productivity growth for a sample of both developed and developing countries. Their industry data come from a variety of sources, such as the OECD's International Direct Investment database and UNIDO's Industrial Statistics database for eight industries, 28-35 countries for the 1987-2000 time period, which results in a highly unbalanced panel. They find some positive relationships between FDI and productivity for some industries when certain preconditions are met, such as high investment and export orientation.

A seminal contribution to firm-level studies, Aitken and Harrison (1999) find only a small effect of foreign ownership on domestic firm productivity, and only for the smallest firms. They also compute the aggregate effect of foreign presence in Venezuela and find it to be a tiny fraction of usual annual GDP growth.

In many contexts it is found that Africa and in particular sub-Saharan African countries differ from the experiences elsewhere (e.g. Asiedu (2002) with respect to FDI determinants). For Morocco, Haddad and Harrison (1993) find smaller productivity dispersion in industries where foreign firms are concentrated, but do not find evidence that foreign firms accelerated productivity growth in domestic firms. For Ghana, Waldkirch and Ofosu (2010) find a positive impact of foreign presence on productivity, although that does not appear to translate to wages. Görg and Strobl (2005) use an interesting feature of the Ghanaian data to examine the effect that previous experience of the manager working for a foreign firm has had on productivity. They find a positive effect, but only if the work experience had been in the same sector.

For Mexico, Blomström (1986) and Blomström and Wolff (1994) present the earliest evidence of a positive correlation between foreign ownership and productivity, using the 1970 and 1975 Industrial Censuses. More recently, Jordaan (2005 and 2008) uses the 1993 Industrial Census to find that foreign ownership has a positive effect on labor productivity, especially in high absorptive capacity industries in which foreign ownership is concentrated.

For Indonesia, Blalock and Gertler (2009) find that the entry of foreign firms raises productivity of domestic firms with a larger technology gap, but less for firms that have little room to catch up. Arnold and Javorcik (2009) find that newly acquired and privatized firms with foreign owners exhibit greater productivity growth than a control group of domestic firms even several years after takeover. They point to substantial restructuring at the firm level following acquisition which raises

investment, employment, and wages.

While most of the literature discussed so far is concerned with intra-industry productivity effects and spillovers, recent contributions by Javorcik (2004, for Lithuania) and Kugler (2006, for Colombia) examine the possibility of inter-industry spillovers. This is in part a response to the relative lack of finding intra-industry spillovers, but also in recognition of the substantial forward and backward linkages that multinational enterprises (MNEs) often develop in the countries that they are engaged in. Both Javorcik and Kugler confirm the lack of productivity effects within the same industry, but find evidence of considerable spillovers to local suppliers (backward linkages).

There is a fairly large segment of this literature devoted to China. Recently, Liu (2008) looks at both productivity levels and productivity growth as a result of foreign presence in a sector and finds a negative (short-run) effect from the former, presumably due to investments necessary to benefit from the foreign technology, and a positive (long-run) effect for the latter, presumably as the new technology becomes integrated in the production process. Xu and Sheng (2012) examine spillover effects of FDI on domestic Chinese firms 2000-2003, taking into account several econometric challenges such as endogeneity of input choice and simultaneity bias and find that domestic firms differ significantly in the extent to which they benefit from FDI. In contrast to Jarvorcik and Kugler, they find evidence that the spillovers arise from forward linkages as firms buy higher quality intermediate inputs or equipment from upstream foreign firms.

One of the few firm-level cross-country studies is Gorodnichenko et al. (2014) who use data from early Enterprise Surveys (2002-2005) along with input-output tables from 17 countries in Eastern Europe and the former Soviet Union. They find positive spillover effects from foreign to domestic firms for backward linkages, but not for horizontal and forward linkages. The cross-country scope of their analysis is limited chiefly by the lack of input-output tables for many countries. Gorodnichenko et al. (2010) focus on a possible spillover channel and analyze the effect of foreign competition and linkages on product and process innovation of domestic firms. These data are available for 27 countries, from the same region and from early Enterprise Surveys. They find robust evidence that foreign competition, the supply chain of multinational enterprises and trade all promote innovation.

3   The Enterprise Survey Data

The World Bank has conducted surveys of individual establishments annually since 2002 and adds new data every year. Some of the surveys are focused on specific questions, such as the effects of

the recent financial crisis or focus on micro enterprises only. Most, however, are designed to have representative samples or add sampling weights so the researcher is able to make inferences about the population. The questionnaires for many of these surveys have been standardized at least since 2005 which make the data comparable across countries.

The main purpose of the surveys from the beginning was to gain a better understanding of the operations of firms in developing countries, especially the very poorest ones, and the obstacles that they are facing. For many countries, this had simply been unknown since no survey or census data was available. Many of the questions thus ask about problems encountered in the operation of the business. These include limited or interrupted access to electricity, water and telecommunications. They also ask about the (un-)availability of credit and relationships with government agencies and officials, such as whether a bribe must be paid to obtain certain licenses and how long it takes to export goods.

The questionnaires also ask about establishment characteristics that are useful to investigate other questions that have not been analyzed thoroughly for developing country firms, especially in a cross-country rather than a single country context. For the purpose of the present paper, the focus is on firm variables that allow computing measures of productivity. It is also known whether an establishment is domestically or foreign owned, which allows for comparisons between domestic and foreign-owned firms' performance and the interaction of the two.[1]

Many of the surveys were conducted in developing countries that have not historically been looked at and especially where detailed firm-level data have hitherto been unavailable. As mentioned earlier, any developed country that happened to be surveyed is omitted, as well as some countries with non-comparable data, micro enterprise surveys and surveys focusing specifically on services sectors such as retail and IT. That leaves 118 countries (listed in Appendix Table A1) and at most 37,542 observations in the broadest sample. The country coverage across different continents is quite impressive. There are 17 Latin American countries, 13 Caribbean ones, 5 from the Middle East, 12 from Asia, 42 from Africa, 4 Pacific Islands and 25 from transition countries, largely Eastern Europe and the former Soviet Union.

Table 1 presents some basic description of the data. Due to large differences in country size, the number of observations per country varies a lot, from a low of 11 for Vanuatu to a high of 2,600 in Nigeria.[2] Most countries have a considerable amount of foreign firms operating in their economies.

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[1]See the Enterprise Surveys web site at enterprisesurveys.org for more information. The data are available for free download to registered researchers.

[2]Omitting the smallest countries with few firms included will not change the results. Note that significantly more

Table 1: Basic Data Description (37,542 Observations)

		Broad Sample	
Number of Countries		118	
Observations per Country min./max	11	2,600	
Size weighted Foreign Ownership Share			
Min/Median/Max	0.31	18.04	76.33
Mean per capita Income ($)		2,016	
Median per capita Income ($)		1,266	
FDI/GDP Share Min/Median/Max	-1.82	3.70	46.83
Trade Openness Min/Median/Max	26.85	78.49	210.46
Firm Age Min/Median/Max	1	13	617
Foreign Firm Age Min/Median/Max	1	12	224
Size (Employees) Min/Median/Max	1	30	64,000
Foreign Size Min/Median/Max	1	104	21,955
Share of Sales Exported Min/Median/Max	0	0	100

The weighted foreign ownership share in an economy ranges from 0.31 percent in Yemen to 76.33 in Cambodia. The median of 18 is reasonable and the standard deviation of 16 shows that there is significant variation in the sector share of foreign ownership within and across countries.

There are no high income countries in the sample and, as mentioned, the World Bank made a particular effort to survey the very lowest income countries, many in Africa, and countries for which there had been no prior firm level data. Consequently, the mean and median per capita incomes are very low in this sample. The FDI/GDP ratio also shows a lot of variation, but is notably different from the weighted foreign ownership share from the survey. In part this is because FDI as it is calculated in national income accounts is not necessarily a good representation of the actual degree of foreign firm activity in a country. Trade openness is quite high, as is common for small countries, which many are.

While descriptive statistics for the variables included in the regressions are described below for the firms in the sample, Table 1 contains a few firm characteristics that are informative of the types of firms we see in developing and transition countries. Many are rather young, as the median age is 13 for the overall sample and 12 for the foreign firms. As a result, productivity is expected to be on the lower end, as age has been shown to be positively correlated with productivity, as less productive firms are more likely to exit (Bernard and Jensen, 2007). Similarly, size and productivity are generally positively correlated. The median firm only has 30 employees, although that is clearly

firms were surveyed in these countries but omitting services firms and missing answers reduce the sample size.

driven by domestically owned firms as foreign ones have a median of 104 employees.[3]

We now turn to a brief discussion of why and how foreign firm presence could affect productivity before discussing the empirical strategy.

4   Foreign Ownership and Productivity: Theory

The presence of foreign firms in a market affects productivity for several reasons. Since foreign owners are inherently disadvantaged relative to domestically owned firms with superior knowledge of local markets and practices, they must possess firm-specific advantages in the form of proprietary assets, technology or management and marketing practices (what Markusen (2002) terms 'knowledge capital'). These imply higher productivity of foreign-owned firms themselves. Moreover, there may be benefits to local firms stemming from productivity spillovers. Productivity spillovers generally take place when the entry or presence of multinational firms leads to efficiency or productivity benefits for local firms that are not fully internalized by the foreign firm (Blomström and Kokko, 1998). For example, host country workers that they hire and train may leave and join or set up local firms. Marketing practices may be observed and imitated. Multinationals have an interest in containing spillovers since these tend to reduce their advantage and thus their profits, but are not entirely able to do so.

