Foreign Presence, Spillovers, and Productivity: Evidence from Ghana

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Abstract

This paper investigates the effect of foreign presence on the productivity of manufacturing industries in Ghana, using firm level panel data. We examine both labor and total factor productivity (TFP), which we compute using the Levinsohn and Petrin (2003) methodology. We control for a number of observed factors as well as unobserved heterogeneity in several dimensions. We find robust evidence that the presence of foreign firms in a sector has a negative effect on domestically owned, but a positive effect on most foreign owned firms. Unlike in recent work on China, it does not appear that the negative level effect is compensated for by a positive growth effect, at least not in any reasonable time period. This finding underscores that care must be exercised in extrapolating results from one country to others. We find no evidence of any wage effects.

Keywords: Foreign Direct Investment, Productivity, Spillovers, Firm Level Data, Africa, Ghana.

JEL Classification: O24, O55, F23.

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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). FDI is considered beneficial not only because it brings in much needed capital, but generates employment and presumably contributes to enhanced economic growth as it provides access to advanced technologies and spillovers, technological or otherwise, especially in local manufacturing industries (Borensztein, De Gregorio and Lee, 1998; De Mello, 1999). For the lowest income developing countries, the manufacturing sector in particular is considered a driving force for modernization and job creation. However, some skepticism remains and centers on the repatriation of profits and competition effects which lead to shrinking market shares or exit of domestic firms. Indeed, some studies such as Oteng-Abayie and Frimpong (2006) find that FDI may have a negative impact on GDP growth.

On the microeconomic level, several studies have provided support for doubts about the efficacy of foreign presence in terms of wages or productivity. For example, Aitken and Harrison (1999), in a seminal study of Venezuela, or Aitken, Harrison and Lipsey (1996) for Mexico and Venezuela, have shown negative productivity and wage effects for domestic firms and only small, if any, positive effects overall. On the other hand, Smarzynska Javorcik (2004) has shown positive inter-industry spillover effects from foreign firms in Lithuania. Liu (2008) documents a negative level, but a positive growth effect for China. While the literature on the effects of foreign presence on productivity and wages in developing countries is growing, the evidence is decidedly mixed and varies greatly among countries and industries (see Blomström and Kokko, 1998). This may be particularly true for countries in Africa, specifically sub-Saharan Africa (SSA), which tend to be quite different from countries in Asia or Latin America in many respects (see, for example, Asiedu, 2002, for evidence on the determinants of FDI).

In order to shed light on whether this applies to FDI's impact on the economy as well, this paper

investigates the effect of foreign presence in manufacturing in Ghana on productivity and wages and the possible existence of spillover effects to domestic firms. We do so using recent methodological advances that allow us to obtain a consistent estimate of total factor productivity (TFP) and accounting for unobserved heterogeneity that avoids biased estimates due to self selection and simultaneity. We use data from a survey of over 200 manufacturing firms in the early to mid-1990s. Even though this dataset has been available for a while and is uniquely suited to such an investigation, to date it has not been used for this specific purpose, to the best of our knowledge, as we will document below in our discussion of related literature.

Policies geared towards attracting foreign direct investment presume that foreign firms have higher productivity and that domestic firms stand to gain from the presence of foreign firms. Ghana has had an open trade policy since the beginning of the 1990s and hence constitutes an interesting case study within SSA. We consider the following specific questions. Are foreign firms more productive than domestic firms? Does the presence of foreign firms in a sector have any effect on the productivity of domestic firms? Is a potentially negative level effect compensated for by a positive growth effect and if so, how long will that take? Do the effects depend on controls for observed and unobserved heterogeneity at the industry, firm and regional level?

The findings of this study are interesting and relevant not only for policy decisions in Ghana with regards to its foreign investment regime, but for SSA countries more generally as many become more open to trade and investment flows. Examining Ghana's experience helps shed light on what may be expected for similar countries in the region, more so than studies of countries whose history and characteristics are vastly different from SSA countries. This is especially important considering that the poorest people in the world are overwhelmingly concentrated in SSA.

We find that the presence of foreign firms in a sector has a negative effect on the productivity of domestically owned, but a positive effect on most foreign owned firms, regardless of the productivity

measure. Interestingly, the effect of foreign ownership per se is ambiguous and depends on the model specification. Unlike in recent work on China, it does not appear that the negative level effect from foreign ownership is compensated for by a positive growth effect, at least not in any reasonable time period. We also find that, after controlling for labor quality and unobserved heterogeneity, foreign firms do not pay higher wages in Ghana. However, they also do not appear to have a negative effect on wages paid by domestic firms.

The paper proceeds as follows. The next section provides a brief economic history of Ghana. We then discuss relevant theory and review the related literature, including other work using this dataset, whose description follows. We then present the empirical methodology, which is based on a simple theoretical model and includes a thorough description of TFP measurement. Section 6 discusses the results and Section 7 concludes.

2 Brief Economic History of Ghana

Since gaining independence in 1957, Ghana has experienced a checkered history of economic underperformance interspersed with periods of solid economic recovery. The first few decades after independence were marked by political instability, economic mismanagement and poor economic performance, whereas the last two have seen steady economic growth. Economic liberalization in the 1980s and political liberation in the 1990s appear to be the key reasons for the improved economic conditions in Ghana.

The period immediately following independence was marked by high GDP growth and accelerated economic change (Rimmer, 1992). The economy diversified away from agriculture into large-scale manufacturing and services. Along with these positive changes, the public sector expanded in order to provide social services. However, lack of fiscal prudence led to unsustainable foreign debt and a slowdown in economic growth, resulting in Ghana's first coup d'etat in 1966.

Although the change in government gave way to optimism, lack of commitment to economic reform and further political instability set Ghana on a downward path of growth. Ghanaian companies remained uncompetitive in international markets, due in part to discrimination against foreign companies and an overvalued currency, the Cedi.

Ghana experienced a dramatic economic decline throughout the 1970s and early 1980s. Between 1970 and 1982, GDP per capita fell by 30%, real wages by 80% and the import volume by 66% (Rimmer, 1992). In addition, investment fell from 14% to 2 % while the government deficit rose from 0.4% to 14.6% of GDP. Unfavorable policy making, including fiscal interference with exporting, inflationary financing of government spending and an inflexible exchange rate take the bulk of the blame for this abysmal performance. The oil crisis of 1975 further exacerbated an already worsening economic situation.

The year 1983 marked a turnaround in policy. The Ghanaian government adopted the Economic Reform Program, with support from the International Monetary Fund and the World Bank. Reform consisted of measures such as stabilization of fiscal balances, removal of price distortions, revised interest rates, upward adjustment of wages, adjustment of the exchange rate and encouragement of foreign direct investment and external trade. Following these reforms, GDP reversed its downward trend and had an average annual rate of growth of over 5% for the rest of the 1980s. The economic recovery experienced in the 1980s continued through the 1990s. In 2006, Ghana still had GDP growth of 6.2 % (The World Bank, 2007). Poverty is down from 51% in 1999 to 33.4% in 2005. According to the World Bank, Ghana could be amongst the first sub-Saharan African countries to become middle income over the next few decades. As Ghana celebrates its 50th independence anniversary, it is on a promising path which may in part be due to the presence of foreign investors, whose impact we investigate below. But first, we discuss some theoretical considerations and related literature.

