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Abstract

Diversifying its economy away from the oil industry and developing competitive nonagricultural industries are two of Nigeria's most important policy targets. However, the Nigerian economy faces significant challenges, such as educational attainment among workers, soundness of infrastructure, and access to finance. This study investigates how and to what extent these factors affect the output and productivity of domestic establishments (DEs) and foreign-owned establishments (FOEs) in Nigeria. Further, it compares the economic performance of these two groups of establishments and analyzes the determinants of ownership differentials. First, the results show that FOEs significantly outperform DEs. Second, access to finance plays a key role, both in improving the economic performance of establishments (regardless of their ownership) and in explaining ownership differentials in economic performance. Third, it is implied that increasing educational attainment amongst workers could improve the performance of DEs by making it easier for them to employ skilled employees. In Nigeria, many reforms are under way under the Economic Recovery and Growth Plan, and they aim to develop infrastructure, strengthen the financial system, and improve human capital, to name but a few objectives; however, their rapid and complete implementation are urgently needed.

Keywords: ownership; manufacture; productivity; decomposition; Nigeria

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1. Introduction

The development of nonagricultural industry has been a key driving force behind economic growth. As an important industrialization strategy, many developing countries strive to attract foreign direct investment from competitive firms, in hopes that domestic firms will benefit from skills and technology transfers from their supposedly superior foreign counterparts.

For this strategy to be effective in promoting domestic manufacturing, foreign firms must be more productive than domestic firms in the first place. For this reason, researchers have measured the productivity of foreign and domestic firms and compared their economic performance. Using census data on Venezuelan firms, Aitken and Harrison (1999) found that foreign share and plant productivity are positively related, although this relation is robust only for smaller plants that have fewer than 50 employees. Blomström and Sjöholm (1999) show that the labor productivity of foreign establishments is higher than that of domestic establishments in Indonesia. Similarly, the results obtained by Javorcik (2004), Suyanto and Salim (2013), and Willmore (1986) indicate that foreign ownership and productivity/efficiency are positively correlated in their Lithuanian, Indonesian, and Brazilian samples, respectively.[1]

Most of the previous studies on the productivity of foreign and domestic firms, including those referenced above, concern the existence and extent of spillovers from the former to the latter (Blomström and Kokko, 1998; Görg and Strobl, 2001; Iwasaki and Tokunaga, 2016). In contrast, we are not aware of studies that analyze the determinants of differences in economic performance between foreign and domestic firms in developing countries. Foreign firms operate while facing benefits and obstacles similar, if not identical, to those that domestic firms do. Thus, if foreign firms perform better than domestic ones, investigating those factors that account for performance differences

[1] Bellak (2004) surveys comparative research on foreign and domestic firms mainly in more developed countries.

should provide useful hints as to how domestic firms can improve their performance in the specific context of their home economies.

The aims of this study are twofold. First, it examines whether foreign-owned establishments (FOEs) have higher output and productivity than domestic establishments (DEs) in Nigeria's nonagricultural sectors. Second, it analyzes which factors give rise to differences in output and productivity across ownership types. To those ends, we apply the decomposition method developed by Blinder (1973) and Oaxaca (1973).

The Blinder–Oaxaca decomposition method decomposes the mean difference between two groups into a part that can be explained by differences in characteristic endowments (the "explained part") and the residual part that is attributable to differences in returns to endowments (the "unexplained part"). This method has been widely used in labor economics, where wage differentials between genders, races, and public and private firms, to name a few, are analyzed (Fortin et al., 2011).

More closely related to our study is that of Castany et al. (2007), who investigated the gap in total factor productivity across firm size among Spanish manufacturing firms by using Blinder–Oaxaca decomposition. Additionally, Smith et al. (2004) leveraged this decomposition method to examine the relationship between research and development (R&D) and productivity in Danish firms, although they estimated the effect of foreign investment on productivity without using this method. More recently, Ali et al. (2016) and de la O Campos et al. (2016) examined gender differences in agricultural productivity in Uganda, and Kilic et al. (2015) studied those in Malawi, both by using the decomposition method. To the best of our knowledge, however, studies that apply the Blinder–Oaxaca decomposition method to analyze determinants of performance differentials by ownership type are almost nonexistent, save for that of Papalia and Calia (2008) on Italian firms.

The remainder of this paper is organized as follows. The next section provides an overview of the Nigerian context. Section 3 describes the data used herein. Section 4

explains the estimation method used, and the results thereof are presented in section 5. Section 6 discusses our results and limitations, and also concludes the paper.

2. Nigerian Economy

With a population of approximately 186 million and a gross domestic product (GDP) of USD457 billion (in 2010 USD), Nigeria is the largest country in the African continent, in terms of both population and economy (World Bank, 2018b).