The entry of multinational firms into a market may also affect productivity by disturbing the existing market equilibrium. Entry may erode the market power of existing indigenous firms, reducing measured productivity, which reflects market power as well as technical efficiency (Bernard et al., 2003). On the other hand, MNEs have an incentive to raise the quality of their local input suppliers, which also benefits local firms that buy from them, thus raising their productivity (Crespo and Fontoura, 2007). Thus, the effect of foreign firm presence on domestic firms' productivity is ambiguous. The overall impact is determined by the combination of foreign superiority, spillovers and competition effects in output and input markets.

A number of characteristics of foreign and domestic firms as well as their sectors and the countries they operate in help determine the possible scope of foreign productivity advantages and spillovers. Labor-intensive, low-technology industries such as textiles and apparel or food processing may receive investment in order to exploit labor cost advantages, but rely on well-known technologies and require little skill, limiting the scope of spillovers. This can be controlled

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[3]Size is proxied by employment here. Output could also be used and is available, but employment numbers make the point that many of these firms are small more clearly.

for with industry specific fixed effects as they are likely to be similar across countries.

Regions in which foreign firm activity is more concentrated could be affected differently than those with relatively fewer multinationals. Few multinationals limit the potential for spillovers, but also reduce the potential negative competition effect. While one could thus include the total number (or the total output) of foreign firms in a region, it is likely that there are many other unobserved characteristics of a region, such as location relative to transportation centers, terrain, weather patterns and more. The regressions below thus include region (within a country) fixed effects in order to account for the fixed region specific characteristics. Note that these are a sub-category of countries and thus subsume country specific effects, such as institutional quality, the rule of law or the degree of democratization.

We now turn to discussing the basic empirical specification based on the previous discussion. An extended specification includes a number of other firm level determinants of productivity in order to ascertain whether foreign ownership may proxy for other characteristics that differ between foreign and domestic firms and are productivity enhancing. These will be discussed in detail in the Results section before they are included in the analysis.

5   Empirical Specification

Fundamentally, productivity is taken to be influenced by the foreign ownership presence in the firm as well as the share of foreign ownership at the sector level and idiosyncrasies related to time, location, and industry, as discussed above:

$$Prod_i = \beta_0 + \beta_1 FP\_firm_i + \beta_2 FP\_sector_{jc} + \lambda_t + \theta_l + \mu_j + \varepsilon_i \tag{1}$$

where FP_firm_i is the foreign ownership share of firm i as given in the surveys.[4] In accordance with generally used ways to define foreign direct investment in national income accounts, a firm with a foreign ownership share of greater than 10 percent is considered foreign.[5] FP_sector is defined as foreign ownership shares averaged over all firms in a sector in a given country, weighted by each firm's size

$$FP\_sector_{jc} = \frac{\sum_i \{FP\_firm_{ijc} \cdot size_{ijc}\}}{\sum_i size_{ijc}} \tag{2}$$

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[4]The surveys do not ask the nationality of the foreign owner(s).

[5]Results are also robust to using a 20 or 50 percent threshold as well as to defining an ownership dummy =1 for any establishment with foreign ownership. The latter means that firms with, say, 60 percent foreign ownership are treated the same as those with, say, 90 percent.

Here, size is measured by employment. For foreign-owned firms, the calculation omits the firm in question so its sector presence does not affect its own productivity (other than through the foreign ownership variable). A positive coefficient β_1 would indicate a positive effect from foreign ownership at the firm level and $\beta_2 > 0$ would indicate the existence of a positive effect from the presence of foreign firms in the same sector. In order to disentangle the influence of this presence on foreign versus domestic firms, many of the regressions are also run on a sample of domestically owned firms only.

Since the surveys were conducted in different years, all regressions include a time fixed effect λ_t. The countries in this sample are very diverse and while one could control for country characteristics, these are not the focus of the analysis. Thus, a location fixed effect, θ_l, accounts for unobserved heterogeneity in this dimension. Many countries are large and samples are usually stratified by regions within countries. Thus, this location fixed effect is at the region-within-country level, in accordance with the sample stratification. This constitutes the very basic specification. It is, however, also easily conceivable that certain industries suffer from shocks that are common across some or many countries, which is then accounted for by a sector fixed effect, μ_j.

Accounting for time, location, and industry fixed factors separately is common in the literature and preserves a sufficient amount of degrees of freedom, although it should be noted that there are over 600 locations defined in the sample. It is conceivable that there is unobserved heterogeneity along two dimensions instead. For example, there may be an idiosyncratic shock that affects only an industry in a particular location, which affects all firms in that industry. In order to account for this, a location-sector fixed effect, η_{lj}, must be included. One check of the robustness of the results below considers several fixed effects along more than one dimension. Doing this is constrained by the quick increase in the number of fixed effects to be considered. In the just discussed case, over 30 sectors and over 600 locations result in nearly 2000 fixed effects. This increases the likelihood of (near) singular matrices in the computation of the standard errors and thus them being invalid. It is also worth noting that while samples are stratified by region and industry in a country, this does not mean that they are simultaneously stratified along those dimensions, only separately. While this naturally lowers the number of fixed effects to be considered in the first place, it also means that identification of an effect of foreign ownership separately from the fixed effect becomes exceedingly difficult.

The outcome variable of interest is (the log of) productivity. Unfortunately, the nature of the surveys and the information available put a significant constraint on how to compute the dependent

variable. The use of sophisticated methods to conduct total factor productivity (TFP), e.g. Olley and Pakes (1996), Levinsohn and Petrin (2003) or Ackerberg et al. (2006) requires time series information, which is available in a very limited fashion, as discussed above, and thus renders using these methods infeasible. Thus, simpler definitions must be used. Most results are shown using a simple measure of labor productivity, output per worker (in logs). Since there is information on inputs other than labor, such as intermediate inputs, a measure of value added per worker can also be constructed. Finally, TFP is calculated following the methodology used by Asker, Collard-Wexler and de Loecker (2014), discussed in more detail below. Note that there are more missing values for the various input measures than for output or employment, so the sample size becomes smaller with the use of alternative productivity measures.

Foreign owned firms on average differ from domestically owned firms in a number of dimensions. The Enterprise Surveys collect data on some of these and thus they can be controlled for in order to ensure that any correlation between foreign ownership of a firm and productivity is not spurious. Moreover, this allows some inference on the channels of superior productivity of foreign firms. Spurious results due to omitted variables are less of a concern with respect to the correlation found between productivity and foreign presence at the sector level. The reason is that there would have to be a correlation between those firm characteristics and the share of foreign firms in a sector. For example, even if foreign firms are more likely to be exporters, that does not necessarily imply a larger (or smaller) share of foreign firms in a particular industry. The data allow for controling for a number of the characteristics often associated with foreign ownership. These are the share of skilled workers, a firm's export status, whether it imports intermediate inputs, whether it is part of a multiplant firm and its age. In addition, a control for capacity utilization is included. Firms in developing countries are more likely than those in developed countries to under-utilize their capacity. This could be due to insufficient demand, power outages or the unavailability of parts, among others, as noted by respondents in the surveys themselves.[6]

While the issue of outliers is dealt with further below, even the broadest sample drops some observations from the original data. An important issue for survey data is potential measurement error. The survey data contain two variables from the person giving a particular survey. They indicate how truthful they think the answers given are and whether the numbers are reliable. Note that the two are not the same. For example, a firm representative may give a number

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[6]Recall that the main intent in conducting these surveys was to learn more about the specific constraints firms in developing countries face in their everyday operations.

Table 2: Summary Statistics

Variable	Mean	Median	Std. Dev.	Min	Max
All Firms (37,542 observations)					
Log Labor Productivity	9.747	9.797	1.525	-5.855	27.302
Value Added per Worker	9.185	9.200	1.484	0.526	27.302
TFP	5.689	5.627	1.161	-7.764	23.137
Foreign Ownership Firm	0.102	0	0.282	0	1
Foreign Ownership Sector	0.172	0.114	0.178	0.000	0.995
Foreign Ownership Sector, by Region	0.145	0.058	0.196	0.000	0.998
Skilled Worker Share	0.236	0.200	0.188	0	1
Exporter	0.336	0	0.472	0	1
Imported Inputs	0.561	1	0.496	0	1
Multiplant Firm	0.135	0	0.342	0	1
Capacity mostly utilized	0.891	1	0.312	0	1
Age	17.917	13	17.731	-1	617
Domestic Firms Only (32,609 observations)					
Log Labor Productivity	9.659	9.716	1.487	-5.855	27.302
Value Added per Worker	9.101	9.125	1.447	0.526	27.302
TFP	5.624	5.568	1.137	-7.764	23.137
Foreign Ownership Sector	0.158	0.099	0.166	0	0.995
Foreign Ownership Sector, by Region	0.130	0.042	0.182	0	0.998
Skilled Worker Share	0.235	0.200	0.187	0	1
Exporter	0.288	0	0.453	0	1
Imported Inputs	0.524	1	0.499	0	1
Multiplant Firm	0.110	0	0.313	0	1
Capacity mostly utilized	0.889	1	0.314	0	1
Age	17.778	13	17.332	1	617

that truly represents the most honest estimate of the amount of sales during the previous year, but did not consult any books to come up with that number. In that case, the answer may be considered truthful, but unreliable. All observations flagged as either 'not truthful' or as 'arbitrary and unreliable numbers' are dropped. The Appendix provides a detailed description of how the dataset used in the empirical analysis was constructed from the raw data provided by the World Bank.