3 Theory and Related Literature

Foreign firms are presumed to have inherent advantages, particularly in scale and technological knowledge and in access to international markets, that allow them to overcome the cost of setting up in a different country and to produce more efficiently (Hymer, 1976; Blomström and Kokko, 1997). Often, these advantages take 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, productivity spillovers may have positive effects on local firms. 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).

There are several mechanisms through which these spillover effects occur.[1] These can be split into competition and demonstration effects (Girma, Greenaway and Wakelin, 2001). The presence of more efficient foreign firms in an industry may increase competition in domestic industries as foreign firms tend to populate industries where the initial cost of entry is high (Caves, 1974). They may also break up domestic monopolies by lowering excess profits and generally improving allocative efficiency. Local firms can also improve their productivity by copying technology from multinational firms in their industry. Foreign firms may not be able to internalize all the gains of their technology and domestic firms may benefit through their contact with foreign firms, either as suppliers, consumers or competitors. The extent to which spillovers occur helps determine the productivity effect for local firms from the presence of foreign firms in the same or related industries.

Reflecting their higher marginal product of labor, foreign firms also pay higher wages. However, it is unclear whether they positively affect wage levels in the host country and in the industries that they are present in. The higher wages in foreign-owned firms may simply reflect their selection into

[1] For a thorough review of the literature on the channels of spillovers see Crespo and Fontoura (2007).

particularly high-wage sectors or regions of a country (Lipsey, 2002). Foreign firms may attract the most able workers, leaving less skilled ones for domestic firms, with resulting lower wages. Indirectly, the increased competition in an industry may drive domestic firms to exit, leaving the aggregate demand for labor ambiguous.

Empirical evidence on wage and productivity effects of foreign ownership span both industrialized and developing countries.In a large panel study of over 30 OECD and non-OECD countries De Mello (1999) finds that FDI has a positive effect on TFP growth in OECD countries, but no or even a negative effect in non-OECD ones. He also finds that the effect of FDI on capital accumulation is nonexistent or negative in the former, but positive in the latter. Put together, these findings lead him to conclude that in technologically laggard countries, there exists a complementarity effect between FDI and domestic investment, resulting in a reduction in TFP growth as FDI enters. For technological leaders, on the other hand, there is a substitution effect, perhaps because older capital is made obsolete more quickly and comprehensively by the introduction of new capital via FDI.

There are a number of developing country studies. Haddad and Harrison (1993), using panel data from Morocco, report that dispersion in productivity is smaller in sectors with more foreign firms but they find no evidence of accelerated productivity growth amongst domestic firms. Blomström and Wolff (1994) investigate spillovers in Mexico from the presence of foreign firms. They find that productivity levels of domestic companies in Mexico have converged to that of foreign-owned firms. They also find that the rate of productivity growth of local firms increases with the share of foreign ownership in an industry. In a seminal study of Venezuela, Aitken and Harrison (1999) find that positive productivity effects are confined to plants with foreign equity participation, and then only small ones, but that domestic plants are negatively affected, with a very small overall positive effect. In a study of Lithuania, Smarzynska Javorcik (2004) finds evidence consistent with spillovers from foreign affiliates to their local suppliers in upstream industries, although only for

projects with shared domestic and foreign ownership, not for wholly owned foreign subsidiaries. Liu (2008) distinguishes between a level and a growth effect of foreign presence on TFP. Learning advanced foreign technology is costly and requires that scarce resources be devoted to the effort which is why a short-term negative effect on the level of TFP is expected but a long-run positive effect on the growth rate of TFP. Panel data on Chinese manufacturing firms confirms the theoretical expectations.

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. They point out that ideally, a panel of firms observed over a number of years should be used to elicit productivity and spillover effects of foreign investment and to be able to deal with self-selection bias and unobserved heterogeneity. In addition, Görg and Strobl's (2001) meta-analysis points out that there appears to be some publication bias, which suggests that the evidence is even more mixed than a review of published studies suggests.

For wage effects in developing countries, a seminal study of Mexico and Venezuela by Aitken, Harrison and Lipsey (1996) finds that while foreign firms tend to pay higher wages, the aggregate effect is virtually zero. They determine that differences in capital intensity account for much of the difference in wages between domestic and foreign firms. In his survey of the literature, Lipsey (2002) concludes that the finding of foreign firms paying higher wages than domestic firms is fairly robust, while the evidence on spillovers is mixed.

Overall, empirical studies generally seem to provide evidence of wage differences between foreign and domestic firms; however, the support for productivity differentials and productivity and wage spillovers is quite weak, especially for developing countries. Blomström and Kokko (1998) attempt to explain these mixed results. They enumerate the determinants of host country spillovers from FDI. For spillovers to occur, host country characteristics such as intellectual property rights,

competition in markets, stock of technical knowledge and the overall size of the economy have to be conducive to the process. Domestic firms must be able to afford the cost of adopting foreign firm technology in order to be able to obtain or copy such technology. Hence the lack of these preconditions may be the cause of weak or non-existent spillover effects from foreign to domestic firms in developing countries, particularly very poor ones such as those in SSA.

Francis Teal (1999; 2000) and coauthors (Söderbom and Teal, 2000, 2004; Söderbom, Teal and Harding, 2006) have made extensive use of the Ghanaian survey data. However, all of these studies address questions that are quite distinct from the ones we ask here. Teal (1999) analyzes productivity growth in Ghanaian manufacturing in general, finding large increases over the survey period, which can be entirely explained by the growth in (physical) capital and labor inputs. Value added regressions include only a simple ownership dummy, the coefficient of which is not even reported. Teal (2000) documents the evolution of real wages over the sample period, estimating labor share equations. Again, a simple ownership dummy is included in regressions, but the coefficient is not reported. Söderbom and Teal (2000) analyze the effect of skill on investing and the export performance of firms. They run one regression with real value added per employee as the dependent variable where they report a significantly positive coefficient on the foreign ownership dummy variable. Söderbom and Teal (2004) address the issue of dispersion of productivity in this sample of firms. The only time they look at foreign owned firms is to correlate the fixed effects from a production function regression with an ownership dummy, finding that technical efficiency dispersion is not different in domestic versus foreign-owned firms. Finally, Söderbom, Teal and Harding (2006) investigate the determinants of firm exit in Ghana as well as Kenya and Tanzania.[2] Again, they include a simple foreign ownership dummy in their regressions, finding no higher probability of exit in foreign-owned firms.

