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Market Size, Sunk Costs, and Transport Costs:

An empirical evaluation of the Impact of Demand Side factors versus Supply Side Factors on Manufacturing Productivity

Patricia Jones
University of Oxford

Emmanuel Lartey
World Bank

Taye Mengistae
World Bank

Albert Zeufack
World Bank

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Abstract

This paper uses plant-level, panel data from the Ethiopian manufacturing census to estimate the effects of both demand side and supply side factors on industry-wide aggregate productivity. We focus on the effects of three factors: 1) local market size; and 2) transportation costs; and 3) sunk costs. Identification is based on a model of production under monopolistic competition as developed by Melitz and Ottaviano (2008). This model enables us to interpret the estimated coefficients of a reduced form, dynamic productivity equation. We carry out our analysis on 11 four-digit ISIC industries in Ethiopia over the period 2000 to 2010. Several interesting results emerge. In our most parsimonious specification, the estimated coefficients are consistent with all three predictions of the model—but only for one industry: cinder blocks (ISIC 2695). In this industry, the expansion of the local market boosts industry-wide total factor revenue productivity (TFPR) while increases in transport costs and licensing fees reduce TFPR. The picture is somewhat mixed in the other 10 industries but broadly consistent with the predictions of the model.

1. Introduction

A central question in development economics is why some countries are rich while others are poor. The starting point to answering this question is the well-established fact that income gaps across countries are largely explained by differences in total factor productivity (TFP). While much of the early growth literature emphasized the importance of supply-side factors, particularly technology, in explaining productivity gaps across countries, many recent studies have stressed the importance of demand-side factors, particularly market size and access. Given this shift in focus, it is important to understand the relative importance of both sides of the market in explaining productivity gaps. This is particularly important to policy makers because, depending upon the binding constraint, different policy responses might be needed for stimulating productivity growth.

In addition, the last ten years has brought a wave of new studies highlighting the micro foundations of aggregate productivity growth (Restuccia and Rogerson, 2008; Hsieh and Klenow, 2009; Bartelsman, Haltiwanger, and Scarpetta, 2009, 2012; Acemoglu and Dell, 2010; Restuccia and Rogerson, 2013; Haltiwanger, Scarpetta, and Schweiger, 2014; Foster, Grim, Haltiwanger, and Wolf, 2015; Bento and Restuccia, 2017). A common theme among these papers is that certain regulations or institutions can have a differential impact on the productivity of heterogeneous plants operating in different markets and that these differences—when summed across the entire economy— explain a large proportion of the variation in aggregate productivity across different countries. Our paper adds to this body of research by examining the impact of changes in supply and demand factors on plant-level productivity—as well as aggregate industry-wide productivity—in Ethiopia over the period 2000 to 2010. Chief among the supply side factors that we consider are market entry costs (in the form of licensing fees) and changes in technology. Demand side factors include exogenous increases in plants' access to domestic or international markets that result from either changes in trade policy or changes in transportation costs.

Our starting point in building an identification strategy is to adopt the modelling framework outlined by Syverson (2004a) and Mellitz and Ottaviano (2008). Specifically, Syverson (2004) argues that imperfect product substitutability (due to factors like high transport costs) prevents consumers from costlessly shifting demand from one producer to another. As a result, "more efficient (lower cost) plants cannot lure away all demand from their less efficient industry rivals simply with lower prices" (p. 534). This enables lower productivity plants to survive, even in long run equilibrium, despite their lower productivity. Similarly, an implication of the Melitz-Ottaviano (2008) model is that high transport costs can reduce the scale of market selection via firm entry and exit.

As outlined by Melitz-Ottaviano (2008), the more differentiated a product is (in the sense of lower product substitutability), the lower is its industry (average and minimum) productivity and the greater is the within-industry dispersion of productivity. Any exogenous increase in market size therefore leads to growth in the average (or expected) plant-level productivity. The lower the degree of product differentiation, the larger these changes are because they are the outcome of market expansion that speeds up the reallocation of market shares and factor inputs (both within the industry itself and between the industry and the rest of the economy) by raising producers' entry and exit rates to and from that industry.

We test these predictions using a 11-year panel of manufacturing firms from Ethiopia.[1] This panel contains annual production data for the period 2000 to 2010 and covers all manufacturing firms employing 10 or more employees.[2] It is arguably the most comprehensive longitudinal dataset on manufacturing firms in Sub-Saharan Africa at this moment. Industries are classified in the dataset at the 4-digit ISIC level. Importantly, the Ethiopian data include producers' physical outputs, q_i, along with their respective prices, p_i. This allows us to distinguish between revenue-based measures of total factor productivity (TFPR) and those based on physical outputs (TFPQ). As is standard in the literature, we define TFPR as the value of revenue $(p_i q_i)$ per input unit (x_i) and TFPQ as the number of physical units produced per unit of output (q_i/x_i). TFPQ measures the technical efficiency of a plant.

As discussed by Foster, Haltiwanger, and Foster (2008), it is important to distinguish between a plants' TRPR and TFPQ when estimating the effects of plant turnover on an industry's

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[1] This panel is compiled from ten years of the Ethiopian Survey of Large and Medium Scale Manufacturing Industries which, despite its name, is a census of all manufacturing firms with 10+ employees.

[2] Data from 2005 are dropped because a survey was conducted during that year rather than a census.

productivity. If all firms are price takers, simultaneous entry and exit processes leads to a selection outcome in which the industry's least productive firms (in the sense of having have lower TFPQ) exit the market in (long-run) equilibrium. However, it is also possible to have an alternative scenario in which a plant's revenue productivity (TFPR) is a better predictor of its survival than its physical productivity (TFPQ). Such a case could arise if some plants in the industry exercise a degree of market power that allows them to charge higher prices for their product than others. If this were the case, plants with higher TFPR could survive in the long run, even if they were less productive (in the sense of having lower TFPQ) than plants exiting the market. In such cases, empirical studies that measure establishment-level productivity using TFPR might thus overestimate the "true" link between a firm's productivity and the probability of its survival.

This kind of measurement error arises when factors other than inter-firm gaps in factor productivity determine inter-firm price differentials. Such factors include the many sources of product differentiation that firms use to lower product substitutability as well as idiosyncratic demand differences that can arise in markets. While such factors drive a wedge between marginal factor productivities and product prices in monopolistic markets, they are not easy to observe or measure. This complicates the empirical task of identifying the impact of supply and demand factors on productivity measures. To get around this problem, we control for the influence of product differentiation simply by focusing on Ethiopian industries that produce only relatively homogeneous goods. We focus on 11 four-digit ISIC industries.