Table 2 provides summary statistics for the variables used in the regressions, separately for all firms and private domestic firms only.[7] Foreign owned firms are far more productive than private domestic firms. While the difference looks small in log terms, there is almost a one hundred percent

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[7]All variables measured in local currency were converted to U.S. dollars and then deflated with a U.S. GDP deflator.

advantage at the median in levels, $32,698 versus $16,586 for domestic firms.

Before turning to a discussion of the results, it is instructive to characterize the productivity data visually. The map in Figure 1 below shows the different productivity quartiles in the data. All colored/shaded countries are included in the sample. Shown is median labor productivity (in levels) in different quartiles. The top quartile consists of China and several Latin American countries, but also includes three countries in Africa (one of them is South Africa) and three in Eastern Europe. None of the Latin American countries, but many in Africa and some in Asia are in the bottom quartile. Overall, the distribution of labor productivity across countries is largely in accordance with intuition and significantly correlated with per capita GDP.[8]

Figure 1: Median Labor Productivity (in levels), Quartiles
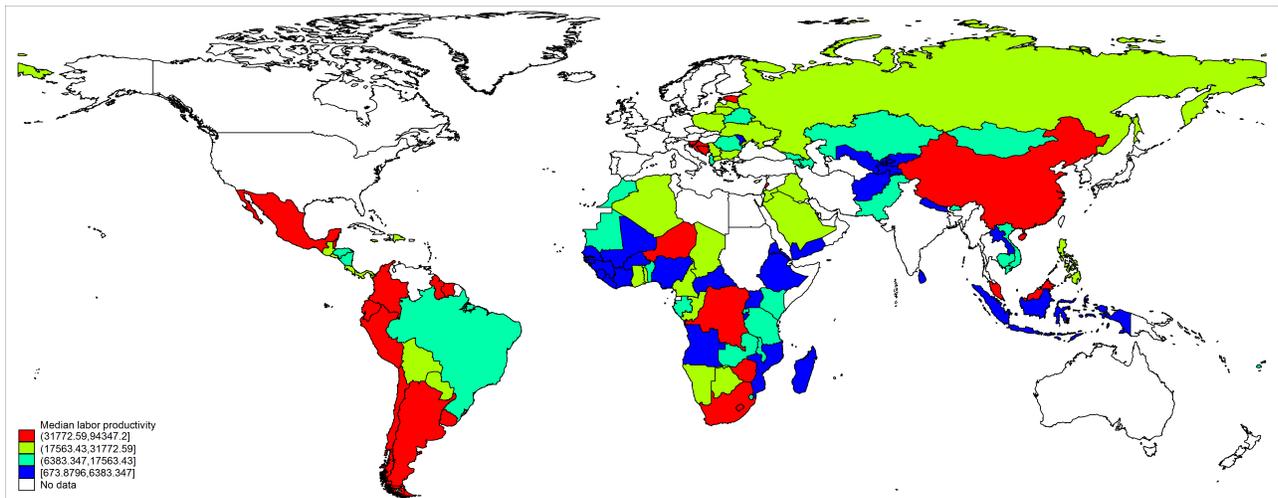
6 Foreign Ownership and Productivity

6.1 Basic Results

This section presents the basic correlations between foreign ownership of the firm, foreign presence in a sector and labor productivity. The robustness of the results to the productivity measure is investigated below by using value added or total factor productivity. These regressions are not chosen as the basic results since the sample size is much lower due to missing data needed to construct these measures.

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[8]In the sample of 118 countries, the correlation is 0.657 with a p-value of 0.

An important issue for survey data is the representativeness of the sample. In most countries, the sample strata are regions and sectors, as well as firm size. The World Bank made every effort to collect information from firms that, as a whole, are a representative sample of the population of the country in question. However, in several countries there were problems contacting a sufficient number of firms in some regions and some sectors. Hence, weights are provided so that all data can be adjusted to give results that are representative of the population. The main results presented below are adjusted using these weights.[9] Since the foreign presence is measured at the sector level (within a country), standard errors are adjusted for clustering at the country-industry level.[10] Unobserved heterogeneity and local characteristics are likely to matter in such a large cross-country sample, as discussed above. Hence, the basic results all include local fixed effects, which are defined using the regions identified by the surveys within a country. Finally, since surveys were carried out in various years, all regressions also include year fixed effects.[11]

We start by regressing productivity only on the foreign ownership share of an establishment, in addition to the fixed effects. As expected, foreign owned firms are more productive, which is indicated by the positive and highly statistically significant coefficient on that variable in column (1) of Table 3. When we include the foreign presence at the sector level next, it is shown to be positively correlated with productivity, but is not statistically significant at conventional levels. Also, when only a sample of domestically owned firms is used in column (3), the coefficient remains positive, but insignificant. This indicates that firm productivity is not affected by foreign firm presence in the same sector.

The regressions thus far have not included sector fixed effects. It is possible that there are common shocks affecting a particular sector across countries that are correlated with productivity. Thus, columns (4)-(6) additionally include industry fixed effects. The caveat of including these is that not all sectors are defined uniformly across countries. For example, smaller countries sometimes only distinguish manufacturing and services whereas larger countries include 2-digit SIC codes. All unique sectors get their own fixed effects. The main result remains: foreign presence at the sector level is positively correlated with productivity. Now, however, this effect is marginally significant and positive for domestic firms only (column 6), suggesting the possibility of domestic

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[9]There are three different types of weights provided, strict, median and weak weights. The main results shown use the strict weights. The sensitivity of results to using one of the other two weights (which are highly correlated at 0.993) as well as no weights are addressed in Appendix Table A2.

[10]In the broad sample, there are 1018 such clusters.

[11]Year fixed effects are of minor importance. However, the omission of location fixed effects affects the results, as also shown in Table A2.

Table 3: Full Sample Basic Results

Dependent Variable	Labor Productivity							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foreign Ownership Firm	0.789***	0.788***		0.733***	0.739***		0.702***	
	(0.214)	(0.217)		(0.184)	(0.184)		(0.186)	
Foreign Ownership Sector		0.487	0.580		0.195	0.464*	0.216	0.480**
		(0.353)	(0.374)		(0.237)	(0.240)	(0.236)	(0.237)
Firm Size							0.040	0.036
							(0.043)	(0.046)
Observations	37,542	37,542	32,609	37,542	37,542	32,609	37,542	32,609
Adjusted R-squared	0.474	0.475	0.493	0.494	0.494	0.511	0.495	0.511
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	No	Yes	Yes	Yes	Yes	Yes
F(.)	37.55	12.29	12.00	35.80	35.89	26.13	35.49	25.31
Prob.>F	0	0	0	0	0	0	0	0

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

firms benefiting from foreign firm presence. In order to rule out that we are detecting a pure size effect (larger firms having grown larger due to their productivity advantage), columns (7) and (8) additionally include firm size. The coefficient on this variable is small and insignificant and does not change the previous results. Thus, it is omitted in further regressions.

What do the coefficients say about the size of the MNE premium? Taking the coefficient of 0.739 in column (5) suggest a 73.9 percent premium, which seems reasonable and is in line with other estimates in the literature (see the survey by Lipsey, 2004).[12] A one standard deviation (0.178) increase in the share of foreign ownership in a sector is associated with 8.3 percent higher labor productivity for a domestic firm (column (6): 0.464×0.178). This is economically meaningful, but, as pointed out, statistical significance of that coefficient is marginal.

Wagner (2012) argues that since firms are heterogeneous, one should not just look at differences in means, but differences at other percentiles of the distribution and indeed compare entire distributions. The Kolmogorov-Smirnov test is a non-parametric test for first order stochastic dominance of one distribution over the other. When run on this sample, it clearly shows that labor productivity of firms with foreign ownership stochastically dominates labor productivity of firms without foreign ownership. This turns out to be true for more limited samples and other measures of productivity, considered below, as well. In summary, the evidence is strong that across a very large sample of

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[12]When using a dummy for foreign ownership and the formula $e^{\beta} - 1$, one gets a very similar result.

firms in developing countries, foreign owned ones are more productive than domestic ones. The evidence on firms benefitting from these more productive firms operating in the same sector is a far weaker and only marginally significant for domestically owned firms. We now consider a plethora of extensions and robustness checks and also explore potential channels that may account for this superior productivity.