[2]Frazer (2005) also investigates the determinants of firm exit, but for Ghana only. His focus is on the role of productivity and again, only a foreign ownership dummy is included as a control. It is never statistically significant.

Görg and Strobl (2005) use the Ghanaian data set not to study the effect of foreign presence on productivity and spillovers per se, but to investigate a very particular channel of possible spillovers. They relate firm level productivity to the previous work experience of the owner, finding that if he or she has previously worked at a multinational company, productivity is enhanced, although only if the foreign firm was operating in the same sector of the economy.[3] In contrast, we study the effects of foreign presence on firm productivity and wages more broadly.

In summary, while a number of studies have used the same dataset to address a variety of questions, none of these ask precisely the same ones that we do. When similar regressions are run, only a simple ownership dummy at the firm level is included as a control, while we analyze the effect of foreign ownership, measured as the equity share, not just as a simple dummy, at both the firm and the sector level, their interaction as well as the role of spillovers.

4 Data

This paper makes use of a comprehensive panel dataset drawn from surveys of the Ghanaian manufacturing sector conducted in five rounds between 1992 and 1998. It provides yearly firm level and labor force information spanning the period 1991-1997. The first part of the data from 1991-1993 was collected as part of the World Bank's Regional Program on Enterprise Development (RPED). The next two rounds each cover two year periods from 1994-1997. The data for this round was collected by a team from the Centre for the Study of African Economies (CSAE)[4], University of Oxford, the University of Ghana, Legon, and the Ghana Statistical Office.

The first sample of firms was drawn randomly from the Census of Manufacturing Activities conducted in 1987. The firms were categorized based on sector and location. In all there are 9

[3] Görg, Strobl and Walsh (2007) study foreign ownership at the firm level and *individual* workers' wages, using only the last wave of the dataset. Te Velde and Morrissey (2003) examine foreign ownership and individual wages in five African countries, including Ghana, using only the first few waves of this dataset.

[4] http://www.csae.ox.ac.uk/

sectors including textiles and garments and metal works. They were also categorized by location: Accra, Cape Coast, Kumasi and Takoradi, all of which constitute major industrial centers in Ghana. The coverage of this dataset is quite extensive as most of the major manufacturing sectors at the time under investigation are represented.

Over the course of data collection, 34 firms of the 200 initially surveyed exited their respective industries. However, these were replaced with firms of similar size from the same sector and location. Within each firm, data was collected on a random sample of up to 10 workers and apprentices, conditional on the total number of workers available. This provides data on worker characteristics.

The dataset has the advantage of containing a large number of firms over a long period of time and information on many firm characteristics. It also contains pre-calculated price deflators which allow the derivation of real output and input prices. Price indices for each year were calculated based on the prices of each firm's most important goods. Where the prices of a firm's goods were unavailable, information on prices of similar goods across firms or sectoral averages were used (Teal, 2002).

5 Empirical Methodology

Consider a standard Cobb-Douglas production function

$$Y_{it} = A_{it} K_{it}^{\alpha_1} L_{it}^{\alpha_2} e_{it} \tag{1}$$

where Y_{it} is value added, A_{it}, K_{it} and L_{it} denote total factor productivity (TFP), capital and labor in firm i at time t, respectively, and e is a random disturbance term.[5] Note that we do not impose

[5] In order to avoid notational clutter, we omit sector subscripts, but emphasize that the following calculations are carried out separately for each sector.

constant returns to scale. Taking natural logarithms and re-arranging slightly, we obtain

$$y_{it} = \alpha_1 k_{it} + \alpha_2 l_{it} + \omega_{it} + \varepsilon_{it} \tag{2}$$

where lower case letters denote log values, $\omega_{it} = \ln(A_{it})$ and $\varepsilon_{it} = \ln(e_{it})$. We take TFP to be influenced by the foreign presence in the firm as well as the sector, their interaction and other factors to be made precise below. But first we need to discuss how to estimate ω_{it} in equation (2). The basic problem in estimating (unobserved) firm- and time-specific productivity is that decision makers may observe it, which conditions their input choices, but the econometrician does not. If this is the case, there is a simultaneity problem, which means that the variable inputs and ω_{it} are correlated and thus ordinary least squares (OLS) would produce inconsistent estimates. There are several solutions which have been proposed. Olley and Pakes (1996) proxy for ω_{it} by introducing an investment function

$$inv_{it} = f_t(\omega_{it}, k_{it}) \tag{3}$$

which, if inv_{it} is monotonically increasing in ω_{it}, can be inverted and then substituted into the production function (2). The problem is that this procedure requires strictly positive investment and observations that show zero investment must be dropped. This is the case for many firms in developing countries in particular. In the Ghanaian data set, 54 percent of usable observations have zero investment, resulting in a large number of observations to be discarded. Levinsohn and Petrin (2003) rely on intermediate input usage instead, which is available in the Ghanaian data where only just over one percent of observations are zero. Consider the intermediate input demand function

$$m_{it} = g_t(\omega_{it}, k_{it}) \tag{4}$$

which, if m_{it} is monotonically increasing in ω_{it}, can be inverted to obtain

$$\omega_{it} = g_t^{-1}(m_{it}, k_{it}). \tag{5}$$

The only additional assumption needed to proceed with the estimation of productivity is that it follows a first-order Markov process. Substituting (5) into (2) gives

$$y_{it} = \alpha_1 k_{it} + \alpha_2 l_{it} + g_t^{-1}(m_{it}, k_{it}) + \varepsilon_{it} \tag{6}$$

which can be written as

$$y_{it} = \alpha_2 l_{it} + \phi_t(m_{it}, k_{it}) + \varepsilon_{it} \tag{7}$$

where $\phi_t(m_{it}, k_{it}) = \alpha_1 k_{it} + g_t^{-1}(m_{it}, k_{it})$. The function ϕ_t can be estimated with a third-order polynomial approximation in m_{it} and k_{it}, and thus this first stage of the estimation yields the estimate $\widehat{\alpha}_2$ of α_2.

Since it cannot be identified separately when estimating equation (7), the coefficient on capital, α_1, is obtained in a second estimation stage, which we will sketch briefly. From (7), one computes an estimated value $\widehat{\phi}_t$, which can be used to compute a prediction for ω_{it} for any candidate value α_1^* using $\widehat{\omega}_{it} = \widehat{\phi}_t - \alpha_1^* k_{it}$. Using these values, a consistent approximation of the expected value of ω_{it} is given by the predicted values of the regression

$$\widehat{\omega}_{it} = \gamma_0 + \gamma_1 \omega_{it-1} + \gamma_2 \omega_{it-1}^2 + \gamma_3 \omega_{it-1}^3 + \epsilon_{it}. \tag{8}$$

Then, the estimate $\widehat{\alpha}_1$ of α_1 is found as the solution to minimizing the sample residual of the production function with respect to α_1^*. A bootstrapping procedure is used to construct the standard errors for $\widehat{\alpha}_1$ and $\widehat{\alpha}_2$. For further details, see Levinsohn and Petrin (2003). We implement this procedure using the 'levpet' command in STATA, which was written by Levinsohn, Petrin and Brian Poi (see also Petrin, Levinsohn and Poi, 2004).