Our identification strategy relies on Melitz and Ottaviano (2008) who construct a structural model of production under monopolistic competition that we use to interpret the results of our reduced form productivity equation. We find that The main predictions of the model are all born out in the most homogenous of the 11 industries: cinder blocks (ISIC 2695). In this industry, the expansion of the local market boosts revenue productivity while increases in transport costs and licensing fees reduce it. The picture is mixed in the other industries, but it is still broadly supportive of the model in as far as local market size is a major factor in determining aggregate revenue productivity within nine of the eleven industries that we examine. Rising transport costs also reduce revenue productivity significantly in eight of the industries. Not surprisingly, higher licensing fees reduce aggregate productivity within all industries.

Looking at the relative significance of the three types of effects, local market size exerts the most influence on aggregate revenue productivity across the 11 industries in as far as the elasticity of TFPR with respect to market size is always higher than that with respect to transport costs and licensing fees. Finally, we find that the demand side factors influence industrial revenue productivity more than the cost of entry does.

The organization of the rest of the paper is as follows. Section 2 develops the main hypotheses that we test empirically in the paper. These hypotheses are derived from the theoretical framework laid out in Melitz and Ottaviano (2008). Section 3 presents our identification strategy as well as our main empirical results. Finally, Section 4 offers some concluding remarks.

2. Theoretical Framework

The main hypotheses that we test empirically are the key predictions of Melitz and Ottaviano's (2008) model of monopolistic competition. In this model, aggregate, industry-wide productivity depends on three demand side variables: the size of the industry's product market; the degree of product differentiation within the industry; and the cost of transport to the point of delivery. The effect of supply side factors on productivity is transmitted via a fixed sunk cost of entry that is assumed exogenous.

A. Product differentiation and market size as demand side factors in competition

In the model an industry consists of a continuum of N producers, indexed by $i : i \in \Omega$, producing distinct varieties of a product to meet demand from a continuum of L consumers who are assumed to have identical preferences over the varieties per the utility function

$$U = q_o + \alpha \int_{i \in \Omega} q_i di - \frac{1}{2}\gamma \int_{i \in \Omega} q_i^2 di - \frac{1}{2}\eta \left(\int_{i \in \Omega} q_i d_i \right)^2 \tag{1}$$

where q_i represents consumption of the output of $i : i \in \Omega$; $q_0 : q_0 > 0$ is quantity consumed of a unique numeraire good; α and η, are constants measuring the ease of substitution between the numeraire and varieties of the differentiated product; and γ is the degree of product differentiation and thus is an inverse measure of the ease of substitution among varieties.

For all varieties production involves the use of inelastically supplied homogenous labor as the only factor input to produce a differentiated good at a constant marginal cost, c, excluding transport costs. Both production and consumption take place in a multiplicity of locations, which could be cities, regions, or even countries. It is assumed that at least some of the produce of each location is consumed locally but varieties are imported from other locations subject to transport costs.

Without loss of generality we consider the simplest case whereby all economic activity takes place in just two distinct locations (or cities), h and l, such that l is the larger of the two local markets in the sense that $L^l > L^h$. Everyone is assumed to consume positive quantities of the numeraire in utility function (1) at unit price $p_i^l \equiv p_{iD}^l(c) + p_{iX}^l(c) = \alpha + \gamma q_i^l - \eta Q^l$, where D and X index, respectively, local sales and exports to the other location, and $Q^l = \int_{i\in\Omega} q_i^l \, d_i$. The unit price is assumed to be consistent with the aggregate inverse demand function for each variety that can be inverted into a demand system across varieties as

$$q_i^l = \frac{\alpha L^l}{\eta N^l + \gamma} - \frac{L^l}{\gamma} p_i^l + \frac{\eta N^l}{\eta N^l + \gamma} \frac{L^l}{\gamma} \bar{p}^l \qquad \forall i \in \Omega_l^* \tag{2}$$

where N^l is the number of varieties sold in location l (equal to the number of firms selling in that location including both local producers and exporters) based in h, L^l is the number of consumers in the same location, $\bar{p}^l = \frac{1}{N^l} \int_{i\in\Omega_i^*} p_i^l \, di$ is the average price in the location where $\Omega_l^* \subset \Omega_l$, $\Omega \equiv \Omega_l \cup \Omega_h$ and $p_i^l \le p_{Max}^l$, where p_{Max}^l is the price ceiling that would reduce the demand for any variety to zero in that location. The price ceiling in the location is given by

$$p_{Max}^l = \frac{1}{\eta N^l + \gamma} \left(\gamma \alpha + \eta N^l \bar{p}^l \right) \tag{3}$$

A precise indicator of the extent of competition that producers face in the product market is the elasticity of demand. For any variety, i, this is given by $\varepsilon = \left[\left(\frac{p^l_{Max}}{p^l_i}\right) - 1\right]^{-1}$ because of equation (3). Sellers in either location are said to face greater product market competition: (a) the greater is the aggregate demand for the industry's output as indicated by α; (b) the lower is the industry average price, $\overline{p}^l$; (c) the greater is the ease of substitution between varieties, that is, the smaller is γ; and (d) the larger is the number of sellers, N^l. The last result follows from the fact that, other things being equal, the price elasticity of demand is higher the larger is N^l because an increase in the number of sellers reduces the price ceiling, p^l_{Max}, in a location. Demand is also more price elastic for the more expensive varieties other things being equal.

B. Transport cost as a supply side factor in competition and productivity

While the same differentiated good is (produced and) delivered locally at the same unit cost, c, in either location, it is assumed that the delivery of identical output to the other location entails additional transport costs, $\tau^l c$ such that $\tau^l > 1$. This implies that the product market is segmented between the two locations by positive transport costs so that each producer maximizes its profits from local sales independently of its profits from exports to the other location.