As Africa's largest oil exporter, the economy heavily relies on oil as a source of government revenues. Positive economic growth in the second and third quarters of 2017—following a recession that continued for five consecutive quarters, due mainly to lower oil prices and production—was mainly driven by the recovery of oil prices and production. As such, Nigeria's growth rates are vulnerable to volatile oil prices.

Contrary to popular opinion, the contribution of oil production to Nigeria's GDP is relatively small, at around 10% or less (National Bureau of Statistics, 2017; IMF, 2018). In comparison, agriculture and services produce about 20% and 60% of GDP and employ 70% and 20% of the labor force, respectively (The World Fact Book, Central Intelligence Agency).[2] Given its positive impact on employment and on more stable economic growth, the development of competitive nonagricultural sectors has been of great interest to policymakers. The current government led by President Buhari has announced the main policy target of diversifying Nigeria's economy away from the oil sector. Nonetheless, the manufacturing sector remains relatively weak, generating only around 9% of GDP.

Insufficient infrastructure—particularly inadequate power supplies—has been a major constraint to Nigerian economic growth: according to IMF (2018) estimates, closing the infrastructure gap could boost growth by more than 0.75 percentage points. In terms of access to electricity, the World Bank's Doing Business Report 2018 ranks

[2] See https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html.

Nigeria at 172nd out of 190 countries worldwide.[3] It is estimated that Nigeria has the potential to generate some 12,000 MW of electricity, but only about one-third of its capacity is available on most days (Power Africa Fact Sheet, USAID).[4] The Power Sector Recovery Programme (PSRP) under the Economic Recovery and Growth Plan aims to improve and increase Nigeria's power supply generation capabilities; nonetheless, sufficient and stable power supplies have not been realized (Okere, 2018). Economic growth demands complete PSRP implementation.

Limited access to private sector credit is another issue in private sector development. Domestic credit to the private sector, as a percentage of GDP, was 14.2% in 2017; this is only about 11% of the world average (IMF, International Financial Statistics and data files, and World Bank and OECD GDP estimates). According to Chief Executive Officer Tony Okpanachi of the Development Bank of Nigeria, more than 95% of Nigeria's 37 million micro, small, and medium enterprises have no access to bank credit (Bala-Gbogbo, 2018). The World Bank ranked Nigeria sixth worldwide in terms of ease of access to credit, but much remains to be done to increase financial inclusion and credit penetration (IMF, 2018).[5]

Increasing educational attainment across the labor force, in order to increase the country's pool of skilled labor, is yet another important policy target. The gross enrollment rate for primary school was 84% in 2016 (i.e., 87% for boys and 80% for girls). However, the figures for higher education remain low: the rate for school attendance in junior secondary school was 43%, while that for senior secondary school was 35% (Federal Ministry of Education, 2016). Inequality in educational attainment across regions also remains a concern. For example, 80% of girls in the southeast attend school, while only 42% of girls in the northeast do. Reflecting higher levels of educational attainment and well-being in the south, Nigeria's economic activity tends to be

[3] See http://www.doingbusiness.org/data/exploretopics/getting-electricity.
[4] See https://www.usaid.gov/powerafrica/nigeria.
[5] See http://www.doingbusiness.org/data/exploretopics/getting-credit.

concentrated in that region (World Bank, 2018a).

Given the aforementioned issues that the Nigerian economy currently faces, whether (and by how much) employment, employees' educational attainment, and access to electricity and finance affect the economic performance of DEs and FOEs, as well as differences between them in these respects, are of particular interest in our analysis.

3. Data and Descriptive Statistics

This study uses data from Enterprise Surveys conducted by the World Bank in Nigeria between April 2014 and February 2015. Nigerian nonagricultural establishments were selected through the use of stratified random sampling, where the strata were defined by industry, size, and region. The survey captures information on annual sales, ownership type, number of employees, year of starting operations, employees' educational attainment, access to electricity or finance (or lack thereof), and innovation activities such as investments in R&D, among others. The data cover 2,676 establishments.

We compare two groups of establishments of different ownership types: those owned solely by private, domestic individuals, companies, or organizations, and those owned, at least in part, by private foreign individuals, companies, or organizations. The number of (partially) foreign-owned establishments in the sample is limited—the original data contain 335 such establishments, but the number decreases dramatically as we control for additional variables, as most of the establishments have missing values for some variables.

On the other hand, there exist "outliers" or data entry errors—where, for example, a very large sales volume was realized by employing very few, or even no, employees. In addition, some establishments do not have separate financial statements from their headquarters or other establishments of the same firm, and they report the total sales of the firm they belong to as their own sales. In view of these points, we excluded from the data the following records: (i) the top and bottom 1.5% establishments in terms of labor productivity (as in Suyanto et al. (2009) and Takii (2005)), and (ii) those establishments

that do not have their own establishment-level financial statements. Here, labor productivity is calculated as sales per permanent employee, because information on output is unavailable from the survey data. Throughout this paper, sales is used as a proxy for output. This analysis does not consider temporary employees, as 71.7% of the establishments in the original data did not employ any temporary employees in the most recent fiscal year, and because 76.7% of those that did do not know for how long they employed temporary employees.