Now, TFP is modeled as a function of foreign presence at the firm and sector levels and other factors:

$$\begin{aligned} tfp_{it} &= \beta_0 + \beta_1 FDI\_firm_{it} + \beta_2 FDI\_sector_{jt} + \beta_3 (FDI\_firm \cdot FDI\_sector)_{ijt} \\ &\quad + \beta_4 LQ_{it} + \mu_{i/j} + \lambda_t + \theta_l + \psi_{it} \end{aligned} \tag{9}$$

where FDI_firm is the foreign ownership share in firm i, ranging from 0 to 1, FDI_sector is the foreign presence in sector j, LQ is labor quality, $\mu_{i/j}$ a sector (μ_j) or firm (μ_i) fixed effect, λ_t a time fixed effect, θ_l a location fixed effect, and ψ_{it} is an iid error. For notational convenience and to distinguish what follows from the procedure of estimating TFP, ω_{it} is replaced by tfp_{it}. *FDI_ sector* is defined as foreign ownership shares averaged over all firms in a sector, weighted by each firm's output share

$$FDI\_sector_{jt} = \frac{\sum_i \{FDI\_firm_{ijt} \cdot output_{ijt}\}}{\sum_i output_{ijt}} \tag{10}$$

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 spillover effect from foreign to domestic firms. The interaction term allows for a differential effect of spillovers for foreign and domestic firms. Specifically, $\beta_3 > 0$ would indicate that foreign owned firms benefit from the presence of other foreign-owned firms in the sector. In the analysis below, we also estimate (9) for domestic firms only, thus omitting FDI_firm and the interaction term, as a robustness check.

Since TFP is estimated from a production function containing capital, labor and material inputs, none of these are included in (9). We have, however, not accounted for differences in the quality of labor among firms. A higher average labor quality or equivalently skill level is likely to result in higher productivity. We use a measure that is constructed from employee-level information from each firm. Specifically, it is the average years of schooling plus the average tenure (experience) of workers in a firm, multiplied by the number of workers. This measure of average labor quality was constructed by Francis Teal from the raw data and is commonly used in work with this dataset (see Teal, 2002). A positive coefficient sign on this variable is expected.

One well-known problem in productivity studies is that differences in productivity might be correlated with foreign activity because foreign firms are attracted to sectors that already have higher productivity. If that is the case, then failing to control for differences across industries is likely

to find a positive correlation between FDI and productivity. A common solution to this problem is the use of industry fixed effects. However, there may additionally be unobserved heterogeneity at the firm level. For example, higher productivity firms may be more attractive takeover targets for foreign investors, again inducing a spurious correlation between productivity and foreign ownership. To the extent that this heterogeneity is firm specific, but time invariant, it can be controlled for with the inclusion of firm dummies. Below, we report both sets of results, those using industry and those using firm dummies and we do this for two reasons. First, prior studies such as Aitken and Harrison (1999) use industry, not firm dummies. Secondly, the drop in degrees of freedom when using firm dummies along with the very low year variation in our foreign ownership variable makes it difficult to detect foreign ownership effects in that case. In addition, we account for unobserved year and location heterogeneity by including both year and location dummies.

Recently, Liu (2008) has hypothesized that foreign presence may have a negative level, but a positive growth effect on productivity. Benefitting from advanced technology and other forms of assets, tangible and intangible, of foreign firms requires expenses for machinery, tools and perhaps training in order to adapt the technology or practice. In the short run, this will lower productivity. In the medium to long run, however, these will have positive productivity effects, resulting in a higher TFP rate of growth. Liu implements this idea by including a time trend (growth) and the trend interacted with the measure of foreign presence in a sector. Adapting this approach to our specification yields

$$\begin{aligned} tfp_{it} &= \beta_0 + \beta_1 FDI\_firm_{it} + \beta_2 FDI\_sector_{jt} + \beta_3 \left(FDI\_sector \cdot time\right)_{ijt} \\ &\quad + \gamma\ time + \beta_4 QL_{it} + \mu_{i/j} + \theta_l + \psi_{it}. \end{aligned} \tag{11}$$

Note that the time trend replaces the year fixed effects. If Liu's hypothesis is correct for Ghana, $\beta_2 < 0$ and $\beta_3 > 0$. Moreover, in such a case, one can compute the number of years it will take for the positive growth effect to compensate for the negative level effect.

While we hypothesize that foreign presence affects total factor productivity and thus a regression of TFP on FDI and controls is an appropriate approach, the model outlined above suggests a complementary, indirect approach. Instead of going through the procedure of estimating TFP, we can directly estimate the effect of foreign presence on labor productivity. This approach is also useful for comparing the results of this study to earlier ones that use only labor productivity, not TFP.[6] Consider again the standard Cobb-Douglas production function (1). Dividing it by L and taking natural logs yields

$$lp_{it} = tfp_{it} + \beta_5 kl + \beta_6 k + \eta_{it} \tag{12}$$

where $lp = \ln(Y/L)$ is log value added per worker (labor productivity), $kl = \ln(K/L)$, $k = \ln(K)$, $\beta_5 = (1 - \alpha_2)$, $\beta_6 = (\alpha_1 + \alpha_2 - 1)$ and η_{it} is an error term. Substituting (9) into (12) yields

$$\begin{aligned} lp_{it} &= \beta_0 + \beta_1 FDI\_firm_{it} + \beta_2 FDI\_sector_{jt} + \beta_3 \left(FDI\_firm \cdot FDI\_sector\right)_{ijt} \\ &\quad + \beta_4 QL_{it} + \beta_5 kl + \beta_6 k + \mu_{i/j} + \lambda_t + \theta_l + \chi_{it} \end{aligned} \tag{13}$$

where $\chi_{it} = \eta_{it} + \psi_{it}$. That is, with labor productivity as the dependent variable we must add the capital-labor ratio as well as capital by itself.

Similarly, we can derive an expression for wages paid. Assuming that workers earn their marginal product, we obtain an expression for (log) wages per worker by taking the partial derivative of (1) with respect to L, divide by L, take natural logs and substitute for TFP to obtain

$$\begin{aligned} wpw_{it} &= \delta_0 + \delta_1 FDI\_firm_{it} + \delta_2 FDI\_sector_{jt} + \delta_3 \left(FDI\_firm \cdot FDI\_sector\right)_{ijt} \\ &\quad + \delta_4 QL_{it} + \delta_5 kl + \delta_6 k + \mu_{i/j} + \lambda_t + \theta_l + \tau_{it} \end{aligned} \tag{14}$$

where wpw is (the natural log of) wages per worker, $\delta_5 = (2 - \alpha_2)$, $\delta_6 = (\alpha_1 + \alpha_2 - 2)$ and τ_{it} is again an iid error term. As discussed earlier, much of the literature finds that while foreign firms

[6] Equivalently, log output or value added can be regressed on the measures of foreign presence as well as a vector of inputs, as in Aitken and Harrison (1999). Note that an advantage of the TFP procedure used above is that the input elasticity parameters are not constrained to be the same across industries.

pay higher wages, the effect on domestic firms may be negative or insignificant at best. We can check whether this is the case for Ghana as well.