6.2 Other Determinants of Productivity

Firms are heterogeneous not only with respect to their productivity but across a broader set of characteristics, which may affect productivity. Some of these are unobserved, such as management quality and practices, marketing techniques or brand names. However, there are several available in the data that are identified as possible determinants of productivity in the literature, which can be controlled for. This subsection explores these potential sources of higher productivity. If foreign ownership remain significant, it is an indication that there are other reasons for the superior productivity than the ones that are explicitly controlled for.

We check for the significance of the following firm characteristics. While the literature identifies more than these, we are limited by what is available in the data. First, a measure of human capital, the share of skilled workers, is included, which is intended to capture the firm's absorptive capacity to new technology and knowledge (Cohen and Levinthal, 1989). Next, we include an exporter dummy. The heterogeneous firm literature consistently shows that more productive firms are more likely to be exporters as they are able to spend the fixed cost needed to become an exporter and still compete with local firms (Melitz, 2003). There is strong empirical support for this notion (Bernard et al., 2003, and the surveys of Wagner (2007) and Wagner (2012)). While cross-country firm-level analyses for developing countries in particular remain scarce, recently Foster-McGregor, Isaksson and Kaulich (2014) have found support for a positive export-productivity relationship in a large dataset of 19 Sub-Saharan African countries. Almeida and Fernandes (2008), using data from the Investment Climate Survey for 43 countries 2002-2005, show that exporting (and importing) activities are important channels for the transfer of technology.

Imported intermediate inputs can be the source of productivity improvements as they may include advanced technology or be of higher quality than domestically sourced ones (Amiti and Konings, 2007). But Augier, Cadot and Dovis (2013) for example have shown that the effect of a firm's decision to source intermediates abroad on productivity critically depends on its capacity to absorb technology as measured by the proportion of skilled labor. The regression thus also contains

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an interaction of the share of imported intermediates with the share of skilled labor, which acts as a proxy for the absorptive capacity of the firm. Multi-plant firms also tend to be more productive since this is indicative of a larger and more successful firm (Bernard and Jensen, 2007). Finally, many new establishments start out with lower productivity and may not survive, which is why the age of a firm is generally positively correlated with productivity (Bernard and Jensen, 2007).

For these data, which contain many low-income countries, another control is important. Recall that the primary motivation behind conducting these surveys by the World Bank has been to learn about obstacles facing firms in those countries, such as power outages, delays in obtaining water access, export licenses or input shipments, and the need to pay in order to get permits or any of these inputs. As a result, firms are often unable to operate at full capacity. Hence, we also include a measure of capacity utilization in order to control for the simple fact that a firm is not running at full capacity while it may retain its employees. We include a dummy that indicates whether an establishment operates at least at 50 percent of its capacity.

Again, it is important to stress that including these productivity determinants tells us something about the reasons for the positive correlation between foreignness and foreign presence and productivity. Except for age, all the variables are positively and statistically significantly correlated with foreign ownership. That is, foreign firms are more likely to be exporters, be part of a larger firm, use most of their capacity and have a higher share of skilled workers. This explains why countries are keen on attracting foreign firms as they have these characteristics that are in turn positively correlated with productivity. Still, if after including these controls, foreign ownership remains positively correlated with productivity, there are other, unobserved, channels as enumerated above that account for this higher productivity.[13]

Table 4 shows the results. The first six columns include the additional determinants of productivity one at a time, columns (7), all firms, and (8), domestic firms only, include them all simultaneously.[14] First note that all six productivity determinants are positively correlated with productivity, as expected; for imported inputs, this is true for the interaction term with skilled labor. All except the age of an establishment are also statistically significant when entered separately. This remains the case when all are entered simultaneously, except the share of skilled workers loses

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[13]Credit constraints could be another reason for the superior measured productivity of foreign firms. The data contain a measure of how severe such constraints are perceived to be. Unlike the objective characteristics investigated in this section, it is subjective and thus not included. In any case, when such a variable is included in these regressions, it is never significant.

[14]While some of these characteristics are correlated with each other, none of the correlations are very high so that multicollinearity should not be a concern. As shown in the correlation matrix in Appendix Table A5, the highest correlation outside of the interaction term and one of its elements is 0.31.

Dependent Variable	Labor Productivity							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foreign Ownership Firm	0.703***	0.657***	0.574***	0.628***	0.617***	0.740***	0.362**	
	(0.171)	(0.179)	(0.151)	(0.181)	(0.150)	(0.182)	(0.150)	
Foreign Ownership Sector	0.137	0.183	0.171	0.258	0.230	0.178	0.238	0.454
	(0.299)	(0.236)	(0.295)	(0.234)	(0.306)	(0.235)	(0.291)	(0.331)
Skilled Worker Share	0.837**						0.132	0.156
	(0.364)						(0.467)	(0.483)
Exporter		0.218**					0.196*	0.197*
		(0.091)					(0.104)	(0.108)
Imports inputs			-0.291				-0.248	-0.281
			(0.203)				(0.207)	(0.220)
Imported inputs * Skill			1.813***				1.429**	1.597**
			(0.475)				(0.673)	(0.688)
Multiplant firm				0.334***			0.243**	0.266**
				(0.106)			(0.120)	(0.123)
Capacity mostly utilized					0.275*		0.258*	0.302*
					(0.151)		(0.153)	(0.163)
Age						0.004	0.003	0.003
						(0.004)	(0.004)	(0.004)
Observations	33,458	37,498	33,041	32,182	34,074	36,925	27,701	24,319
Adjusted R-squared	0.504	0.497	0.514	0.498	0.487	0.495	0.506	0.525
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F(.)	39.95	32.06	58.18	52.93	32.95	47.40	44.93	38.96
Prob.>F	0	0	0	0	0	0	0	0

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

its significance, likely because of the inclusion of its interaction with imported inputs. As theory predicts, a greater share of skilled workers, being an exporter or a multi-plant firm, and using most of one's capacity all raise productivity. The insignificance of age is likely due to the fact that this is the age of the establishment, not the parent firm in the case of a multinational, which biases age downward.

The coefficients and significance levels of the foreign ownership and sector foreign presence variables now indicate whether there is an effect of foreignness on productivity beyond what is working through these factors that are controlled for. Foreign ownership at the firm level remains highly statistically significant. The magnitude of the coefficient changes moderately when one of the new variables is included at a time, but is cut in half, to 0.362, when all are entered simultaneously.

Thus, these determinants of productivity that are correlated with foreignness of a firm reduce, but do not eliminate the productivity advantage of such firms. The positive coefficient on the sector level presence of foreign firms remains statistically insignificant for all firms and now also loses its marginal significance in the sample of domestic firms only, i.e. domestic firms do not appear to be benefitting from foreign firm presence.

We now turn to a more detailed exploration of whether outliers may be a problem in these data and affect the results.

6.3 Outliers

Firm survey data show a great deal of heterogeneity, particularly in productivity. For the most part, this appears to be a regular feature of such data and thus a true description of reality. Syverson (2011) in his survey article documents the great productivity heterogeneity even within narrowly defined industries, which is very robust across countries and time in many studies. Dispersion tends to be greater in low- than in high-income countries. In our broad sample, for example, the ratio of productivities at the 90th to 10th percentile is 41.5 and even at the 75th compared to the 25th percentile it is still 7.5. Recall that this is after addressing potential measurement error already by removing observations for which the surveyor has doubts about the accuracy of the data or the veracity of the respondent.[15] Even so, measurement error may remain an important concern, not only in the productivity measure, but other variables as well. For example, Verardi and Wagner (2012) find that after removing outliers, there is no longer a productivity premium for German firms exporting to the euro area relative to non-exporters. Thus, this subsection utilizes an additional, more formal econometric way to identify outliers in the data, remove them and then re-estimate the model.

Outliers may come in three different flavors (see Rousseeuw and Leroy, 1987), observations that are outlying in the y-, but not the x-dimension; observations that are outlying in the x-dimension and are far from the regression line; and observations that are outlying in the x-dimension, but are close to the regression line nonetheless. These affect slope and intercept coefficient estimates to varying degrees, but must all be dealt with. Yohai (1987) defines a class of estimators he calls MM-estimators in order to deal with the problems of such outliers and identify them. Basically, the idea is to avoid minimizing the sum of squared residuals, as the OLS estimator does, since this gives outsized weight to outliers, especially those that are outlying in both dimensions. The

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[15] These ratios are of course considerably smaller, on average, within an industry in a specific country.

MM-estimator for panel data was proposed by Bramati and Croux (2007) and its implementation in Stata is described in Verardi and Croux (2009). However, this estimator becomes problematic in the presence of dummy variables. A very similar estimator, called an MS-estimator is able to deal with dummy variables, because it alternates a so-called S-estimator (for continuous variables) and an M-estimator (for dummy variables) (Verardi and Croux, 2009) and is thus used.[16]

For the basic sample without additional controls, this procedure identifies 2,188 outliers whose removal thus reduces the sample size by almost 6 percent. Column (1) of Table 5 re-estimates the simplest regression [from column (2) of Table 3] with outliers removed. The coefficient on foreign ownership at the firm level is almost unchanged and remains highly statistically significant. While the coefficient on sector level presence of foreign-owned firms becomes smaller, it remains statistically insignificant. When the regression is re-run on the sample of remaining domestic firms only, the marginal statistical significance found before is lost. It thus appears that the tenuous positive correlation between foreign firm presence in a sector and productivity of domestic firms is possibly due to outliers in the data and the conclusion is that no statistically significant correlation appears to exist for any type of firm. Note the increase of the adjusted R^2 from 0.474 to 0.581, suggesting that this procedure indeed removes excessive noise in the data.[17] The R^2 rises further to 0.609 in column (3) when industry fixed effects are included. In that case, the coefficient on the foreign firm presence at the sector level is almost zero.