Figure 1 presents the kernel density estimates of the log of sales for DEs and FOEs analyzed in this study. It shows that, on average, FOEs' sales were higher than those of DEs, and that the former had a higher variance than the latter.

Table 1 defines the main variables, and Table 2 presents the descriptive statistics for DEs, FOEs, and the pooled sample. Data are fully available for 1,093 DEs and 41 FOEs. The first row of Table 2 shows that FOEs' sales were indeed higher than those of DEs; the difference is statistically significant at the 1% level. In absolute terms, the mean sales of FOEs and DEs were, respectively, 831 million Nigerian naira (NGN) and NGN33.3 million. Thus, the mean sales of FOEs were 25 times higher than those of DEs. The difference in the number of permanent, full-time employees is also significant at the 1% level: on average, FOEs employed more permanent employees, compared to DEs (the mean number of employees was 61.1 for FOEs and 15.5 for DEs). Thus, sales per permanent employee of FOEs (NGN13.6 million) was more than six times higher than that of DEs (NGN2.14 million), and this is partially reflected in the difference in the coefficient of employment (Table 3). In addition, as is evident from the third row of Table 2, the average FOE had been operating 5.7 years longer than the average DE, although this difference is significant only at the 10% level. *Education*, in the fourth row, is defined as the percentage of permanent, full-time employees who completed secondary school. The average of this percentage for DEs was 22.7 points higher than that for FOEs—that is, DE employees were on average *more* educated than FOE employees. *Electricity* is a

dummy variable that takes the value of 1 if the establishment considers a lack of electricity a major or very severe obstacle to operations. In all, 46.2% of DEs and 53.2% of FOEs find it difficult to secure sufficient electricity supplies, and this reflects the current state of infrastructure in Nigeria (section 2). There is no statistically significant difference between DEs and FOEs in this regard—roughly speaking, both groups of establishments lack access to electricity to similar extents. *Finance* is a dummy variable that takes the value of 1 if a lack of access to finance is a major or very severe obstacle to the establishment's operations. Unlike with electricity, the two groups show a clear difference with respect to finance: financing posed a bottleneck for more than one-quarter of DEs (25.4%), but for only 4.3% of FOEs. Finally, *R&D* is a dummy variable that takes the value of 1 if an establishment has invested in R&D activities in the three previous years; 13.1% of FOEs and 7.7% of DEs invested in R&D, but the difference is not statistically significant.

In what follows, we examine how these differences between DEs and FOEs contribute to differences in their performance.

4. Estimation Method

First, for each group of establishments, we examine the contribution of each explanatory variable to sales. We do so by estimating the following equation for each ownership type.[6]

$$\begin{aligned}\log(sales)_{ir} = {} & \beta_{0r} + \beta_{1r}\log(employees)_{ir} + \beta_{2r}Age_{ir} + \beta_{3r}Education_{ir} \\ & + \beta_{4r}Electricity_{ir} + \beta_{5r}Finance_{ir} + \beta_{6r}R\&D_{ir} + \beta_{7r}I_i + \beta_{8r}S_i \\ & + \varepsilon_{ir}, \end{aligned} \quad (1)$$

where subscripts i and r = *DE* and *FOE* respectively indicate establishment and

[6] Capital and costs of raw materials, fuel, electricity, and the like are likewise not included as explanatory variables, due to data limitations. For example, only 13 FOEs in our dataset (without outliers) reported the values of their capital stock, and two of these were zero. Information on the extent of competition—or, more precisely, the number of competitors—was provided by only 16 FOEs, and thus we do not control for this, either.

ownership type. I_i and S_i are industry and state dummies, respectively, and these are included to account for differences across industries and states in output price, as well as unobservable factors that affect productivity. Other variables are as explained in the previous section and Table 1.

This study aims to find the determinants of productivity differentials between DEs and FOEs in Nigeria. To this end, we use the Blinder–Oaxaca method to decompose mean differences in log sales into a part explained by group differences in mean endowments/characteristics, and a residual part that cannot be explained by such differences (Blinder, 1973; Oaxaca, 1973).