Transport costs make it more difficult for firms to sell outside of the local market in that they need to charge a higher breakeven price than they do selling locally. Let c^l_D be the highest of the unit costs for profitably delivering any variety in location l while c^l_X is the highest of the unit costs of profitable shipments of the same variety to the other location. By assumption c^l_D is the same as the unit cost of the marginal (or highest -cost) local supplier in location l. That is, the producer that has the highest cost among the firms selling locally in l and is consequently just breaking even by charging the highest of the local prices observed, p^l_{Max}. We thus have $c^l_D = \sup\{c : \pi^l_D(c) > 0\} = p^l_{Max}$, where $\pi^l_D(c)$ is maximized profits from local sales. Also c^l_X is the highest possible marginal cost of shipment of a variety to the other location, h, in the sense that

$c_X^l = \sup\{c : \pi_X^l(c) > 0\} = \frac{p_{Max}^h}{\tau^h}$, where $\pi_X^l(c)$ is maximized profits from exports to the other location . But this implies that $c_X^h = \frac{c_D^l}{\tau^l}$, which means that no producer can just breakeven by making any shipment of its output to the other location without charging a higher price than it would charge if it were selling the same output locally. Moreover, given any unit price of a variety, more of the variety is sold locally at that price than would be shipped to the other location.

C. Sunk entry costs as a supply side factor in competition and productivity

Let $q_D^l(c)$ be the quantity that a firm based in location l sells locally at the profit maximizing unit price, $p_D^l(c)$, and let $q_X^l(c)$ be the quantity of its shipment to the other location at the profit maximizing unit price, $p_X^l(c)$. Maximized profits from local sales and exports to the other location are thus given respectively by $\pi_D^l(c) = [p_D^l(c) - c]q_D^l(c)$ and $\pi_X^l(c) = [p_X^l(c) - \tau^h c]q_X^l(c)$

Firms make the decision on whether to produce only after having incurred a fixed sunk cost of entry, f_E, that is assumed to be invariant between locations. This decision is based on each firm's assessment of the profits that it expects to make by supplying either or both markets. The expected profits in turn depend on the firms' draw from the cost distribution, $G(c)$, across all potential producers. Given $G(c)$ and f_E, firms for which the expected profits is high enough to at least cover their sunk cost of entry "survive" the cost draw and start producing, while those for which the expected profits are less than f_E exit the product market. This defines the free entry condition of the model as

$$\int_0^{c_D^l} \pi_D^l(c) dG(c) + \int_0^{c_X^l} \pi_X^l(c) dG(c) = f_E \tag{4}$$

where the right- hand side is the expected profits of producing in location l .

In picking the optimal quantity and price combination for supplying locally, each firm in l takes as given the number of varieties produced locally, N^l, and those produced in the other location,

N^h. It also takes as given the respective average prices, $\overline{p}^l$ and $\overline{p}^h$, charged in both locations. This is a case of monopolistic competition whereby profit maximization in each firm's pricing and production choices leads to equilibrium prices and quantities that can be expressed in terms of cost thresholds as

$$p_D^l(c) = \frac{1}{2}\left(c_D^l + c\right) \tag{5}$$

and

$$p_X^l(c) = \frac{\tau^h}{2}\left(c_X^l + c\right) \tag{6}$$

where $p_D^l(c)$ and $p_X^l(c)$ are the local and "export" components of the price $p^l(c) = p_D^l(c) + p_X^l(c)$ charged by producers in location l for their locally sold and exported quantities of

$$q_D^l(c) = \frac{L^l}{2\gamma}\left(c_D^l + c\right) \tag{7}$$

and

$$q_X^l(c) = \frac{L^h}{2\gamma}\left(c_X^l + c\right) \tag{8}$$

respectively where $q^l(c) = q_D^l(c) + q_X^l(c)$, and where L^l and L^h are the respective sizes of the product markets in the two locations, measured in terms of the aggregate number of consumers in each location.

Equations (5) through to (8) lead to $\pi_D^l(c) = \frac{L^l}{4\gamma}\left(c_D^l + c\right)^2$ and $\pi_X^l(c) = \frac{L^h \tau^h}{4\gamma}\left(c_X^l + c\right)^2$ as the expressions for the maximized profits from local sales and from exports, respectively of equation (4)—the free entry condition. Assuming a specific functional form for $G(c)$ in that equation leads to relatively precise predictions about the effects of market size, transport costs, and product substitutability as demand side determinants of aggregate productivity. Thus if $G(c)$ is a Pareto distribution with shape parameter k , such that

$$G(c) = \left(\frac{c}{c_M} \right)^k, \qquad c \in [0, c_M] \tag{9}$$

and we assume that the differentiated product is produced in both locations the free entry condition (4) reduces to

$$L^l (c_D^l)^{k+2} + L^h \rho^h \left(c_D^h\right)^{k+2} = \gamma \phi f_E \tag{10}$$

where $\phi = 2(k+1)(k+2)(c_M)^{k+2}$, $1/c_M$ is the technological lower bound of productivity, k is higher the more concentrated is the industry in the sense of the number of high cost potential producers being higher relative to that of all potential producers; and $\rho^l = \left(\tau^l\right)^{-k} \in (0,1)$ is a parameter monotonically decreasing in transport costs. The parameter ϕ is increasing in the maximum cost threshold c_M and therefore decreasing in the technological lower bound, $1/c_M$. It also increases in the shape parameter of the cost distribution, k . Indeed ϕ is increasing in the variance (or dispersion) of the cost distribution of equation (9) and therefore in the dispersion of productivity across firms.

Equation (10) can be solved for the upper cost bound, c_D^l , of local supply as

$$c_D^l = \left[\frac{\gamma \phi f_E}{L^l (1+\rho)} \right]^{\frac{1}{(k+2)}} \tag{11}$$

on the simplifying assumption that transport costs are symmetric between the two locations, so that $\rho^l = \rho^h = \rho$.

This equation links the cost threshold, c_D^l, to the demand side variables (γ, ρ, L^l), on one hand, and to ϕ and f_E on the supply side. Indeed, it is a statement of all three predictions of the model about the effects of product market demand factors on industry level aggregate (or average) productivity. These are that the lower bound of productivity, $1/c_D^l$, is higher: 1) the larger is the product market, L^l; 2) the greater is the degree of product differentiation, γ; and 3) the smaller is the cost of transport/shipment of varieties to and from other locations (i.e., the smaller is ρ).

These predictions can be set against a fourth one, also read from equation (11), that lower bound productivity is higher the smaller is the non-recoverable cost of entry, f_E, which, in turn, sums up a host of supply side factors, such as the legal regulation of entry.