6 Results

In this section, we report the results from relating foreign presence at the firm and sector levels to total factor productivity (TFP), labor productivity and wages, as outlined in the previous section. Before discussing these, Table 1 gives the definitions of all variables and Table 2 provides summary statistics for the variables in all the samples used in subsequent regressions. Throughout, they illustrate that foreign firms are larger and have more capital. They also pay higher wages, although the unconditional means for the quality of labor are also larger. Finally, they are characterized by higher TFP as well as labor productivity. The sample sizes differ slightly since all complete observations are used in each case. We now turn to the regressions results.

Tables 3-5 present results with TFP as the dependent variable. Table 3 shows results from estimating various versions of the basic TFP model (9), whereas Table 4 looks at level versus growth effects, as outlined in (11). Table 5 re-estimates the TFP models for domestically owned firms only. Throughout, we confine the sample to firms for which we have at least four (out of a possible seven) observations. Table A1 in the Appendix shows the first-stage regression results of estimating TFP according to the Levinsohn and Petrin (2003) methodology. The results seem reasonable (although note that all but the wood products sector do not appear to be characterized by constant returns to scale) and are roughly comparable to Görg and Strobl's (2005) first-stage results using a simpler methodology.

We present the results of various versions of (9) in order to ascertain whether the inclusion of labor quality and location dummies as well as the choice between industry and firm fixed effects affects the results. The sample is limited to observations for which we have complete information

on all variables. 20 percent of firms have some amount of foreign ownership. Foreign ownership by itself (FDI_firm) either has no (in half of the regressions) or a negative effect on firm TFP. It is not significant when we omit both labor quality and location dummies (column (1)) as well as when we include firm instead of industry fixed effects. In the latter case, the paucity of time variation in the ownership variable makes it impossible to identify a foreign ownership effect when we have already accounted for unobservable, but time invariant heterogeneity at the firm level.

Foreign presence at the sector level (FDI_sector), on the other hand, has a statistically significant negative effect on firm TFP in all specifications. However, the interaction term is significantly positive regardless of specification as well. The magnitude of the coefficients, which is very similar across specifications, implies that all domestic firms are negatively affected by foreign presence in a sector (FDI_firm=0). Foreign firms with a foreign ownership share of at least 43 percent (specification (6); less for the other ones) are estimated to benefit from the presence of other foreign firms in their sector. All but six firms in the sample, comprising 18.5 percent of foreign firms, pass that threshold. Thus, for most foreign owned firms, foreign presence in the sector is productivity enhancing. But even if we take the negative coefficient on firm level foreign ownership at face value, the positive interaction term suggests that this is only true in sectors with a low foreign presence. In sectors with a high foreign presence, foreign equity in a firm is always productivity enhancing. Specifically, taking the results from model (4), when the foreign ownership share in a sector exceeds 34 percent, all foreign firms benefit. This is true, for example, for all years in the food products and machinery sectors.

Which specification is the most appropriate? Not surprisingly, the R^2 improves when including firm fixed effects, but also when including labor quality, which is always highly statistically significant and positive, as expected. A Ramsey RESET test for omitted variables, however, gives slightly conflicting results with respect to the inclusion of location dummies. When adding these for the

specification without labor quality (regressions (2) with industry and (6) with firm fixed effects), the null of no omitted variables can no longer be rejected. This is not true in regression (4), when labor quality is included. We caution, however, that this test is known to have low power. Thus, in later results (Tables 5-8), we will include both location dummies and labor quality.[7]

We now turn to Table 4, which shows results for the modified model (11) in order to check level and growth effects of foreign presence in a sector. The sample is identical to the one in Table 3. Recall that the coefficient on the foreign presence in a sector (FDI_sector) reflects the effect on the level of TFP, while the interaction with the time trend reflects the growth effect. The results are robust, but discouraging. There is a strong negative level effect, but the interaction term is never statistically significant, suggesting that there is no offsetting positive growth effect on TFP from foreign ownership. This is in stark contrast to Liu's (2008) finding for China, where the negative level effect was predicted to be offset by the positive growth effect within a few years. We cannot find such a result for Ghana.[8] While this is unfortunate, it underscores the importance of investigating different countries and not extrapolating findings from one country to others, even if they are similar in terms of their development level.

One stark difference to the findings in Table 3 is the positive coefficient on the foreign ownership variable, suggesting that all firms with any foreign ownership benefit from it. However, the coefficient again turns insignificant when including firm dummies (and the RESET test strongly suggests that this is the appropriate specification). It is also far smaller when labor quality is included, suggesting that foreign presence and labor quality may be correlated and thus the foreign ownership effect really reflects the higher average labor quality found in foreign-owned firms.

Table 5 presents results from running the two models on a sample of domestic firms only. As

[7] Aitken and Harrison (1999) also investigate whether spillovers may be local. They are able to distinguish 220 separate locations. Our data only distinguish four locations and most of the firms are located in Accra. This precludes an investigation of local spillovers similar to Aitken and Harrison's (1999).

[8] Our result is more in line with the findings of Haddad and Harrison (1993), who found no effect of sector FDI on TFP growth.

mentioned above, from here onwards, we only present results from regressions that include both labor quality and location dummies. The results confirm what we found in the mixed (domestic and foreign firms) sample. Domestic firms are negatively affected by the presence of foreign firms in a sector, where a one percentage point higher sector ownership share reduces TFP by roughly two percent, by no means a negligible effect. Again, no growth effect to counteract the negative level effect can be ascertained. The result of negative sectoral spillover effects for domestic firms is in line with, for example, Aitken and Harrison (1999), whose basic specification, however, more closely resembles equation (13), estimated below. Smarzynska Javorcik (2004), in contrast, finds no evidence of an intra-industry spillover effect, positive or negative, for Lithuania, using the Olley and Pakes (1996) methodology. This underscores again the uniqueness of a particular country experience and sample and thus the need for additional evidence.