More precisely, let *Y* be the dependent variable, *X* a vector of independent variables and a constant, and β a vector of coefficients of the independent variables. Then, (1) can be rewritten as

$$Y_{ir} = X'_{ir}\beta_r + \varepsilon_{ir} \quad (r = DE, FOE).$$

Thus, the difference in the predicted means of the two groups of establishments, $\bar{Y}_{DE}$ and $\bar{Y}_{FOE}$, is given by

$$\begin{aligned} \bar{Y}_{DE} - \bar{Y}_{FOE} &= \bar{X}'_{DE}\hat{\beta}_{DE} - \bar{X}'_{FOE}\hat{\beta}_{FOE} \\ &= (\bar{X}_{DE} - \bar{X}_{FOE})'\hat{\beta}_{DE} + \bar{X}'_{FOE}(\hat{\beta}_{DE} - \hat{\beta}_{FOE}), \end{aligned} \tag{2}$$

where the hats indicate estimated coefficients. The first term in the second line expresses the part of the log sales differential that can be explained by differences in the mean characteristics (i.e., the explained part, or endowment effect): the average log sales of DEs would change by this amount if the DEs had had the mean characteristics of FOEs. The second term is the residual part that is attributable not to differences in characteristics, but to differences in returns to characteristics between the two groups (i.e., the unexplained part, or structural effect): the average log sales of DEs would change by this much if the returns to the characteristics had been those of FOEs, assuming that the mean characteristics of DEs are the same as those of FOEs.

Blinder–Oaxaca decomposition methods have been widely used to analyze wage

differentials between genders, races, or the public and private sectors (Fortin et al., 2011; O'Neill and O'Neill, 2006). In the literature—especially that on gender and race wage differentials—researchers are interested in examining whether there is discrimination against individuals of a particular gender or race. In such cases, coefficients that are considered nondiscriminatory should be used to obtain the part of wage differentials explained by differences in independent variables. If we apply the argument to our case, the difference in the means would be decomposed as

$$\bar{Y}_{DE} - \bar{Y}_{FOE} = (\bar{X}_{DE} - \bar{X}_{FOE})'\beta^* + \left[\bar{X}'_{DE}(\hat{\beta}_{DE} - \beta^*) + \bar{X}'_{FOE}(\beta^* - \hat{\beta}_{FOE})\right], \quad (3)$$

where β^* is the nondiscriminatory returns to establishment characteristics. Differences between β^* and the group coefficients are attributed to discrimination for or against the groups. Jann (2008) suggests that the coefficients from a pooled model be used as nondiscriminatory coefficients (see also Neumark, 1988).

In the current study, we do not explicitly assume any "discrimination" against either group of establishments. In addition, decomposition (2) is easier to interpret than decomposition (3); thus, we mainly follow decomposition (2). The results of decomposition (3), where the coefficients of the pooled model are used as β^*, will be presented as a robustness check for the main results. (See the column in Table 6 headed by "Coefficient: pooled.")

5. Results

(a) *Ordinary least squares estimations*

Table 3 presents the results of ordinary least squares (OLS) estimations from model (1), run separately for DEs, FOEs, and the pooled sample. Because the sample size of DEs is much larger than that of FOEs, the coefficients for the pooled sample more closely resemble those for DEs.

As expected, in all regressions, an increase in the number of permanent employees is associated with an increase in annual sales: a 1% increase in the number of permanent

employees increases sales by 0.57% for DEs, and by 1.2% for FOEs. Additionally, the length of operations positively and significantly correlates with DEs' sales at the 1% level: when the years of operation increases by one, sales increase by 3.7%. However, the age of FOEs has no significant relationship to sales of FOEs. On the other hand, employees' educational attainment has a significant association with annual sales at the 5% level for FOEs, but not for DEs. The magnitude of the return to education is nonnegligible—if FOEs increase the percentage of full-time permanent employees who completed secondary school by 1%, their sales will increase by 2.3%. Contrary to our expectations, a lack of access to electricity was found *not* to have a significant relationship with annual sales, for either DEs or FOEs; it should be noted, however, that this variable is based on establishments' subjective evaluations. Therefore, those establishments that found impeded access to electricity to be a major obstacle to their operations might have been less constrained by it than establishments that found impeded access to be less of an obstacle. Thus, this result should be interpreted with caution, especially because stable power supplies are essential to the development of the Nigerian economy in general, and the manufacturing sector in particular.[7] A lack of access to finance, on the other hand, was found to have a negative and significant effect on the sales of both DEs and FOEs: the sales of DEs (FOEs) that found it difficult to obtain adequate funding were only 52.7% (7.5%) of the sales of their counterpart establishments that are less finance-constrained. Although the effect of finance on sales is much larger for FOEs than for DEs, the percentage of FOEs that face financial difficulty (4.3%) is much lower than that of DEs (25.4%) (Table 2). Below, we will investigate how these differences in characteristics and the returns to them affect the log sales differential. Finally, R&D expenditure is found to have no significant effect on annual sales for either group in our Nigerian sample; this finding runs counter to the majority of existing work (Hall et al., 2010).

[7] The same caution should be given to the case of *Finance*, although in this case, the associated results are more intuitive.