Columns (5) and (6) show the results from repeating the same exercise with the additional control variables included. The outlier identification procedure was repeated for this case, resulting in the identification of 1,487 outliers, which is just over 5 percent of the sample. Again, the coefficient on foreign ownership at the firm level remains positive and significant, although it again becomes much smaller. The coefficient on foreign sector presence remains statistically insignificant. Interestingly, some of the additional determinants of productivity now also become insignificant, the skilled workers share and its interaction with imported inputs. Exporters, multiplant firms and those with high capacity utilization remain more productive.

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[16]Verardi and Croux (2009) discuss the shortcomings of other estimation methods that are supposedly robust to outliers and implemented in Stata, such as robust regression (command *rreg*) and quantile regression (command *qreg*).

[17]The productivity ratios fall noticeably: from 41.5 to 31.6 for the 90th relative to the 10th percentile; from 7.5 to 6.7 for the 75th relative to the 25th percentile.

Dependent Variable	Labor Productivity					
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign Ownership Firm	0.675***		0.633***		0.244**	
	(0.215)		(0.164)		(0.0993)	
Foreign Ownership Sector	0.313	0.278	0.0594	0.197	-0.140	-0.155
	(0.317)	(0.307)	(0.195)	(0.162)	(0.191)	(0.205)
Skilled Worker Share					0.622	0.694
					(0.413)	(0.427)
Exporter					0.246***	0.241***
					(0.082)	(0.080)
Imports inputs					0.018	0.054
					(0.122)	(0.135)
Imported inputs * Skill					0.147	-0.035
					(0.397)	(0.441)
Multiplant firm					0.247**	0.333***
					(0.104)	(0.111)
Capacity mostly utilized					0.230**	0.174*
					(0.092)	(0.100)
Age					0.003	0.002
					(0.002)	(0.003)
Observations	35,354	30,815	35,354	30,815	26,214	23,096
Adjusted R-squared	0.581	0.592	0.609	0.618	0.619	0.629
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Location Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	Yes	Yes	Yes	Yes
F(.)	22.14	24.23	78.40	67.96	100.4	113.1
Prob.>F	0	0	0	0	0	0

Table 5: Outliers Removed

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6.4 Sensitivity to Level of Unobserved Heterogeneity

While year, location and sector fixed effects account for unobserved heterogeneity along those dimensions, it is conceivable that there is heterogeneity along several dimensions simultaneously. For example, an industry could face an idiosyncratic shock in a country due to a new regulatory law or a specific trade restriction, none of which affect the same industry in another country, at least not directly. Separate country and industry fixed effects would not account for this. Table 6 thus presents results that include fixed effects along more than one dimension.

The first column includes Location-Industry fixed effects, η_{lj}, instead of location and industry fixed effects separately, in order to account for unobserved industry shocks that may be specific to a particular region within a country. These do not affect the result that foreign-owned firms are more productive and the foreign presence in a sector is associated with higher productivity, though again, the latter remains statistically insignificant. The regression fit increases to a R^2 of 0.62.

One might think that there are perhaps few shocks that are isolated to a particular region within a country. For example, regulatory laws affecting specific industries tend to be implemented at the national level in most countries. The same is true for trade restrictions or subsidies affecting a sector. Thus, instead of location-industry, we include country-industry fixed effects, τ_{cj}, next. However, in order to be able to do so, one other change is needed. The measure of foreign presence at the sector level is computed at the country-industry level. Therefore, it is perfectly collinear with country-industry fixed effects. It is possible to include these effects along with a foreign sector presence if the latter is instead computed separately for each region within a country and that is what is shown in column 2.[18] The coefficient on the sector presence is slightly larger than it was in the first column and attains marginal statistical significance. Foreign ownership at the firm level is still significantly correlated with productivity. Thus, accounting for these different levels of possible sources of unobserved heterogeneity does not invalidate the basic results.

The next two columns show results including year indicators along other dimensions. Column (3) includes year-location fixed effects, which account for possible regional shocks at specific times. This hardly changes the basic result, both in size of the coefficients of interest and statistical

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[18]Calculating the foreign sector presence at the local level instead of at the country level was not chosen as the basic specification for several reasons. In many countries, there are no clear impediments to economic activity crossing region borders and thus not much reason to believe that firms would be unaffected by foreign firm presence in the same sector, but a different region. Going to such a fine level also means that there are a significant number of location-industry combinations that have very few firms in them, which thus produces some extreme outliers in the foreign sector presence measure. Recall that sample stratification is along regions and industries separately, not simultaneously.

Table 6: Robustness Unobserved Heterogeneity

Dependent Variable	Labor Productivity						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Foreign Ownership Firm	0.444***	0.568***	0.739***	0.568***	0.244*	0.362**	0.208
	(0.125)	(0.164)	(0.184)	(0.166)	(0.132)	(0.150)	(0.173)
Foreign Ownership Sector	0.404		0.186		-0.0720	0.231	
	(0.466)		(0.239)		(0.582)	(0.292)	
Foreign Ownership Sector Location		0.529*		0.523*			0.455
		(0.300)		(0.307)			(0.377)
Skilled Worker Share					-0.0303	0.130	0.289
					(0.544)	(0.468)	(0.436)
Exporter					0.281***	0.195*	0.179
					(0.095)	(0.104)	(0.117)
Imports inputs					-0.295*	-0.247	-0.429**
					(0.172)	(0.207)	(0.217)
Imported inputs * Skill					1.512**	1.429**	1.660**
					(0.666)	(0.674)	(0.645)
Multiplant firm					0.208*	0.241**	0.259*
					(0.115)	(0.120)	(0.141)
Capacity mostly utilized					0.134	0.262*	0.215
					(0.171)	(0.154)	(0.178)
Age					0.006	0.003	0.004
					(0.005)	(0.004)	(0.005)
Observations	37,542	37,542	37,542	37,542	27,701	27,701	27,701
Adjusted R-squared	0.620	0.473	0.493	0.470	0.637	0.506	0.483
Year Fixed Effects	Yes	Yes	No	No	Yes	No	No
Industry Fixed Effects	No	No	Yes	No	No	Yes	No
Location-Industry Fixed Effects	Yes	No	No	No	Yes	No	No
Country-Industry Fixed Effects	No	Yes	No	No	No	No	No
Year-Location Fixed Effects	No	No	Yes	No	No	Yes	No
Year-Industry-Country Fixed Effects	No	No	No	Yes	No	No	Yes
F(.)	11.05	22.55	43.41	6.217	9.727	51.96	2.326
Prob.>F	0	0	0	0	0	0	0

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

significance. Similarly, adding the time dimension to the country-industry fixed effects, χ_{tcj}, almost exactly replicates the results in column (2) without the time dimension. Thus it appears that adding year fixed effects separately is adequate to account for the fact that the surveys were carried out in different years in different countries.

The next three columns repeat the exercise including the additional determinants of productivity identified above. Since again including country-industry or year-country-industry effects produces essentially identical results, only results are shown using the latter. Columns (5) and (6) show that the inclusion of additional variables in the presence of location-industry or year-location fixed effects again attenuates the coefficient on firm level foreign ownership without a loss in statistical significance. Foreign sector presence remains not associated with productivity. Only the inclusion of year-industry-country fixed effects (and again measuring foreign sector presence at the regional level) results in a loss of statistical significance for foreign ownership at the firm level.

Overall, we thus conclude that accounting for unobserved heterogeneity as we have done is unlikely to generate the observed foreign ownership and presence-productivity relationship we have found. Next, we turn to examining different productivity measurements.

6.5 Productivity Measurement

Data limitations dictate how productivity is measured. In order to obtain the broadest sample, a simple labor productivity measure, output per worker, has been employed thus far. Still, it is possible and desirable to utilize other, more complex productivity measures, which, however, comes at the cost of a smaller sample size. The first alternative measure is value added per worker. Value added is calculated by subtracting the value of intermediate inputs from output.[19] The results for the basic specification with all sets of fixed effects, for domestic firms only and repeating the exercise with the additional productivity determinants included are shown in columns (1)-(4) of Table 7. The results are nearly the same as before. There is a positive and highly significant correlation between foreign ownership of a firm and productivity, whose magnitude is approximately cut in half when additional firm determinants of productivity are included. There is no significant effect of foreign firm presence at the sector level for all firms, but a marginally significant effect for domestic firms only.

A more comprehensive and widely used productivity measure is total factor productivity (TFP).

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[19]Many firms also have information on other inputs, such as energy or water. Subtracting those from output in addition to the intermediate inputs produces very similar results.