The free entry condition that equation (11) states also means that aggregate productivity is decreasing in a second set of supply side factors, namely, ϕ and k. The first of these measures is the variance of the cost distribution, $G(c)$, of equation (9) and the productivity distribution underling that cost distribution. As a positive correlate of the variance of $G(c)$ and, hence, that of the underlying productivity distribution, ϕ also inversely measures the concentration of the population of firms relative to that of highest cost and hence, least productive firm. Clearly ϕ is higher the higher is k and the greater is c_M. This implies that industry wide average productivity is therefore higher the lower c_M and the smaller is k and, therefore, the lower is ϕ.

3. Empirical Specification and Findings

A. Specification of the Productivity Equation

The model described in section 2 reveals that aggregate industry productivity is a function of both demand side variables (i.e., local market size, transport costs; and the degree of product differentiation) and supply side variables (i.e., the total sunk cost of entry). The model reveals a functional relationship between the explanatory variables and the productivity of the marginal producer; that is, the least productive or highest-cost firm in the industry. Specifically, the model predicts that the productivity of the marginal firm is higher when: 1) the local market is larger; 2) the cost of transport between different locations of production is lower; 3) product differentiation between suppliers is lower; and 4) the sunk cost of entry is lower.[3] What the model doesn't tell us is how large these effects are relative to each other. This is what we test empirically using a dynamic production function.

Our starting point in testing these propositions is the specification of the productivity equation implied by equation (11), which is

$$P = [L^l(1+\rho)]^{\sigma}[\gamma\phi f_E]^{-\sigma} \tag{12}$$

where $P = 1/c_D^l$ is the lower bound of firm level productivity, $\rho = \tau^{-k} \in (0,1)$, and $\sigma = \frac{1}{k+2}$

which we can write as

$$lnP = \sigma(lnL + \rho) - \sigma(ln\gamma + ln\phi + lnf_E) \tag{13}$$

using the Taylor's series approximation $\ln(1+\rho) \approx \rho$.

Let S represent the size of the local market, T represent the size of transport costs from the local market to an outside market, F represent the size of sunk costs needed to enter the industry, $g(\gamma)$ represent the degree of product differentiation, and $f(\phi)$ represent the minimum level of productivity needed to operate within the industry (which is defined by the industry's technology). Let $Y = h(P) \equiv {}^{1}/_{c}$ be the productivity of a randomly selected producer in the industry. Then equation (11) leads to an estimable stochastic equation such as the following where *i* and *t* index the individual establishment and timing of each observation:

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[3] The productivity of the marginal firm is also higher the lower is the variance of industry's firm level cost distribution ϕ (i.e., the lower is the cost threshold, c_m and the lower is the parameter k). It thus turns out that In the Meliz and Ottaviano (2008) model, a reduction in the intra industry inter-firm dispersion of factor productivity is inferred from observing an increase the minimum productivity threshold. This is consistent with the conjecture in Syverson (2004a) that for most common density functions of productivity, an increase in the minimum cost threshold (and hence a decrease in the minimum productivity threshold) not only reduces the average productivity of survivors (i.e. firms on or above the minimum productivity threshold) but also increases the dispersion (or variance) of productivity among those survivors.

$$lnY_{it} = \beta_1 lnS_{it} - \beta_2 T_{it} - \beta_3 F_{it} - \beta_4 f(\phi) - \beta_5 g(\gamma) + u_{it} \quad (14)$$

where $\beta_j = \beta_j(\sigma) > 0$ and u_{it} is a random error term that may include unobserved establishment effects.

B. Data and Measurement Issues

Our data are drawn from an 11-year, annual census of manufacturing firms from Ethiopia.[4] This panel contains production data for the period 2000 to 2010 and covers all manufacturing firms employing 10 or more employees.[5] Industries are classified at the 4-digit International Standard of Industrial Classification (ISIC) level. We analyze data from eleven 4-digit ISIC industries on which sufficient observations are available in the data per annum over several years for estimating parameters of the production function at the level of the individual industry. Importantly, the data include producers' physical outputs, q_i, along with their respective prices, p_i. This allows us to distinguish between revenue-based measures of total factor productivity (TFPR), defined as the value of revenue $(p_i q_i)$ per input unit (x_i) and its physical counterpart (TFPQ), defined as the number of physical units produced per unit of output (q_i/x_i). We analyze data on TFPQ and TFPR on only four of these eleven industries. These industries are: 1) cinder blocks (ISIC 2695); 2) cooking oil (ISIC 1514); 3) grain mills (1531); and 4) bakeries that produce white bread (ISIC 1541).

We limit our analysis to changes in TFPR for the remaining seven industries. We group these seven industries into two sets. The first set is "textiles" which includes weaving and spinning activities (ISIC 1710), manufacturing of wearing apparel (ISIC 1810) and the footwear industry (ISIC 1920). The second set is "other" industries which includes wood processing (ISIC 2000), manufacturing of plastic products (ISIC 2520), manufacturing of structural metal products (ISIC 2811), and furniture making (ISIC 3610).

Equation (12) sums up the hypotheses of interest, which relating to the respective roles in industrial productivity of market size and transport costs, as demand side factors, on one hand,

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[4] This panel is compiled from the Ethiopian Survey of Large and Medium Scale Manufacturing Industries, which is in effect a census of all manufacturing firms with 10+ employees.

[5] Data from 2005 are dropped because a survey was conducted during that year rather than a census.

and sunk costs of entry, as a supply side factor. The equation is obtained from equation (11) by taking the degree of product differentiation, γ, is as given as a potential source of within-industry inter-firm differences in productivity by focusing on industries producing relatively homogenous goods. The industries that meet this condition best in our data are the production of cinder blocks (ISIC 2695), grain mills (ISIC 1531) and bakeries (ISIC 1541).

Table 1 provides summary statistics on these industries and the production of cooking oil (ISIC 1514). The table covers 3, 426 observations divided between the three industries and a baseline group of establishments from three other food processing industries, namely, the sugar industry and cooking oil production. The data on the industries of focus include an unbalanced panel of 91 of annual observations on 53 establishments producing cinder blocks, a panel of 115 annual observations on 55 grain mills, and a panel 105 annual observations on 50 bakeries.

The summary statistics include those of our measures of productivity, namely, TFPQ and TFPR, along with those of the explanatory variables of interest. Observations on TFPQ and TFPR are obtained as residuals from the regression of, respectively, physical output and constant-price output in value terms, on factor inputs as described in Jones, Mengistae and Zeufack (2017). The computation itself is based on observations on physical quantities and product prices as reported in the survey along with corresponding inputs the value of annual output, annual sales, annual consumption of intermediate inputs, annual wage bill, employment, beginning -of- year and end-of-year fixed assets and annual investment.