(b) *Blinder–Oaxaca decomposition*

The use of Blinder–Oaxaca decomposition of the mean difference in log sales between DEs and FOEs enables us to determine those factors that contribute to the difference, and to what extent. In particular, the decomposition tells us whether it is the difference in establishment characteristics or the difference in their returns that determines the productivity differential between DEs and FOEs.

Table 4 shows the results of the aggregate decomposition. The mean predicted values of log sales are 14.6 for DEs and 16.4 for FOEs, with a statistically significant difference of 1.87 at the 1% level. This result is consistent with those of Aitken and Harrison (1999) and Willmore (1986), who found a positive correlation between foreign ownership and productivity among Venezuelan plants and Brazilian firms, respectively (see also Javorcik (2004) and Bellak (2004) for cases of higher-income countries). It should also be noted that differences in the characteristics of DEs and FOEs account for more than three-quarters of the mean ownership differential in sales. Differences in the returns to those characteristics explain only the remaining 22.4% of the ownership gap.

Table 5 presents the results of the detailed decomposition. Of the explained part of the total mean difference in log sales, 1.45, the difference in the number of permanent employees between DEs and FOEs accounts for 0.29, or 19.7%. Apart from the industry dummies, the largest portion of the explained part is attributed to the fact that FOEs employ more permanent employees than do DEs. The next largest contributor to the explained part is *Age* (i.e., length of operation), which explains 14.5% of the part. The next largest portion of the explained part, 9.3%, is due to the difference in access to finance between DEs and FOEs; as seen in the previous subsection, the magnitude of damage caused by a lack of access to finance is much greater for FOEs than for DEs. However, only a small fraction (4.3%) of FOEs suffer from a lack of adequate operational funding, while one-quarter of DEs face difficulties on account of it. It is this difference that accounts for 9.3% of the explained part, or 7.2% of the total log sales difference

between DEs and FOEs. Access to electricity and R&D do not affect the log sales differential, as they were not significantly correlated with sales within each group of establishments (Table 3). The same caution applied in the previous subsection needs also to be applied here: given the subjective nature of establishments' responses, the variable *Electricity* and its coefficient may not reflect the "true" effect on sales of a lack of access to electricity. Therefore, special care should be taken before concluding that access to electricity is not an issue for establishments in Nigeria.

For the unexplained part, only *Age* and *Education* are statistically significant at the 10% level. Note, however, that *Age* "counter-explains" the higher sales of FOEs by having a positive sign. In addition, the unexplained part as a whole is not statistically significant. Therefore, the results of our analysis of Nigerian establishments indicate that more focus should be placed on the explained part—that is, differences in endowments between DEs and FOEs.

It is noteworthy that about 78% of the output differential by ownership type is due to an endowment effect: FOEs in Nigeria produce higher sales/output not because they use their endowments more efficiently, but because they possess better endowments. This bears important policy implications, as will be discussed in the final section.

(c) *Robustness checks*

To check the robustness of the aforementioned results, we decompose mean log sales differentials by using different variable definitions and model specifications (Table 6). In our main model, FOEs are defined as those establishments that are *at least partially* owned by foreign individuals, companies, or organizations. The first three columns of Table 6 report the decomposition results when we consider an establishment foreign-owned only if the percentage of foreign ownership is equal to or higher than 10%, 30%, and 50%. The main results remain largely unchanged—namely, FOEs have higher sales/output than DEs; most of the difference can be explained by the endowment effect;

the number of permanent employees and access to finance are significantly associated with the explained part (though *Age* is not); and the unexplained part is statistically insignificant. The log sales differential and the coefficients of the variables for the explained part are also quite similar in magnitude. In contrast, some notable changes are observed in the unexplained part. For example, differences in the returns to employment and age across ownership type become very large and significant. These changes are probably due to the small FOE sample size.

It is known that the decomposition results for dummy variables depend on the choice of the base group (Jann, 2008). This issue is not critical for the explained part of the decomposition, which we are more interested in. Still, as a reference, the results of an estimation that is independent of the choice of the base group for all the dummy variables, *Electricity*, *Finance*, *R&D*, and industry and state dummies, are presented in the fourth column titled "Categorical" in Table 6. The part explained by the endowment effect slightly decreases from 77.6% to 74.2%. However, although the sizes and the level of significance of the coefficients for the unexplained part change, those of the coefficients for the explained part are, again, largely unchanged—the number of employees and access to finance still play a key role accounting for the explained part.

Finally, as was mentioned in section 4, we decompose the mean output differential according to equation (3), using the coefficients of the pooled model as β^*. The results are shown in the last column "Coefficient: pooled". Once again, the coefficients and their significance for the explained part as well as the difference in log sales by ownership type are almost unchanged.