Table 7: Different Dependent Variables

Dependent Variable	Value Added per Worker				TFP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foreign Ownership Firm	0.700***		0.379***		0.638***		0.391***	
	(0.155)		(0.133)		(0.158)		(0.142)	
Foreign Ownership Sector	0.186	0.569*	0.262	0.549*	-0.258	0.116	-0.374	-0.0337
	(0.348)	(0.334)	(0.313)	(0.319)	(0.339)	(0.347)	(0.331)	(0.355)
Skilled Worker Share			0.277	0.290			-0.311	-0.272
			(0.477)	(0.497)			(0.391)	(0.401)
Exporter			0.106	0.093			0.290***	0.288***
			(0.108)	(0.114)			(0.072)	(0.085)
Imports inputs			-0.120	-0.098			-0.153	-0.148
			(0.171)	(0.176)			(0.122)	(0.130)
Imported inputs * Skill			0.922	0.945			1.122**	1.161**
			(0.625)	(0.607)			(0.514)	(0.520)
Multiplant firm			0.259*	0.272*			0.183*	0.194*
			(0.147)	(0.161)			(0.109)	(0.107)
Capacity mostly utilized			0.222	0.250			0.0180	0.033
			(0.140)	(0.154)			(0.116)	(0.129)
Age			0.003	0.003			0.004	0.004
			(0.003)	(0.004)			(0.003)	(0.003)
Observations	30,550	26,764	23,578	20,851	22,440	19,835	18,373	16,285
Adjusted R-squared	0.511	0.520	0.518	0.529	0.399	0.394	0.435	0.433
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F(.)	28.72	22.53	45.81	50.72	25.05	26.58	34.40	27.32
Prob.>F	0	0	0	0	0	0	0	0

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

The cross-sectional nature of the data here preclude computing TFP with methods proposed by Olley and Pakes (1996), Levinsohn and Petrin (2003) or Ackerberg et al. (2006).[20] Instead, we follow Asker, Collard-Wexler and de Loecker (2014) and compute TFP as follows. Consider a standard Cobb-Douglas production function for firm i

$$Y_i = A_i K_i^{\alpha_K} L_i^{\alpha_L} M_i^{\alpha_M} \tag{3}$$

where K_i is capital, L_i is labor and M_i are materials. Assuming constant returns to scale, $\alpha_K + \alpha_L + \alpha_M = 1$. Combining this production function with a constant elasticity demand curve facing the firm, $Y_i = B_i P_i^{-\epsilon}$, yields what can be termed a sales-generating production function

$$S_i = \Omega_i K_i^{\beta_K} L_i^{\beta_L} M_i^{\beta_M}$$

where $\Omega_i = A_i^{1-\frac{1}{\epsilon}} B_i^{\frac{1}{\epsilon}}$, and $\beta_x = \left(1 - \frac{1}{\epsilon}\right) \alpha_x$ for $x \in \{K, L, M\}$. TFP is defined as $\omega_i \equiv \ln(\Omega_i)$. In order to obtain the TFP measure, the coefficients β_x must be computed, which is done by country and industry, i.e. the β's and thus the production function is country and industry specific. Without adjustment costs, profit maximization implies that each of these coefficients equal the share of the inputs' expenditure in sales:

$$\beta_x = \frac{P_i^X X_i}{S_i} \qquad \text{for } X \in \{L, M\}$$

Because of constant returns to scale, $\beta_K = \frac{\epsilon-1}{\epsilon} - \beta_L - \beta_M$. As in Asker, Collard-Wexler and de Loecker (2014), who themselves follow Bloom (2009), ϵ is set equal to four. We also follow them in using the median of the expenditure share in a given country-industry in order to obtain a robust measure of these shares. For a few cases, the sum of the labor and materials shares exceeds 0.75 (which would imply a negative β_K) and for those cases, we use the country's average coefficient.[21]

Columns (5)-(8) of Table 7 show the results of using this TFP measure again for all firms with and without the additional productivity determinants and for domestic firms only. Foreign owned firms continue to have higher productivity and foreign firm presence in the same industry is not correlated with productivity, including domestic firms only, where the coefficient is now far from statistical significance. Thus, the results are robust and not particularly sensitive to which productivity measure is used. The coefficients on additional productivity determinants remain as predicted by theory, although more lose their statistical significance.

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[20]While encouraging robustness checks, Syverson (2011, p.332) asserts that results from productivity studies are generally robust to the choice of how to measure TFP because the variation inherent in micro data is likely to dominate differences in productivity due to the choice of productivity metrics.

[21]The sum of the average labor and material coefficient exceeds 0.75 for only one country, Mauritania, which is dropped from this part of the analysis.

Next, we explore the heterogeneity of results by considering different groups of countries as well as a select group of individual ones.

6.6 Regional and Individual Country Results

While the main contribution of the paper is to document the relationship between foreign ownership and productivity across a large sample of developing and transition countries, it is also interesting to check whether the conclusions drawn apply equally to major world regions. For example, Asiedu (2002) finds that sub-Saharan African countries are systematically different along several dimensions from countries elsewhere. Moreover, if we are to draw policy implications for developing countries generally, differences across regions would impact these depending on a country's location and status. Thus, we present results from estimating the productivity-foreign ownership relationship separately for large groups of countries: Latin America, Transition countries of Europe and the former Soviet Union, Africa, and Asia.[22]

Table 8 shows results from the basic specifications with and without the additional controls.[23] Results are broadly consistent with the aggregate ones, although there are some interesting differences for some regions. In the basic specification without additional firm controls, all regions show higher productivity in foreign owned firms. However, this coefficient becomes insignificant for both Latin America and Asia when additional productivity determinants are added. None of the regions show a statistically significant positive correlation between foreign ownership at the sector level and productivity.[24] Indeed, there is a statistically significant negative relationship in Transition countries and Asia when productivity is measured by TFP (see Table A3 in the Appendix). Thus, there is some indication that sometimes competition effects are detrimental to the productivity of domestic firms, which is in line with, for example, the early findings of Aitken and Harrison (1999) for Venezuela. For Latin America, imported inputs and exporter status appear to explain the higher productivity apart from foreign ownership status. Capacity utilization matters in Transition countries, whereas in Africa older firms are also more productive, as well as those with greater absorptive capacity. For both Africa and Asia, multiplant firms are significantly more productive.[25]

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[22]Omitted are countries from the Middle East and Caribbean and Pacific Island nations. Both groups are too small to yield meaningful results.

[23]Appendix Table A3 shows additional results: the effect on domestic firms only and using TFP as the dependent variable.

[24]This is also true for the sample of domestic firms only, as shown in Appendix Table A3.

[25]This variable is omitted for transition countries since it is missing for such a large number of firms that the sample would be cut by more than half. Still, all other results are unchanged in such a smaller sample.

Table 8: Regional Results

Region Dependent Variable: Labor Productivity	Latin America	Latin America	Transition Countries	Transition Countries	Africa	Africa	Asia	Asia
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foreign Ownership Firm	0.907***	0.0618	0.722***	0.595***	0.632***	0.458***	0.648**	0.279
	(0.314)	(0.249)	(0.192)	(0.215)	(0.0938)	(0.085)	(0.253)	(0.200)
Foreign Ownership Sector	0.280	-0.092	-0.216	-0.0613	0.320	0.238	-1.329	-0.482
	(0.213)	(0.447)	(0.203)	(0.235)	(0.208)	(0.156)	(1.101)	(0.824)
Skilled Worker Share		-0.578		0.275		0.642***		0.254
		(1.017)		(0.280)		(0.187)		(0.609)
Exporter		0.853*		0.177*		0.230***		0.116
		(0.498)		(0.093)		(0.079)		(0.104)
Imports inputs		-0.723		0.119		0.097		-0.018
		(0.574)		(0.137)		(0.068)		(0.258)
Imported inputs * Skill		4.006***		0.507		0.465**		0.201
		(1.259)		(0.365)		(0.206)		(0.900)
Multiplant firm		0.111				0.214***		0.270*
		(0.337)				(0.060)		(0.141)
Capacity mostly utilized		-0.214		0.562***		0.049		0.225
		(0.218)		(0.141)		(0.066)		(0.271)
Age		0.008		-0.001		0.008***		-0.002
		(0.008)		(0.004)		(0.002)		(0.005)
Observations	8,742	7,936	7,402	6,650	10,643	8,473	7,523	6,197
Adjusted R-squared	0.225	0.305	0.368	0.416	0.335	0.365	0.581	0.582
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F(.)	310.2	1426	19.58	13.88	46.80	47.09	189.9	123.1
Prob.>F	0	0	0	0	0	0	0	0

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9 shows some results for individual countries. From each country group, the two with the largest sample size were picked. These happen to be countries of general interest and some have been subject to multiple individual country studies. In order to conserve space, the top rows show results from running the regressions without additional productivity determinants and those below the line include them. The individual country results reveal greater heterogeneity than those from major world regions. The productivity advantage of foreign firms ranges from nonexistent in the Ukraine (no statistical significance, although the coefficient is positive) to a 180 percent advantage in Nigeria. Accounting for additional productivity determinants reduces this advantage to zero in most countries, but there remains a statistically significant advantage in Mexico and Nigeria.