Tables 6 and 7 present results from repeating the exercise with value added per worker as our measure of productivity. As shown in the previous section in equation (13), such a model can also be derived from the production function, but requires the addition of the capital-labor ratio and, in the absence of imposing constant returns to scale, the capital stock in the regressions. Table 6 results illustrate that the basic insights from the TFP regressions continue to hold. Foreign presence in a sector has a negative effect on all domestic and a positive effect on most foreign-owned firms, at least those with a majority foreign ownership, both in the entire (columns (1) and (3)) as well as the domestic firms only (columns (2) and (4)) sample. In slight contrast to the TFP results, foreign ownership alone has no significant effect. We also note that the coefficients on capital per worker and the capital stock are highly significant and sensible, implying a coefficient on the capital stock of about 0.2 and on labor of about 0.35.

The results in Table 7, which investigate the level versus growth effects of foreign presence, are slightly more encouraging than those for TFP. While the level effect remains strongly negative,

three of the four specifications show a positive growth effect, a significantly positive coefficient on the interaction of FDI_sector and the time trend. Still, even if we take this result at face value, the magnitude of the coefficients suggests that it would take in excess of ten years for the growth effect to compensate for the level effect (for example in column (1), it would take $2.124/0.206 = 10.3$ years to catch up). Thus we can conclude that the foreign presence in Ghana has been a boon for most foreign-owned firms, but not for domestic firms. Moreover, a dynamic growth effect is unlikely to counteract the estimated negative level effect. We do caution that our sample from the 1990s spans only seven years. Nonetheless, these results are somewhat discouraging.

The findings with respect to wages are similarly mixed. In Table 8, we present results from estimating the effect of foreign ownership and foreign sector presence on workers' wages, according to (14). The dependent variable in all regressions is the (log of) real annual wages per worker. None of the foreign ownership and sector presence variables nor their interactions have any coefficients that are significantly different from zero. This suggests that foreign firms have had no negative effect on wages paid in domestic firms. However, it also suggests that in Ghana, at least in the firms in our sample, foreign firms do not pay higher wages than domestic firms, once we control for labor quality. The latter is an important point. Were we not to control for labor quality, we would find the standard result that foreign firms do pay higher wages. We emphasize that we think that the labor quality measure that we use is a very good one because it considers both education and experience and it is based on individual level information from the firms in the sample. This is a measure that is not available in most samples others have used and thus we worry that the finding elsewhere that foreign firms do pay higher wages may be due to an inadequate measure of worker characteristics in foreign versus domestic firms. However, we will have to leave a more thorough investigation of this possibility for future work.

7 Conclusion

The experience of developing countries with foreign direct investment in their economies is extremely varied. Existing studies of the effects of FDI on productivity and wages find everything from positive effects on foreign as well as domestic firms, inter- and intra-industry spillovers to no aggregate industry or economy-wide effects to strongly negative effects, particularly for productivity and wages of competing domestic firms. These differences in country experiences may in part reflect to what extent channels through which superior foreign technology and practices spill over to domestic firms exist. Regardless, they underscore that it is difficult, if not impossible, to extrapolate from one country's experience to others.

This is particularly true for sub-Saharan African countries, whose characteristics as well as trade and investment policies are quite distinct from many Asian and Latin American developing countries. Thus, evidence on the efficacy of foreign investment for this particular set of countries is important in order to inform the discussion of the welfare effects of FDI and future policies. At the same time, the most convincing evidence results from firm-level studies with several years of data. Self-selection and unobserved heterogeneity loom large in productivity analyses and can only be overcome with such microdata. Thus, country case studies that use a consistent and representative sample such as the one used in this study of Ghana are the most likely to help improve our understanding of the heterogeneous effects of foreign investment across industries, countries, and continents.

We find that controlling for observed as well as unobserved heterogeneity along a number of dimensions, the presence of foreign firms in a sector has a negative effect on the productivity of domestically owned, but a positive effect on most foreign owned firms. Decomposing the effect into level and growth effects, we find that the former is negative, but the latter does not appear to be positive in the case of total factor productivity. There is some evidence that there is a positive

growth effect with respect to labor productivity, but the magnitude of the estimates suggest that the catching-up process is likely to take at least a decade. This result is in contrast to other recent ones, for example for China, underscoring that the experience of SSA countries is quite different.

The results with respect to wages are similarly mixed and at least in part at odds with the existing literature. While foreign presence in a sector does not appear to affect wages negatively, foreign-owned firms also do not appear to pay higher wages themselves, once we control for labor quality within the firm. Of course, it is conceivable that the higher labor quality and the corresponding higher wages for skilled workers (see also Teal, 2000) are a result of worker training in those foreign firms. An investigation of this possibility is, however, left for future work. It is also hoped that more detailed firm level data for other countries in SSA can be analyzed along the lines of this study in order to ascertain the benefits FDI may bring to the region.

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Table 1: List of Variables and Their Definitions

Variable	Description
Total Factor Productivity (TFP)	Calculated using the Levinsohn and Petrin (2003) methodology with labor (measured as real wages paid), the total value of capital at replacement value and the real value of all materials as inputs and real value added as output, all in '000s of Cedis. Firm-specific input and output deflators provided y the Centre for the Study of African Economies at the University of Oxford were used. See the text for details and Table A1 for the first stage TFP regression results by sector.
Labor Productivity	Real value added in '000s of Cedis per worker.
FDI_firm	A firm's foreign equity share, taken directly from the survey.
FDI_sector	Share of foreign equity in a sector, weighted by firm real output. For a listing of sectors, see below.
Labor Quality	Sum of the firm level weighted average of education and tenure for each employee, multiplied by the number of employees.
Time	A time trend.
Industry Dummies	A dummy for each of the following industrial sectors: Bakeries, Furniture, Garments, Textiles, Metals, Machinery, Wood Products. The omitted sector is Food Processing.
Regional Dummies	A dummy for each of the following regions: Accra, Kumasi, Takoradi. The omitted region is Cape Coast.
Firm Dummies	A dummy for each firm included in the respective sample.
Year dummies	A dummy for each of the years covered in the sample (1991-1997). The omitted year is 1991.

Table 2: Summary Statistics Various Subsamples

Total Factor Productivity Sample All Firms (912 Observations)					
Variable	Mean	Median	Std. Dev.	Min.	Max.
Value Added	105,018	10,364	339,821	6	4,259,198
Labor	22,559	2,878	58,590	6	538,645
Capital	541,712	14,929	3,365,132	20	7.99E07
Materials	114,351	14,224	444,698	0	7,983,212
TFP	426.5	131.0	869.4	0.056	10,744
FDI_firm	0.116	0	0.257	0	1
FDI_sector	0.284	0.342	0.171	0	0.580
FDI_firm · FDI_sector	0.044	0	0.103	0	0.580
FDI_sector · Time Trend	1.222	1.069	1.027	0	3.928
Labor Quality	1,050	278.7	1,968	1	13,557
Total Factor Productivity Sample Domestic Firms (738 Observations)					
Value Added	37,293	6,920	89,298	6	1,027,462
Labor	9,837	1,634	25,032	6	308,919
Capital	173,255	5,949	635,691	20	1.08E07
Materials	42,693	9,452	116,351	0	1,384,413
TFP	314.8	122.3	585.0	0.056	7,917
FDI_sector	0.261	0.283	0.174	0	0.580
FDI_sector · Time Trend	1.108	1.027	1.001	0	3.928
Labor Quality	609.9	203.4	1,116	1	10,677
Labor Productivity Sample All Firms (1006 Observations)					
Labor Productivity	1,015	550.4	1,592	0.257	23,877
FDI_firm	0.105	0	0.247	0	1
FDI_sector	0.240	0.309	0.174	0	0.561
FDI_firm · FDI_sector	0.037	0	0.094	0	0.561
FDI_sector · Time Trend	1.005	0.620	0.997	0	3.927
Labor Quality	990.4	240.9	1,912	1	13,557
Capital per Worker	4,110	607.5	16,060	1.874	358,139
Capital	502,331	10,980	3,210,683	20	7.99E07