6. Discussion and Conclusion

This study estimates the difference in the value of output between DEs and FOEs in Nigeria, and attempts to pinpoint those factors that account for differences. To this end, we use the decomposition method developed by Blinder (1973) and Oaxaca (1973), and

we consider establishment characteristics such as the number of employees, age, employees' educational attainment, access to electricity and finance, and investment in R&D.

Our main findings can be summarized as follows. First, on average, FOEs generate significantly higher sales than do DEs. Second, the decomposition results show that around three-quarters of the log sales differential can be explained by differences in establishment characteristics. In contrast, the ownership gap in sales is not significantly associated with differences in the coefficients of the characteristics across ownership type. Third, apart from industry dummies, the number of employees, age, and access to finance are the three largest contributors to the part of log sales differential explained by characteristic differences.

The finding that the sales/output differential between DEs and FOEs in Nigeria is largely due to differences in firm characteristics—and not to differences in returns to them—has important policy implications. Developing countries try to attract foreign firms, in the hope that they will enhance technological and management progress in the host economies and among domestic firms. However, in so doing, host countries need to incur substantial costs (Bellak, 2004). Our analysis indicates that: (i) there is room for DEs to receive such benefits from FOEs, as FOEs have much higher returns to employment (Table 3); however, (ii) the gap in sales/output can be significantly reduced if DEs can hire more (permanent) employees and/or have easier access to finance. Removing these obstacles to DEs should be emphasized more in further developing the Nigerian economy.

One may think it too obvious that sales (or output) increases as employment increases, and that DEs employ fewer workers than FOEs because that is optimal for them. It should be noted, however, that finding fully qualified applicants is not always easy in Nigeria. Indeed, 27% of the DEs that had had vacancies for skilled production workers in the previous 12 months stated that the biggest challenge in filling the most recent vacancy

was a lack of basic and technical skills among the applicants. On the other hand, only 14% of FOEs faced such difficulties. Other things being fixed, if DEs were to employ the same number of permanent employees as FOEs, 15.3% of the ownership gap in sales would disappear.

Access to finance is another factor worthy of particular attention. Our analysis reveals that: (i) one-quarter of DEs face difficulties in obtaining sufficient operational funding, while only 4.3% of FOEs have such difficulties, and (ii) this difference accounts for 7.2% of the total log sales differential between DEs and FOEs. In fact, access to finance not only increases sales, but also improves the labor productivity of DEs. Table 7 presents the results of the decomposition of labor productivity differential by ownership type, where labor productivity is defined in terms of sales per employee. As the table shows, the difference in access to finance is significantly correlated with the productivity differential—that is, if the percentage of DEs that lack adequate funds were to decrease to that of FOEs, DEs' labor productivity would increase *and* the productivity gap across ownership type would narrow.

In terms of improving the performance of domestic nonagricultural establishments, our results point to the importance of reforming both education and finance systems in Nigeria. If DEs could employ skilled workers and obtain funds from financial institutions more easily, and if the differences between DEs and FOEs in the means of both employment and access to finance were to vanish, 22.5% of the gap in mean log sales across the two ownership types would disappear.

Due to data limitations, we were unable to control for several important factors, such as capital stock, costs of intermediate and other inputs, and the degree of competition in the markets. Second, we did not study the dynamic aspects of establishment performance or the effects of ownership change, which would require panel data that track the same set of establishments over time. Third, although we found neither access to electricity nor R&D to have any significant effects on sales among DEs and FOEs, or on the sales

differential by ownership type, more scrutiny is needed to determine their effects. This is especially the case with electricity, not only because 46% of the DEs and 53% of the FOEs analyzed in our study consider a lack of access to electricity a major or very severe obstacle to operations, but also because electricity is an indispensable resource for the economy. Such detailed analyses can be undertaken once new waves of survey data are made available.

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Figure 1. Kernel density estimates of the log of sales, by ownership