More consistent with the aggregate and regional results is the lack of a correlation between foreign presence at the sector level and productivity for most countries. An exception is Nigeria, where the coefficient is positive and significant at the one percent level with and without additional controls, and Mexico where it becomes marginally significant once additional determinants are included. Interestingly, Morocco shows a significantly negative coefficient, again both with and without controls. This could be viewed as an update to Haddad and Harrison (1993) who found a negative, though statistically insignificant, coefficient on the foreign firm presence at the sector level with respect to firm productivity growth. China also has a significantly negative coefficient on foreign ownership at the sector level, although only when additional productivity determinants are included.[26]

A final robustness check is to run all regressions only using surveys conducted after 2005. Questionnaires for the earlier surveys are not as strictly comparable than those used later, although that is not a problem for the variables used in this paper. Selected results of this exercise are shown in Appendix Table A4 and they show no qualitative change in any results. For example, foreign ownership is associated with a 74 percent productivity premium which is cut in half when additional productivity determinants are included.

7 Conclusion

Many countries seek more foreign investment and have designed policies to attract multinational firms. It is therefore important to empirically evaluate the welfare effects of the presence of such firms in an economy. This paper has gone significantly beyond existing single country as well as

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[26] All of the sector presence results also hold when the regressions are run on the domestic firm sample.

Table 9: Individual Country Results

Country	Brazil	Mexico	Bulgaria	Ukraine	Morocco	Nigeria	China	Vietnam
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foreign Ownership Firm	1.431***	1.583***	0.572*	0.676	0.124	1.827***	0.622*	0.422*
No controls	(0.351)	(0.411)	(0.313)	(0.445)	(0.104)	(0.334)	(0.368)	(0.254)
Foreign Ownership Sector	1.064	1.533	0.00441	-0.966	-2.810***	1.511***	-0.633	0.0474
No controls	(0.978)	(0.950)	(0.430)	(0.951)	(0.528)	(0.430)	(0.980)	(0.675)
Foreign Ownership Firm	-0.341	0.751*	0.312	0.0237	-0.0344	1.144***	0.0414	0.232
	(0.487)	(0.393)	(0.390)	(0.620)	(0.105)	(0.288)	(0.217)	(0.175)
Foreign Ownership Sector	0.694	1.237*	-0.636	-0.704	-1.514***	1.177***	-1.934**	0.473
	(2.870)	(0.662)	(0.807)	(2.081)	(0.419)	(0.415)	(0.973)	(0.665)
Skilled Worker Share	-0.917	1.042	1.414	0.917	2.486*	1.106***	1.685***	0.345
	(1.618)	(0.747)	(1.323)	(0.930)	(1.385)	(0.145)	(0.386)	(0.420)
Exporter	0.944**	0.533***	0.357*	0.224	-0.445***	0.785***	0.160*	0.305*
	(0.471)	(0.152)	(0.208)	(0.455)	(0.0726)	(0.127)	(0.0878)	(0.161)
Imports inputs	-1.477*	0.967***	-0.183	0.567	0.330*	-0.132**	0.0155	-0.601***
	(0.784)	(0.273)	(0.477)	(0.633)	(0.175)	(0.062)	(0.267)	(0.230)
Imported inputs * Skill	6.447***	-1.260	0.288	2.727*	0.161	-0.0451	-0.605	2.576***
	(2.271)	(0.952)	(1.775)	(1.578)	(1.395)	(0.461)	(0.992)	(0.538)
Multiplant firm	0.322	0.691***			0.467***	0.300***	0.327**	0.438***
	(0.466)	(0.181)			(0.139)	(0.062)	(0.148)	(0.159)
Capacity mostly utilized	-0.509	0.341**	0.838***	0.449	0.468***	0.003	-0.705*	-0.097
	(0.338)	(0.139)	(0.289)	(0.340)	(0.145)	(0.052)	(0.407)	(0.300)
Age	0.011	0.001	-0.023***	-0.007	0.018***	0.011***	0.002	0.005
	(0.010)	(0.005)	(0.001)	(0.008)	(0.002)	(0.002)	(0.006)	(0.005)
Observations (no controls)	2,473	1,018	808	650	1,303	2,600	1,645	1,889
Observations	2,363	996	684	541	1,195	2,473	1,561	1,808
Adjusted R-squared (no controls)	0.174	0.170	0.132	0.114	0.102	0.167	0.053	0.085
Adjusted R-squared	0.280	0.351	0.268	0.265	0.272	0.251	0.094	0.187
Location Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F(.) (no controls)	11.28	7.970	5.198	4.380	14.89	22.36	1.887	40.06
F(.)	5.307	15.65	4.450	4.407	44.86	24.17	4.140	22.29
Prob.>F	0	0	0	0	0	0	0	0

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

cross-country studies by using detailed firm-level data for 118 developing and transition countries. These Enterprise Survey data are the first time that systematic and comparable data have been collected for the operations of firms in so many countries. The standardization of the question-naires and the inclusion of survey weights ensures that results are comparable across countries and representative of the population of firms.

The focus of the study is on firm productivity, which has been shown to map into aggregate productivity and ultimately economic growth. A robust result is that foreign owned firms are more productive than domestically owned ones across the developing and transitioning world. This superiority itself conveys welfare benefits, such as increased employment in a labor surplus economy and higher incomes. There is little to no indication, however, that there is any effect of the presence of foreign firms at the sector level on other firms, foreign or domestic. Doing the analysis separately for major world regions broadly confirms this result, although there is some heterogeneity across individual countries, including some evidence of negative effects.

The results are robust to many economic and econometric specifications. Accounting for un-observed heterogeneity is crucial in a large cross-country context, but results are shown not to be sensitive to the specification of fixed effects. The paper does demonstrate, however, that exclusion of location fixed effects, as well as of survey weights, does lead to different and misleading results. Eliminating outliers from the data through a careful econometric procedure only strengthens the conclusion that any positive correlation between foreign presence in a sector and firm productivity is tenuous.

The results hold up for different measures of productivity, from labor productivity to value added per worker to total factor productivity. In order to explore possible channels of foreign superiority, other known determinants of productivity are then included in the regressions. Human capital, exporter and multiplant status, imported intermediate inputs and capacity utilization are all found to be positively correlated with firm productivity. Their inclusion reduces the size of the foreign productivity advantage by roughly 50 percent, but does not eliminate it, suggesting that there are other foreign firm characteristics that matter. These include management quality and practices, marketing techniques, brand names and other knowledge that may be embodied in products and services. They are unobservable in these data, but should be explored in future work.

The most important next step in the analysis of foreign ownership and productivity is to con-struct panel data, i.e. survey the same firm repeatedly. The Enterprise Surveys have done this in a limited set of countries and for a very limited set of firms. The availability of a sufficient

number of panels in the future will allow the researcher to deal with simultaneity bias and control for unobserved heterogeneity at the firm level through the inclusion of firm fixed effects. Still, we believe that the present paper makes an important contribution to our understanding, broadly, of the effect of foreign ownership of firms in developing and transition countries.

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Appendix

Construction of the data set

The World Bank makes the raw data, along with the questionnaires and implementation notes for each country, available for download at the Enterprise Survey web site enterprisesurveys.org for registered researchers. From each individual country file, only the information and variables needed are extracted and renamed. This is done since there are a few files that do not use the variable names common across most countries. For each of these cases, information from the questionnaires was used to determine equivalencies. There are multiple, and different, missing data codes, all of which were converted to a common missing code, period, which is used in Stata. For each country, it was carefully evaluated whether values were in local currency (to be later converted into constant U.S. dollars by using average annual exchange rates and the U.S. producer price index), euros (dto.) or already in U.S. dollars. As part of this process, some obvious mistakes were corrected. For example, some numerical variables were stored as string variables. A unique country code was added before merging all country files into one. GDP and deflator information was then added from the World Development Indicators.

A number of countries were dropped before constructing the variables used in the analysis. These are: all high income countries, Czech Republic, Germany, Greece, Hungary, Ireland, Portugal, Slovak Republic, South Korea and Spain; Venezuela, whose monetary information appears highly implausible upon inspection and which is lacking foreign ownership information in the 2006 survey; countries whose surveys are not comparable and/or are missing lots of important information, such as sales, Oman, Egypt, Bangladesh and the 2005 China survey; and countries that do not have any foreign owned firms, Kosovo, or which no longer have any after removing outliers, Eritrea. This leaves 118 countries, which are enumerated in Table A1 below.

All surveys of specific services sectors such as retail or IT, those only surveying micro enterprises and those designed to gauge the effect of the recent financial crisis are not used. All services sectors are also dropped from the remaining data to arrive at a sample of manufacturing firms only. After finally dropping all observations where the survey giver indicates that answers are either "not truthful" or have "arbitrary and unreliable numbers" and those that do not have foreign ownership, sales or employment information, the broad sample of 37,542 observations results.