Table 2, continued: Summary Statistics Various Subsamples

Labor Productivity Sample Domestic Firms (832 Observations)					
Variable	Mean	Median	Std. Dev.	Min.	Max.
Labor Productivity	794.2	457.9	1,021	0.257	8,497
FDI_sector	0.217	0.171	0.173	0	0.561
FDI_sector · Time Trend	0.891	0.606	0.953	0	3.927
Labor Quality	587.7	185.5	1,114	1	10,677
Capital per Worker	2,689	352.4	7,120	1.874	109,556
Capital	167,267	4,048	626,991	20	1.08E07
Wages Sample All Firms (948 Observations)					
Wages per Worker	223.1	159.2	234.4	0.75	2,682
FDI_firm	0.112	0	0.253	0	1
FDI_sector	0.264	0.283	0.169	0	0.580
FDI_firm · FDI_sector	0.041	0	0.098	0	0.580
FDI_sector · Time Trend	1.125	1.025	0.973	0	3.405
Labor Quality	1,059	269.7	2,030	1	16,984
Capital per Worker	4,390	813.7	16,540	4.436	358,139
Capital	535,569	14,333	3,306,976	20	7.99E07
Wages Sample Domestic Firms (772 Observations)					
Wages per Worker	176.4	120.5	0.171	0.75	1,178
FDI_sector	0.240	0.267	0.940	0	0.580
FDI_sector · Time Trend	1.011	0.774	0.940	0	3.405
Labor Quality	623.8	200.0	1,250	1	16,984
Capital per Worker	2,905	419.7	7,429	4.436	109,556
Capital	175,892	5,705	648,240	20	1.08E07

Table 3: Foreign Ownership and Total Factor Productivity (TFP)

	(1)	(2)	(3)	(4)	(5)	(6)
FDI_firm	-0.743	-0.960**	-1.929***	-1.905***	-1.518	0.509
	(0.456)	(0.458)	(0.378)	(0.380)	(3.549)	(3.642)
FDI_sector	-1.552***	-1.596***	-1.830***	-1.864***	-1.584***	-1.656***
	(0.587)	(0.589)	(0.603)	(0.607)	(0.499)	(0.505)
FDI_firm · FDI_sector	4.476***	4.813***	5.722***	5.677***	3.948***	3.887***
	(1.193)	(1.188)	(1.001)	(1.005)	(1.452)	(1.481)
Labor Quality			0.440***	0.440***		0.246***
			(0.026)	(0.028)		(0.075)
Industry Dummies?	Yes	Yes	Yes	Yes	No	No
Firm Dummies?	No	No	No	No	Yes	Yes
Location Dummies?	No	Yes	No	Yes	No	Yes
Number of foreign firms	32	32	32	32	32	32
Number of domestic firms	128	128	128	128	128	128
Observations	912	912	912	912	912	912
R^2	0.67	0.68	0.76	0.76	0.86	0.86
F(·)	112.0	106.6	131.5	127.4	162.3	140.0
Prob. > F	0.00	0.00	0.00	0.00	0.00	0.00
RESET F(·)	4.01	0.50	9.52	10.22	2.66	1.84
Prob. > F	0.01	0.69	0.00	0.00	0.05	0.14

Notes:
Dependent variable is the natural log of total factor productivity (TFP).
All regressions include a constant and year dummies. Robust standard errors in parentheses.
RESET is Ramsey's RESET test for omitted variables, H0: no omitted variables.
, * denote significance at the five, and one percent level, respectively.

Table 4: Foreign Ownership and Total Factor Productivity (TFP) Level and Growth

	(1)	(2)	(3)	(4)	(5)	(6)
FDI_firm	0.943***	0.860***	0.231*	0.244*	0.306	2.283
	(0.186)	(0.189)	(0.138)	(0.139)	(4.037)	(4.113)
FDI_sector	-1.690**	-1.644**	-1.518**	-1.522**	-1.861***	-1.697***
	(0.748)	(0.742)	(0.732)	(0.731)	(0.596)	(0.598)
FDI_sector · Time	0.146	0.133	0.085	0.076	0.147	0.095
	(0.121)	(0.121)	(0.107)	(0.107)	(0.091)	(0.092)
Time	-0.033	-0.027	-0.017	-0.013	-0.042	-0.025
	(0.037)	(0.039)	(0.036)	(0.036)	(0.031)	(0.031)
Labor Quality			0.433***	0.435***		0.243***
			(0.026)	(0.028)		(0.080)
Industry Dummies?	Yes	Yes	Yes	Yes	No	No
Firm Dummies?	No	No	No	No	Yes	Yes
Location Dummies?	No	Yes	No	Yes	No	Yes
Number of foreign firms	32	32	32	32	32	32
Number of domestic firms	128	128	128	128	128	128
Observations	912	912	912	912	912	912
R^2	0.66	0.66	0.74	0.74	0.85	0.86
F(·)	147.3	128.8	173.3	154.2	120.7	113.1
Prob. > F	0.00	0.00	0.00	0.00	0.00	0.00
RESET F(·)	4.00	0.85	16.21	15.78	0.33	0.04
Prob. > F	0.01	0.46	0.00	0.00	0.81	0.99

Notes:
Dependent variable is the natural log of total factor productivity (TFP).
All regressions include a constant and year dummies. Robust standard errors in parentheses.
RESET is Ramsey's RESET test for omitted variables, H0: no omitted variables.
*, **, *** denote significance at the ten, five, and one percent level, respectively.