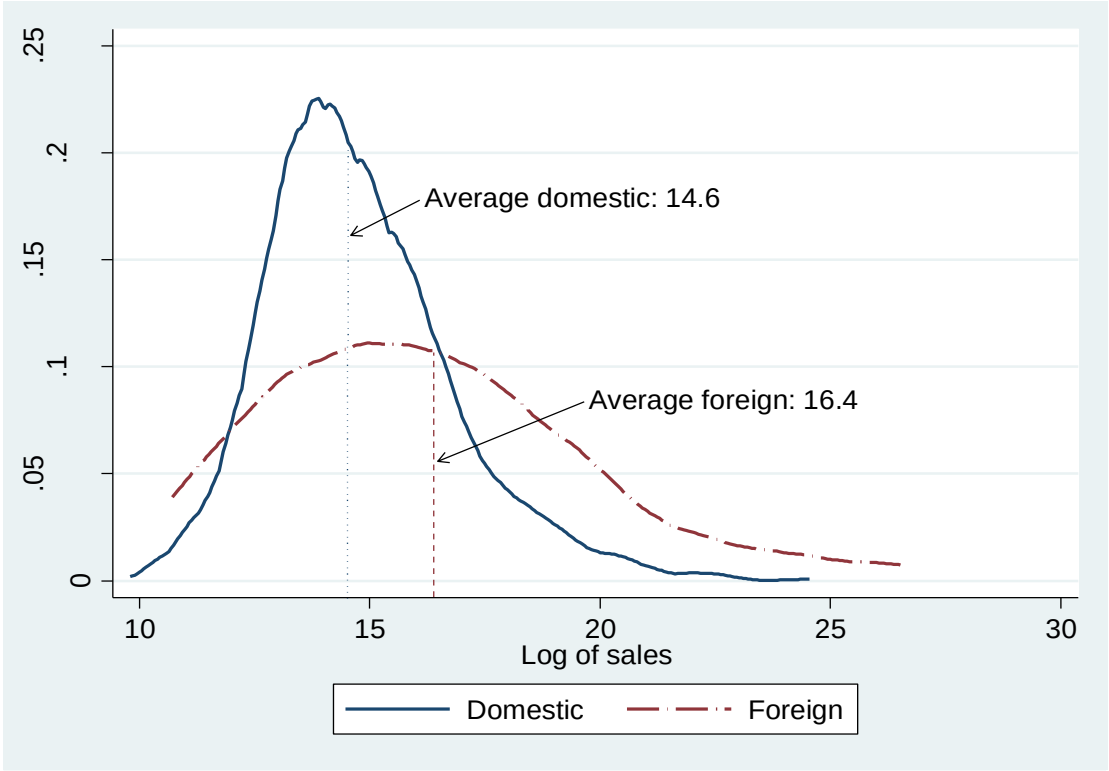

Table 1. Variables and Definitions

Variable	Definition
Log (sales)	Log of annual sales in the most recent complete financial year
Log (employees)	Log of the number of permanent, full-time employees at the end of the most recent complete financial year
Age	The number of years of operation
Education	The percentage of permanent, full-time employees who completed secondary school
Electricity	Dummy variable that takes the value of 1 if access to electricity is a major or very severe obstacle to the current operations of the establishment
Finance	Dummy variable that takes the value of 1 if access to finance is a major or very severe obstacle to the current operations of the establishment
R&D	Dummy variable that takes the value of 1 if the establishment spent on formal R&D activities during the last three years

Table 2. Descriptive statistics of establishment characteristics, by ownership type

	Pooled sample	DEs	FOEs	Difference
Log (sales)	14.635	14.572	16.440	-1.868***
Log (employees)	2.313	2.296	2.798	-0.502***
Age	15.398	15.206	20.939	-5.733*
Education	68.180	68.938	46.274	22.664**
Electricity	0.465	0.462	0.532	-0.069
Finance	0.247	0.254	0.043	0.210***
R&D	0.079	0.077	0.131	-0.054
Observations	1134	1093	41	

Notes: The estimates are weighted according to the survey design. The levels of statistical significance are indicated as follows: * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 3. OLS estimations, by ownership type

	Pooled sample	DEs	FOEs
Log (employees)	0.597***	0.568***	1.229***
	(0.096)	(0.097)	(0.407)
Age	0.0378***	0.0366***	-0.0155
	(0.0069)	(0.0071)	(0.028)
Education	0.0031	0.0032	0.0225**
	(0.0027)	(0.0027)	(0.0096)
Electricity	0.0854	0.104	-1.594
	(0.205)	(0.209)	(2.063)
Finance	-0.678***	-0.641***	-2.586**
	(0.220)	(0.220)	(1.153)
R&D	0.249	0.255	1.028
	(0.229)	(0.238)	(0.980)
R-squared	0.407	0.380	0.970
Observations	1134	1093	41

Notes: The dependent variable is the log of sales. Industry and state dummies and a constant are also included in all regressions. Standard errors are in parentheses. As in Table 2, the estimates are weighted according to the survey design. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 4. Aggregate decomposition, by ownership type

Mean log sales		Difference	Decomposition			
DEs	FOEs		Explained	Percentage	Unexplained	Percentage
14.572***	16.440***	-1.868***	-1.450**	77.6%	-0.418	22.4%
(0.134)	(0.680)	(0.693)	(0.645)		(0.488)	

Note: Standard errors are in parentheses. The estimates are weighted according to the survey design. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table 5. Detailed decomposition, by ownership type

	Explained	Unexplained
Log (employees)	-0.285**	-1.849
	(0.118)	(1.165)
Age	-0.210*	1.089*
	(0.127)	(0.613)
Education	0.073	-0.891*
	(0.069)	(0.491)
Electricity	-0.007	0.902
	(0.023)	(1.126)
Finance	-0.135**	0.084
	(0.054)	(0.069)
R&D	-0.014	-0.101
	(0.019)	(0.137)
Industry dummies	-0.984*	-0.548
	(0.579)	(0.405)
State dummies	0.111	0.77
	(0.253)	(0.979)
Total	-1.450**	-0.418
	(0.645)	(0.488)