C. Measuring market size, transport costs and sunk costs of entry

In measuring market size, S, of equation (12) we assume that markets are spatially demarcated at level of the of city location of the plant being observed. It is therefore convenient that each producer is tagged by a unique identifier in the data and is geo-referenced at that level. This matches each producer to a unique local market that it produces and operate from but while also supplying customers beyond that market in other cities or even countries. We define the variable "market size" as the size of the local market, that is the size of the market of the city or town in which the plant is located. The ideal measurement for "market size" so defined would be the aggregate disposable income or purchasing power of the home city—of the location market. Unfortunately, aggregate income and expenditure data are not available to the public in Ethiopia at the level of the city. But we do have what seem to be reasonable proxies for the same variable. One such proxy is the population of the local city (Table 1). An alternative is the average night time luminosity per year of the city of location as observed between year 2008 and 2012. The variable is named "Luminosity" in Table 1, and is described in detail in Jones, Mengistae, and Zeufack (2017).

We measure transport costs, T, of equation (12) as the freight costs of transferring goods to distributors or directly to consumers. We use the license fee that they had to incur at start up as a proxy for sunk costs of entry, F. Table 2 presents ordinary least square regression of value added per worker on each of the explanatory variables of interest industry by industry as an extension of the descriptive statistics of Table 1.

D. Identification and estimation

To allow for serially correlated shocks, we model a plant's productivity as an AR (1) process augmented by current and lagged values of market size, current and lagged values of transport costs and sunk costs of entry as additional right hand side variables along with a white noise error term. In other words, we will extend equation (14) into the following estimation framework:

$$lnY_{it} = \delta_1 lnY_{it-1} + \delta_2 lnS_{it} + \delta_3 T_{it} + \delta_4 F_{it} + \delta_5 f(\phi) + \delta_6 g(\gamma) + \varepsilon_{it} \tag{15}$$

where δ_j , $j = 1,..6$ is a constant and ε_{it} is a random error term that may include unobserved establishment effect.

In Tables 3 through to 6 we report results of the estimation of the model using the dynamic panel GMM estimator described in Arellano and Bond (1991) and Blundell and Bond (2000) on the assumption that current and lagged values of transports costs are endogenous.

E. Determinants of aggregate productivity (TFPQ)

Table 3 suggests that all three of the predictions of the Melitz-Ottaviano model about the determination of aggregate industry productivity apply to the production of cinder blocks but not to any of the three food processing industries. The table displays estimates of parameters of the Arellano-Bond specification of productivity in a plant as an augmented AR (1) process of TFPQ in log units by industry. In the table, market size measured by nighttime luminosity of the city where the establishment is located. Estimates of parameters the model for cinder blocks production are presented in the last column of the table, where TFPQ rises as market size increases but declines with any rise in sunk costs of entry or in transport costs. The decline in TFPQ that an increase in license fees would imply per the column is consistent with the model's prediction that productivity would fall with any increase in sunk costs of entry. The model would explain this outcome in terms of rising sunk costs having the effect of reducing entry and exit rates in the industry. Similarly, the negative elasticity coefficients of the terms in transport costs is consistent with the prediction of the model that rising transport costs would reduce aggregate productivity. The model would explain this outcome by higher transport costs reducing final demand product substitution possibilities for customers of the industry.

But results contrast sharply with what we see in data on grain mills and bakeries as shown in column 3 (for grain mills) and column 4 (for bakeries) of the same table. In each of these cases TFPQ declines as the market expands but rises if sunk costs of entry or transport costs increase.[6]

Broadly speaking, these findings concur with what is reported in Table 4, where we apply the same estimator to the Arellano-Bond specification but this time while measuring market size by the population size of the city of location of the plant rather than by the city's night time luminosity. In Table 4, all three predictions of the Melitz-Ottaviano model hold up in the data on

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[6] It is worth point out that the case of the cooking oil industry as reported in second column of Table 3 lies in between these two extreme cases. This a case where TFPQ rises with market size and falls with rising entry costs, as in the case of the cinder blocks industry, but increases with rising transport costs as in the case of grain processing and bakeries. That said these the estimates for cooking oil production are based on based on what would by all counts too small a sample of observations and should not therefore be given much weight.

the production of cinder blocks, with TFPQ declining with rising costs of entry and with increasing transport costs while rising with increasing market size albeit with a one year time lag. Just as is the case with Table 3, this result contradicts the case of grain mills and bakeries. For TFPQ rises with rising costs of entry and rising transport costs in these industries per Table 4. TFPQ also falls with market expansion in grain mills in Table 4 even though it does rise bakeries.

That said, the results in Table 3 seem to be more clear- cut than those in Table 4 in as far as night time luminosity of a city seems to be a more reliable indicator of its market size than its population size. We will therefore limit our discussion to our findings that relate to the determinants of TFPR and product prices to that of estimates based on the measurement of market size by nighttime luminosity of the city of location.[7]

Table 3 and Table 4 illustrate a pitfall in the estimation of the effects of any of the three factors—market size, transport costs, or sunk costs of entry—at high levels of aggregation. This is in the sense that fitting equation (15) to data pooled across the four industries conceals the heterogeneity of across exiting across industries generates results that would contradicting those of any of the four with respect to at least one of the effects we seek to identify. Thus, we see in the first column of Table 3 that, on the pooled data, TFPQ declines as the cost of entry rises, which would be true of cinder block production but contrary to what would happen in grain processing or bakeries. Also, on the pooled data, TFPQ rises as transport costs rise, which would be also true of that in grain mills and bakeries but contrary to what would happen in the production of cinder blocks. Then we see in the same column that TFPQ would decline as the market expands just as it would happen in grain mills and bakeries but contrary to the case of cement block production.

F. Determinants of aggregate revenue productivity (TFPR)

It turns out that, in general, industry-wide physical total factor productivity (TFPQ) and the corresponding measure of revenue productivity (TFPR) do not necessarily move together. This

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[7] We do include in the paper annex tables of results based on market size being measured by population size.

underscores that all three industries that we analyze operate under imperfect product market competition. See Table 3 and Table 5.