Table A1: List of Countries Included (118)

Argentina	Iraq	Gabon	Fiji
Bolivia	Jordan	Gambia	Vanuatu
Brazil	Lebanon	Ghana	Samoa
Chile	Saudi Arabia	Guinea Bissau	Tonga
Colombia	Yemen	Guinea	
Costa Rica		Cote d'Ivoire	Armenia
Dominican Republic	Afghanistan	Kenya	Azerbeijan
Ecuador	Bhutan	Lesotho	Belarus
El Salvador	Cambodia	Liberia	Albania
Guatemala	Sri Lanka	Madagascar	Georgia
Honduras	Indonesia	Malawi	Kazakhstan
Mexico	Laos	Mali	Kyrgiz Republic
Nicaragua	Malaysia	Mauritania	Bulgaria
Panama	Nepal	Mauritius	Moldova
Paraguay	Pakistan	Morocco	Russia
Peru	Philippines	Mozambique	Tajikistan
Uruguay	Vietnam	Niger	Ukraine
	China	Nigeria	Uzbekistan
Antigua & Barbuda		Zimbabwe	Estonia
Bahamas	Algeria	Rwanda	Latvia
Barbados	Angola	Senegal	Montenegro
Dominica	Botswana	Sierra Leone	Lithuania
Grenada	Burundi	Namibia	Mongolia
Guyana	Cameroon	South Africa	Croatia
Belize	Cape Verde	Swaziland	Slovenia
Jamaica	Central African Republic	Tanzania	Macedonia
St Kitts and Nevis	Chad	Togo	Bosnia &
St Lucia	Congo, Rep.	Uganda	Herzegovina
St Vincent and Grenadines	Congo, Dem. Rep.	Burkina Faso	Poland
Suriname	Benin	Zambia	Serbia
Trinidad & Tobago	Ethiopia		Romania

Table A2: Basic Sensitivity

Dependent Variable		Labor Productivity				
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign Ownership Firm	0.832***		0.653***		0.930***	
	(0.173)		(0.038)		(0.230)	
Foreign Ownership Sector	0.269	0.583**	-0.023	-0.032	1.367**	1.771***
	(0.237)	(0.265)	(0.083)	(0.087)	(0.600)	(0.662)
Observations	37,542	32,609	37,542	32,609	37,542	32,609
Adjusted R-squared	0.431	0.439	0.407	0.407	0.301	0.315
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Location Fixed Effects	Yes	Yes	Yes	Yes	No	No
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Weights	Median	Median	No	No	Strict	Strict
Clustering	Yes	Yes	Yes	Yes	Yes	Yes
F(.)	26.07	18.56	45.83	22.17	17.28	18.72
Prob.>F	0	0	0	0	0	0

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

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Table A3: Additional Regional Results

Region	Latin America		Transition		Africa		Asia	
Dependent Variable	Labor Productivity	TFP	Labor Productivity	TFP	Labor Productivity	TFP	Labor Productivity	TFP
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foreign Ownership Firm		0.519		0.767***		0.322***		0.155
		(0.421)		(0.280)		(0.052)		(0.150)
Foreign Ownership Sector	-0.370	-0.101	-0.099	-0.711**	0.153	-0.290	-0.365	-1.069*
	(0.397)	(0.388)	(0.250)	(0.279)	(0.193)	(0.205)	(1.026)	(0.621)
Skilled Worker Share	-0.742	-0.895*	0.371	-0.514	0.549***	0.327**	0.259	-0.378
	(1.030)	(0.518)	(0.298)	(0.434)	(0.171)	(0.139)	(0.631)	(0.540)
Exporter	0.929*	0.458	0.178*	0.269**	0.245**	0.400***	0.114	0.267***
	(0.537)	(0.353)	(0.092)	(0.115)	(0.095)	(0.050)	(0.101)	(0.067)
Imports inputs	-0.789	-0.434*	0.127	-0.199	0.094	0.103**	-0.062	0.0819
	(0.579)	(0.232)	(0.149)	(0.185)	(0.070)	(0.051)	(0.285)	(0.184)
Imported inputs * Skill	4.248***	2.323***	0.527	0.619	0.451**	-0.211	0.342	-0.188
	(1.268)	(0.686)	(0.355)	(0.525)	(0.221)	(0.160)	(0.928)	(0.608)
Multiplant firm	0.0157	-0.179			0.171***	0.274***	0.352**	0.347***
	(0.362)	(0.236)			(0.063)	(0.049)	(0.146)	(0.103)
Capacity mostly utilized	-0.247	0.097	0.580***	0.054	0.018	0.139***	0.316	0.237
	(0.252)	(0.173)	(0.137)	(0.114)	(0.071)	(0.045)	(0.297)	(0.169)
Age	0.009	0.002	3.81e-05	0.009**	0.006***	0.006***	-0.003	0.004
	(0.009)	(0.003)	(0.004)	(0.004)	(0.002)	(0.001)	(0.006)	(0.004)
Observations	7,142	4,904	5,708	3,589	7,420	7,668	5,267	2,643
Adjusted R-squared	0.279	0.354	0.423	0.384	0.363	0.381	0.610	0.568
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F(.)	1100	2006	15.02	4.004	404.0	194.1	100.2	1310
Prob.>F	0	0	0	0	0	0	0	0

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A4: Results from post-2005 surveys only

Region	All	All	All	All	All	Latin America	Transition	Africa	Asia
Dependent Variable	Labor Productivity			Value Added per worker	TFP	Labor Productivity			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Foreign Ownership Firm	0.743***	0.363**	0.230*	0.380***	0.391***	0.049	0.619***	0.537***	0.277
	(0.187)	(0.152)	(0.137)	(0.134)	(0.143)	(0.250)	(0.231)	(0.084)	(0.201)
Foreign Ownership Sector	0.177	0.220	-0.372	0.251	-0.378	-0.132	-0.073	0.246	-0.631
	(0.245)	(0.294)	(0.562)	(0.318)	(0.332)	(0.456)	(0.249)	(0.158)	(0.849)
Skilled Worker Share		0.123	-0.043	0.275	-0.313	-0.613	0.268	0.661***	0.252
		(0.470)	(0.552)	(0.479)	(0.392)	(1.050)	(0.319)	(0.189)	(0.611)
Exporter		0.195*	0.277***	0.105	0.289***	0.853*	0.187*	0.307***	0.117
		(0.104)	(0.096)	(0.109)	(0.072)	(0.507)	(0.099)	(0.068)	(0.104)
Imports inputs		-0.252	-0.300*	-0.120	-0.155	-0.731	0.112	0.113	-0.020
		(0.211)	(0.177)	(0.173)	(0.122)	(0.590)	(0.146)	(0.074)	(0.263)
Imported inputs * Skill		1.436**	1.526**	0.916	1.130**	4.063***	0.572	0.300	0.204
		(0.683)	(0.681)	(0.628)	(0.516)	(1.299)	(0.418)	(0.202)	(0.913)
Multiplant firm		0.241**	0.203*	0.255*	0.183*	0.100		0.219***	0.270*
		(0.121)	(0.117)	(0.149)	(0.109)	(0.341)		(0.061)	(0.141)
Capacity mostly utilized		0.261*	0.132	0.223	0.018	-0.208	0.594***	0.035	0.222
		(0.156)	(0.176)	(0.142)	(0.117)	(0.232)	(0.149)	(0.069)	(0.274)
Age		0.003	0.006	0.002	0.004	0.007	-0.0008	0.006***	-0.002
		(0.004)	(0.005)	(0.003)	(0.003)	(0.008)	(0.004)	(0.001)	(0.005)
Observations	28,723	24,139	24,139	21,203	17,482	6,365	3,346	7,610	5,069
Adjusted R-squared	0.494	0.505	0.634	0.517	0.435	0.304	0.400	0.372	0.580
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location Fixed Effects	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Location-Industry Fixed Effects	No	No	Yes	No	No	No	No	No	No
F(·)	39.18	48.14	7.806	46.91	35.42	266.0	11.24	45.07	123.8
Prob.>F	0	0	0	0	0	0	0	0	0

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A5: Correlation Matrix

	Labor Productivity	Foreign Ownership Firm	Foreign Ownership Sector	Firm Size	Skilled Worker Share	Exporter	Imported Inputs	Imported Inputs * Skill	Multiplant Firm	Capacity mostly utilized	Age
Labor Productivity	1										
Foreign Ownership Firm	0.1662	1									
Foreign Ownership Sector	0.1377	0.2120	1								
Firm Size	0.2620	0.2562	0.0933	1							
Skilled Worker Share	0.2604	0.0321	0.0818	-0.0197	1						
Exporter	0.2381	0.2549	0.1557	0.4662	-0.0002	1					
Imported Inputs	0.1922	0.1877	0.1733	0.2589	0.1249	0.3119	1				
Imported Inputs * Skill	0.2680	0.1238	0.1373	0.1160	0.6593	0.1661	0.6647	1			
Multiplant Firm	0.1563	0.1939	0.0685	0.2493	0.0744	0.1220	0.0991	0.1111	1		
Capacity mostly utilized	0.0528	0.0197	-0.0073	0.0913	-0.0516	0.0518	-0.0210	-0.0478	-0.0048	1	
Age	0.1987	0.0208	0.0638	0.2697	0.1420	0.1466	0.1438	0.1903	0.1186	-0.032	1