Note: Standard errors are in parentheses. The estimates are weighted according to the survey design. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6. Decompositions under different specifications

	Foreign ownership			Categorical	Coefficient: pooled
	10%	30%	50%		
Mean log sales of DEs	14.572***	14.572***	14.572***	14.567***	14.572***
	(0.134)	(0.134)	(0.134)	(0.134)	(0.134)
Mean log sales of FOEs	16.419***	16.398***	16.362***	16.440***	16.440***
	(0.697)	(0.729)	(0.758)	(0.680)	(0.680)
Difference	-1.847***	-1.826**	-1.790**	-1.873***	-1.868***
	(0.710)	(0.742)	(0.770)	(0.693)	(0.693)
Explained					
Log (employees)	-0.285**	-0.269**	-0.256**	-0.269**	-0.293**
	(0.118)	(0.118)	(0.117)	(0.112)	(0.120)
Age	-0.199	-0.215	-0.208	-0.209*	-0.213*
	(0.126)	(0.132)	(0.135)	(0.126)	(0.128)
Education	0.074	0.075	0.079	0.08	0.075
	(0.070)	(0.071)	(0.075)	(0.071)	(0.069)
Electricity	-0.007	-0.006	-0.004	-0.008	-0.006
	(0.023)	(0.023)	(0.022)	(0.025)	(0.021)
Finance	-0.139**	-0.140**	-0.152***	-0.131**	-0.140**
	(0.055)	(0.055)	(0.058)	(0.054)	(0.055)
R&D	-0.012	-0.007	-0.002	-0.016	-0.013
	(0.018)	(0.014)	(0.011)	(0.021)	(0.018)
Industry dummies	-0.984*	-1.032*	-1.067*	-0.94	-0.905*
	(0.582)	(0.599)	(0.613)	(0.594)	(0.485)
State dummies	0.126	0.105	0.143	0.103	0.155
	(0.255)	(0.265)	(0.273)	(0.248)	(0.286)
Total	-1.426**	-1.489**	-1.468**	-1.390**	-1.340**
	(0.653)	(0.673)	(0.700)	(0.667)	(0.576)
Unexplained					
Log (employees)	-4.037***	-4.505***	-4.468***	-1.939*	-1.842
	(0.885)	(0.403)	(0.403)	(1.166)	(1.163)
Age	2.511***	2.454***	2.433***	1.087*	1.093*
	(0.520)	(0.406)	(0.418)	(0.612)	(0.612)
Education	0.316	0.565***	0.551***	-0.877*	-0.893*
	(0.437)	(0.174)	(0.175)	(0.490)	(0.492)
Electricity	0.667	2.931***	2.825***	0.054	0.901
	(0.834)	(1.016)	(1.066)	(0.297)	(1.126)
Finance	0.211	0.13	0.059	-0.896*	0.089
	(0.134)	(0.086)	(0.051)	(0.532)	(0.069)
R&D	0.053	-0.093*	-0.076*	0.272	-0.102
	(0.116)	(0.049)	(0.043)	(0.371)	(0.137)
Industry dummies	-1.822**	-0.526	-0.422	-0.595	-0.626
	(0.906)	(1.588)	(1.714)	(0.414)	(0.397)
State dummies	1.998***	5.193***	6.174***	0.786	0.726
	(0.665)	(0.648)	(0.758)	(0.976)	(0.960)
Constant	-0.318	-6.486***	-7.397***	1.625	0.126
	(1.048)	(0.352)	(0.352)	(1.432)	(2.035)
Total	-0.421	-0.337	-0.321	-0.482	-0.528
	(0.501)	(0.516)	(0.534)	(0.514)	(0.409)

Notes: Standard errors are in parentheses. The estimates are weighted according to the survey design. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7. Decomposition of labor productivity differential

	Explained	Unexplained
Age	-0.209	0.958*
	(0.130)	(0.544)
Education	0.055	-1.026**
	(0.067)	(0.506)
Electricity	-0.006	0.77
	(0.021)	(1.006)
Finance	-0.119**	0.069
	(0.052)	(0.049)
R&D	-0.010	-0.110
	(0.015)	(0.143)
Industry dummies	-1.002	-0.414
	(0.613)	(0.486)
State dummies	0.091	0.492
	(0.253)	(0.808)
Total	-1.200*	-0.165
	(0.721)	(0.491)

Notes: The dependent variable is the log of sales per permanent employee. The mean log productivity is 12.3 for DEs and 13.6 for FOEs. The difference, 1.37, is statistically significant at the 10% level. Standard errors are in parentheses. The estimates are weighted according to the survey design. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.