We see in the last of column of Table 5 that an increase in the size of the market also raises the average price of cinder blocks. This result is inferred from our finding that average TFPR increases by a greater percentage than the boost that TFPQ gets from the same expansion of market size (Table 3). On the other hand, a rise in transport costs reduces average TFPR (Table 5), not only because it lowers average TFPQ (Table 3), but also because the average price of cinder blocks is lower. By contrast, an increase in sunk costs of entry raises plant level average TFPR in the industry (Table 5) despite reducing the corresponding average TFPQ (Table 3) because it raises the average price of cinder blocks by an even greater proportion than it reduces physical productivity.

The same happens in grain mills and bakeries, where a rise in sunk costs of entry reduces industry wide average TFPR (Table 5) despite raising aggregate TFPQ (Table 3) because the increase in sunk costs of entry also depresses average product prices. An increase in transport costs has a similar outcome in bakeries, where it leads to decline in average TFPR in Table 5 despite increasing the corresponding average TFPQ in Table 3 because it also reduces average product prices. But this means that the average unit price of bread decline as the market expands even though the average unit price of flour does rise.

Similarly, Table 5 shows that industry wide average plant level TFPR of grain mills rises if transport costs do. Together with the fact that that the corresponding average TFPQ increases with rising transport costs at the pace shown in Table 3 this implies that the price of flour also increases along with physical productivity in grain mills. An increase in market size also pushes down industry wide average TFPR in grain mills as well as bakeries in Table 5 and reduces industry wide average TFPQ in both industries per Table 3. However, in this case the proportionate decline in average TFPR is lower than that in TFPQ in grain mills, which means that market expansion pushes up the price of flour as it is pushing down physical productivity. By contrast the proportionate decline in TFPR due to market expansion is higher than that of TFPQ in bakeries implying that the price of bread would fall along with productivity as the market expands.

Table 6 presents estimation results of a more parsimonious specification whereby we assume that the effects of market expansion and rising transport costs are both fully instantaneous having no lagged component at all. But the findings are broadly consistent with those in Table 5. Here also the main result is that all three predictions of the Melitz-Ottaviano model hold up only in data on the production of cinder blocks. This is in the sense that TFPR increases with market expansion in that industry while declining with an increase in transport costs or with an increase in sunk costs of entry, all indicated by appropriately signed and statistically significant elasticity estimates.

TFPR increases whenever market size expands in Table 6, not only in the cinder blocks industry but also in the production of cooking oil and in bakeries. But unlike the reading in Table 5, TFPR declines with increasing transports costs in the production of cooking oil. An increase in sunk costs of entry also has the predicted effect in grain mills as well as in the production of cinder blocks.

G. Effects on productivity and prices across the size distribution of establishments

A comparison of corresponding entries of the last columns of Table 5 and Table 7 shows that the effects of increase in market size on productivity vary in magnitude across the size distribution of cinder block producers. Specifically, for any given increase in market size, industry wide average plan level TFPQ and product prices both increase at proportionately higher rates among smaller and less capital intensive producers. This follows from the fact that market expansion is seen to increase TFPR significantly in the relevant entries of the two tables with a proportionate increase that is always higher in Table 7. The latter point implies that the effect of market expansion on TFPR as read from Table 5 is smaller in larger (in terms of employment size) or more capital-intensive establishments.

Similar comparison of entries of the tables relating to the cost of licensing indicate that the effects of any given rise in sunk entry costs on TFPQ and on product prices of cinder blocks production are always more pronounced in smaller and less capital intensive producers. For the same increase in license fees is seen to produce greater decline in TFPR in Table 7 than that it would per Table 5. The decline in TFPR itself reflects a decline in TFPQ per Table 3. Looking at corresponding entries of the third and fourth columns of the three tables also indicates that there are similar scale and technology effects of rising sunk costs of entry in grain mills and bakeries whereby the decline in TFPR is steeper for smaller or less capital intensive producers.

A rise in the cost of entry thus would reduce TFPR in bakeries per Tables 5 and 7, but proportionately by twice as much in the former. This suggests that the effect varies with the scale or technology of production, being lower in larger or more capital intensive establishments. The contrast is reversed in the case of grain mills, where an increase in the cost of entry would reduce TFPR in Table 5, but would not have as statistically significant influence on the same variable in Table 7. This means that the effect of rising cost of entry on TFPR in grain mills as read in Table 5 must also reflect the influence of rising cost of entry on the choice of the technology or scale of production of flour.

But the pattern of size effects that we see in relationship between productivity on one hand and market size and the cost entry, on the other, does not seem to carry over to the influence of transport costs on productivity. For looking at the entries corresponding to transport costs in the last three columns of the three tables suggests that rising transport costs directly influence the choice of techniques (or factor proportion) as well as the scale of production in each of the three industries.

In cinder block production rising transport costs have the opposite effects on TFPR between Tables 5 and Table 7, whereby they reduce TFPR per the former while increasing it per Table 7. This suggests that the fall in productivity (TFPQ) and output price that rising transport costs) would prompt per Tables 3 and 5 would be brought about partly by the influence that increasing transport costs would have on the choice of the technology or scale of production or both.

By contrast rising transport costs are associated with higher TFPR in grain mills as well as bakeries. But the increase TFPR associated with rising transport costs per Tables 4, 6 and 7 would higher in both industries than what it would be per Table 5. This suggests that transport costs raise TFPR by a smaller proportion in the largest or most intensive establishments of either industry.

Market expansion also directly affects the choice technique in grain mills and bakeries, which it does not seem to in the production of cinder blocks. This also comes out in Table 5 and Table 7, where market expansion is seen to reduce TFPR in bakeries per the first table by a higher proportion than in Table 7. Part of the effect seen in Table 5 must therefore be associated with the choice of the scale or factor intensity in this case also. The picture is similar in grain mills, where market expansion reduces TFPR in Table 5, but does not have any such effect in Table 7, suggesting that the effects we read in Table 5 are influences transmitted via choice of the scale or technique.

H. Determination of TFPR in textiles, garments, footwear, plastic products, wood work, metal works, and the furniture industry

How does the pattern of results reported for the four industries in Tables 3 to 7 hold up across the other seven industries? Do market size, transport costs, and entry regulation affect aggregate productivity across any of these industries as they seem to be in the production of cinder blocks? Or, is the effect of any one of the three factors contrary to what economic theory predicts?