Table 5: Foreign Ownership and Total Factor Productivity (TFP): Domestic Firms Only

	(1)	(2)	(3)	(4)
FDI_sector	-1.699***	-1.537***	-2.015**	-1.776***
	(0.659)	(0.524)	(0.795)	(0.647)
FDI_sector · Time			0.098	0.076
			(0.112)	(0.100)
Time			-0.010	-0.013
			(0.036)	(0.033)
Labor Quality	0.368***	0.270***	0.367***	0.260***
	(0.033)	(0.081)	(0.033)	(0.088)
Industry Dummies?	Yes	No	Yes	No
Firm Dummies?	No	Yes	No	Yes
Location Dummies?	Yes	Yes	Yes	Yes
Number of				
domestic firms	128	128	128	128
Observations	738	738	738	738
R^2	0.72	0.83	0.71	0.82
F(·)	84.70	50.75	101.4	69.42
Prob. > F	0.00	0.00	0.00	0.00
RESET F(·)	10.55	1.96	12.68	0.53
Prob. > F	0.00	0.12	0.00	0.66

Notes:
Dependent variable is the natural log of total factor productivity (TFP).
All regressions include a constant and year dummies. Robust standard errors in parentheses.
RESET is Ramsey's RESET test for omitted variables, H0: no omitted variables.
, * denote significance at the five, and one percent level, respectively.

Table 6: Foreign Ownership and Labor Productivity

	(1)	(2)	(3)	(4)
FDI_firm	-0.378		-2.159	
	(0.308)		(3.555)	
FDI_sector	-1.220**	-1.108**	-1.861***	-1.689***
	(0.500)	(0.553)	(0.452)	(0.467)
FDI_firm · FDI_sector	2.569***		3.833***	
	(0.868)		(1.295)	
Labor Quality	0.459***	0.412***	0.287**	0.304**
	(0.125)	(0.126)	(0.142)	(0.145)
Capital per Worker	0.638***	0.637***	0.735***	0.729***
	(0.132)	(0.136)	(0.166)	(0.175)
Capital	-0.432***	-0.427***	-0.704***	-0.742***
	(0.132)	(0.138)	(0.166)	(0.175)
Industry Dummies?	Yes	Yes	No	No
Firm Dummies?	No	No	Yes	Yes
Location Dummies?	Yes	Yes	Yes	Yes
Number of foreign firms	32	-	32	-
Number of domestic firms	145	145	145	145
Observations	1006	832	1006	832
R^2	0.43	0.39	0.72	0.69
F(·)	30.31	24.44	31.76	26.63
Prob. > F	0.00	0.00	0.00	0.00
RESET F(·)	9.23	10.81	4.80	4.83
Prob. > F	0.00	0.00	0.00	0.00

Notes:
Dependent variable is the natural log of value added per worker.
All regressions include a constant and year dummies. Robust standard errors in parentheses.
RESET is Ramsey's RESET test for omitted variables, H0: no omitted variables.
, * denote significance at the five, and one percent level, respectively.

Table 7: Foreign Ownership and Labor Productivity Level and Growth

	(1)	(2)	(3)	(4)
FDI_firm	0.503***		-0.044	
	(0.152)		(3.948)	
FDI_sector	-2.124***	-2.280***	-2.854***	-2.819***
	(0.781)	(0.854)	(0.666)	(0.727)
FDI_sector · Time	0.206*	0.208	0.233**	0.189*
	(0.123)	(0.131)	(0.103)	(0.113)
Time	-0.059	-0.052	-0.072**	-0.059*
	(0.039)	(0.040)	(0.033)	(0.035)
Labor Quality	0.404***	0.356***	0.199	0.225
	(0.124)	(0.126)	(0.147)	(0.153)
Capital per Worker	0.579***	0.588***	0.628***	0.633***
	(0.131)	(0.136)	(0.169)	(0.182)
Capital	-0.371***	-0.368***	-0.555***	-0.595***
	(0.133)	(0.137)	(0.169)	(0.181)
Industry Dummies?	Yes	Yes	No	No
Firm Dummies?	No	No	Yes	Yes
Location Dummies?	Yes	Yes	Yes	Yes
Number of foreign firms	32	-	32	-
Number of domestic firms	145	145	145	145
Observations	1006	832	1006	832
R^2	0.42	0.38	0.70	0.67
F(·)	37.27	29.21	53.16	46.47
Prob. > F	0.00	0.00	0.00	0.00
RESET F(·)	7.44	10.42	1.95	1.80
Prob. > F	0.00	0.00	0.12	0.15

Notes:
Dependent variable is the natural log of value added per worker.
All regressions include a constant and year dummies. Robust standard errors in parentheses.
RESET is Ramsey's RESET test for omitted variables, H0: no omitted variables.
*, **, *** denote significance at the ten, five, and one percent level, respectively.

Table 8: Foreign Ownership and Wages

	(1)	(2)	(3)	(4)
FDI_firm	0.360		-1.286	
	(0.388)		(1.423)	
FDI_sector	0.225	0.152	-0.286	-0.306
	(0.371)	(0.398)	(0.329)	(0.331)
FDI_firm · FDI_sector	0.107		2.014	
	(0.878)		(1.477)	
Labor Quality	0.422***	0.341***	0.169**	0.158*
	(0.101)	(0.098)	(0.086)	(0.084)
Capital per Worker	0.477***	0.413***	0.518***	0.531***
	(0.109)	(0.109)	(0.116)	(0.123)
Capital	-0.318***	-0.258**	-0.510***	-0.540***
	(0.109)	(0.108)	(0.118)	(0.125)
Industry Dummies?	Yes	Yes	No	No
Firm Dummies?	No	No	Yes	Yes
Location Dummies?	Yes	Yes	Yes	Yes
Number of foreign firms	32	-	32	-
Number of domestic firms	130	130	130	130
Observations	948	772	948	772
R^2	0.43	0.35	0.72	0.68
F(·)	38.10	23.95	37.22	33.04
Prob. > F	0.00	0.00	0.00	0.00
RESET F(·)	2.76	6.90	1.18	0.64
Prob. > F	0.04	0.00	0.32	0.59

Notes:
Dependent variable is the natural log of wages per worker.
All regressions include a constant and year dummies. Robust standard errors in parentheses.
RESET is Ramsey's RESET test for omitted variables, H0: no omitted variables.
, * denote significance at the five, and one percent level, respectively.

Appendix

Table A1: TFP Estimation Results

	(1) Food processing	(2) Bakeries	(3) Furniture	(4) Garments & Textiles	(5) Metals & machinery	(6) Wood products
Capital	0.125	-0.056	0.320***	0.124	0.040	0.269
	(0.119)	(0.199)	(0.094)	(0.144)	(0.067)	(0.206)
Labor	0.375***	0.474***	0.234***	0.487***	0.398***	0.643***
	(0.110)	(0.117)	(0.075)	(0.103)	(0.081)	(0.220)
Observations	126	96	206	146	254	84
Number of firms	21	16	35	28	42	18
Constant Returns?	No	No	No	No	No	Yes

Notes:
Results from first-stage regressions using the Levinsohn and Petrin (2003) methodology.
See text for details.
Standard errors in parentheses.
Constant Returns = Yes if a Wald test for constant returns cannot reject H0 (Constant Returns) at least at the five percent level.
*** denotes significance at the one percent level.