We address this question by analyzing data on seven four-digit ISIC industries and report our findings in Tables 8 through to 11. The tables relate to growth in TFPR only, to which our comparison across the 11 industries is limited. This is because we do not have unit product price data for the industries that the four tables cover.

Estimation and test results on the textiles industry (ISIC 1710), wearing apparel (ISIC 1810) and the footwear industry (ISIC 1920) are reported in Tables 8 and 10. Results for wood processing and wood products (ISIC 2000), manufacturing of plastic products (ISIC 2520), structural metal products (ISIC 2811) and furniture making (ISIC 3610) are reported in Tables 9 and 11.

The first column of Table 8, underscores that unweighted estimates of the revenue productivity equation of section 3.3 on data on firms pooled across the sector would conceal effects that would observed in relatively homogenous industries. Thus, per this column, productivity would respond to changes in local market size as the theory would predict but not to shifts in transport costs or to entry license fees. This contrasts sharply with what we see in Tables 3 to 7 relating to food processing and to the production of cinder blocks. It also contrasts with what we see in Table 8 itself with respect to the textiles, garments and footwear industries. Between them Table 8 and Table 10 suggest that market expansion would lead to significant growth in TFPR across these three industries. This is also the effect that market expansion is shown to have in food processing and the production of cinder blocks in Tables 5 and 6. On the other hand increases in entry licensing fees and rises in transport costs reduce aggregate productivity in two of the three industries--namely, the textiles and the footwear industries in the case of the former, and in the textiles and garments industries in the case of rising transport costs.

Market expansion also leads to aggregate TFPR growth in the production of structural metal products and in furniture making per Tables 9 and 11, Just as it does in food processing, the production of cinder blocks and in the textiles, garments and footwear industries (per Tables 5, 6, 8 and 10). The wood work and plastic product industries are indeed the only ones among the 11 industries where market expansion would not boost revenue productivity. TFPR does not seem to respond to any changes in entry licensing fees in the metal works industry per Tables 9 and 11. This contrasts with the case of the furniture industry, where an increase in licensing fees would cut revenue productivity substantially, and with that of the plastics industry and wood works industry, where an increase in transport costs or license fees have same effect.

A reading of Tables 9 and 11 along with Tables 5 and 6 shows that rising costs of entry would reduce aggregate revenue productivity in 8 of the 11 industries leaving out only the textiles and garments and the structural metal products industries. Similarly rising transport costs reduce aggregate TFPR in 8 of the 11 industries. The ones where a rise in transport costs would not have a similar effect are the footwear, structural metal products and furniture industries.

Comparing the relative weight of the three factors in productivity, market size is the most consistently observed and strongest influence on aggregate revenue productivity across the 11 manufacturing industries. This is partly in as far as the estimated elasticity of TFPR with respect to market size is higher than that with respect of transport costs or the cost of entry. It is also partly in as far as the effect of market size is significant across more industries than the effect of transport costs or that of the cost of entry.

Between them the two demand size factors ---that is, market size and transport costs--- are stronger and more consistently observed drivers of revenue productivity across the 11 industries than the only supply side driver on which we observations, namely, the cost of entry licensing.

I. Costs of utilities and financial services as supply side factors

In the section we report parameter estimates of a more general specification of the productivity equation explicitly controlling for supply side factors beyond those spelt out in the Meltiz and Ottaviano model. The extension leads to important nuances to our estimates of the effects of market size, trade costs and sunk costs of entry on aggregate productivity. Specifically, controlling for the cost of power and financial services in the productivity equations shows that indicators for sunk costs proxy as much for entry barriers as they would do for recurrent costs of utilities and tradable service input. This is particularly the case in food processing, textiles, garments and the cement industry. The reason is that the costs of power and financial services are both major factors in productivity in those industries.

The share of the cost of power and financial services is also comparatively high in the cost structure of in wood work and metal work industries. Because firms of both industries tend to operate in larger towns and cities, the effects of local market size on aggregate productivity cannot be identified separately from those the costs of power and financial services in those industries.

J. "Other" Industries

Food processing and the cement industry

The first of these results comes out from the comparison of the estimates in Tables 6 with those of Table 6B and those of Table 10 with those in Table 10B. Starting with the first pair, Table 6B shows that increases in the cost of power or in the cost of financial services would lead to significant decline in revenue productivity (TFPR) when we pool data across the four industries. The same effect is also observed on data within each of three of the four industries, namely, grain mills, bakeries and the production cinder blocks. Looking at data on individual industries, controlling for the cost of power and the cost of financial services, revenue productivity would increase with local market expansion while contracting with increases in transport costs in the production of cinder blocks, which is what we also see in the results of the estimation of basic specification of Table 6 and consistent with two of the predictions of the Melitz- Ottaviano model. But controlling for costs of power and financial services delinks revenue productivity from the cost of entry licensing contrary to the association that the model establishes between the two variables and in contrast to what we see in Table 6.

Revenue productivity declines with increases in the cost of licensing in bakeries when we control for the cost of power and cost of financial services as in Table 6B as well but also when we do not as in table 6. Revenue productivity also declines with a rise in the cost of power or in financial services in the same industry but increases as the local market expands. This makes data on bakeries consistent with two of the three predictions of the Melitz- Ottaviano model. But here as well as well as in table 6, the data are not consistent with the third prediction of the model, namely, that productivity would decline with increases in transport costs.

Controlling for the cost of power and the cost of financial service also makes revenue productivity rise with increase in the cost of entry licensing or in transport costs in grain mills contrary to the predictions of the Melitz - Ottaviano model and to what we see in Table 6. But as with the case of bakeries and the production of cinder blocks, productivity declines in grain mills with the cost of power and the cost of financial services.

Textiles, Garment and Footwear industries

Turning to comparting Tables 10 and 10B, recall that only one of the three predictions of the model is seen to hold in the first table when we pool data across the 11 industries. This is that aggregate revenue productivity rises with local market expansion. Although revenue productivity is also correlated with transport costs, rising transport costs are associated with rising and not declining revenue productivity contrary to the model’s prediction. Revenue productivity would still rise with local market expansion when control for the cost of power and the cost financial services as we do Table 10B, but it would no longer be correlated with transport costs. At the same time revenue productivity is seen to decline with rising cost of power or rising cost financial services.

Focusing on textiles, garments and the footwear industry, only one of the predictions of the model holds when we pool data across all three in estimating the baselines specification in Table 10. This is that aggregate revenue productivity rises as the local market expands, which continues to hold when we control for the cost of power and the cost of financial services in table 10c. But now revenue productivity also declines with rising transport costs just as it does with rising costs of power and rising costs of financial services.

Looking at estimates industry by industry, controlling for the costs of power and the costs of financial services makes production data on the footwear industry (ISIC 1920) fully consistent with all three predictions of the Melitz- Ottaviano model. For we see in Table 10B that productivity declines with rising costs of power while also increases with local market expansion while declining with increasing transport costs and rising costs of entry licenses. This bears sharp contrast to estimates of the basic specification in Table 10, where the only significant influence on productivity in the same industry is seen to be that of market expansion.

Controlling for the cost of power and financial services also removes the association between the cost of entry licensing and revenue productivity in the textile industry as reported in Table 10. At the same time productivity declines with rising cost of power while increasing with local market expansion just as it does in footwear industry and, indeed, in most of the 11 industries covered by our data.

The contrast between the results of Table 10B and Table 10 is similar when it comes to the garments industry, where controlling for the cost of power and the cost of financial services also removes any correlation between productivity and licensing fees. Productivity declines with rising costs of power in this industry also but the effect of local market size is not there anymore.

Wood work, metal work and the furniture industry

These are the industries where the effects of market size on aggregate productivity are cannot be identified empirically separately from those the provision of utilities and service inputs more generally.

They are also the group for which estimation results of the basic specification are the least consistent among the 11 with the predictions of the Melitz - Ottaviano model. Estimation of the baseline specification in Table 11 on data pooled across the four industries, thus shows that aggregate productivity is associated only one of the three factors that the model entertains, namely, transport costs, but even here association between these costs and productivity is positive contrary to the prediction.

Controlling for the cost of power and financial services removes even that association as shown in Table 11B, where the only significant influence on revenue productivity is only the cost of power, whereby productivity declines as the cost power rises. Productivity is also lower within each of three of the industries as the cost of power rises in the same table, these being the furniture industry and those of the production of structural metals and plastic products.

In three of the four industries productivity would not respond to changes in the size of the local market regardless of whether we control for the cost of power or the cost of financial services, which is in marked contrast to what we see in the industries of tables, 6, 6B, 10 and 10B. The only industry where productivity increases with the expansion of the local market is the production of structural metals. But that is only when we estimate the baseline specification of Table 11. Controlling for the cost of power and the cost financial services as we do in Table 11B removes that same association. When we do control for these factors, productivity would fall with any increase in the cost of power at least in three of the four industries, namely, the production plastic products, the structural metals industry and furniture making. Productivity also declines with rising transport costs and rising costs of the financial services in furniture making, which is the industry that most similar in that regard to the industries of Tables 6B and 10B in that regard. But according to Tables 11 and 11B productivity does not seem to respond to changes in the size of the local market even in the furniture industry among this group of industries.

3. Conclusion

Based on analyses of the panel data on plants in 11 four-digit ISIC manufacturing industries in Ethiopia, this paper estimates the effects on productivity of local market size, transport costs and license fees. The first two of these variables are important demand side drivers of industrial productivity growth. The third is an important item of sunk costs of entry and consequently a supply side factor. Identification of the effects relies on the Melitz-Ottaviano model of productivity and producer turnover under monopolistic competition, in which all three are joint determinants of the average cost of the marginal producer in long run equilibrium.

All three predictions of the model are born out in the most homogenous of the 11 industries, namely, the production of cinder blocks (ISIC 2695). In that industry, expansion of the local market boosts revenue productivity while increases in transport costs and licensing fees reduce it. The picture is somewhat mixed in the other industries but nonetheless supportive of the model in that one and, more often, two of the predictions hold up. The most significant result is that local market size is a major factor in aggregate revenue productivity within each of 9 of the 11 industries, the exceptions being wood work (ISIC 2000) and the plastic products industry (ISIC 2520). Rising transport costs also reduce revenue productivity significantly within each of 8 of the 11, the industries where the result does not hold being those producing footwear (ISIC 1920), furniture (ISIC 3610) and structural metal products (ISIC 2811). Increasing licensing fees reduce aggregate productivity within all industries excepting the manufacturing of textiles (ISIC 1710), wearing apparel (ISIC 1810) and structural metal products (ISIC 2811).

Looking at the relative weight of the three factors, local market size exerts the greatest influence on aggregate revenue productivity across the 11 industries. This result holds in the sense that the elasticity of TFPR with respect to market size is always higher relative to the elasticities estimated for transport costs and licensing fees. Similarly, these demand factors affect industry TFPR more supply side factors.

Thus, the paper has provided new findings on as sources of industry wide TFPR growth. To do this, we needed to decompose aggregate TFPR growth into two components: TFPQ and product price changes. This was done for 4 of our 11 industries; that is, cinder blocks (ISIC 2695), cooking oil (ISIC 1514), grain mills (1531) and bakeries (1541). Once this decomposition was completed, several interesting results emerged. In the cinder blocks industry, for example, industry wide average TFPQ increases as market size increases but declines with rising transport costs and sunk costs. However, we find somewhat different results for grain mills and bakeries. In each of these industries, average TFPQ declines as market size increases and rises with increasing transport costs and sunk costs.

While average TFPR increases with market size in the cinder blocks industry, this result is being driven by both market expansion (which boosts physical productivity in terms of TFPQ) and by a rise in the average price of cinder blocks rises. Similarly, a rise in transport costs reduces average TFPR both by reducing average TFPQ and by pushing down the average price of cinder blocks. Somewhat surprisingly, an increase in license fees raises average TFPR by boosting the average price of cinder blocks more than it reduces average TFPQ.

By contrast, a rise in licensing fees reduces average TFPR in grain mills and bakeries, despite raising average TFPQ because it lowers average product prices by a larger proportion. Similarly, although an increase in transport costs pushes up average TFPQ in bakeries, it also lowers industry wide average TFPR because it reduces average product prices by an even greater proportion. These results underscore the fact that industry-wide average TFPQ and the corresponding average TFPR do not necessarily move together under imperfect competition. This needs to be borne in mind when revenue based measures of productivity are used in the analysis of firm dynamics.

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Table 1: Summary Statistics

Industry *Input -output variables:*		Employment size Size	Fixed assets per worker	Value added per worker	tfpr	tfpq
Cooking oil						
	Mean	37	6,896	254	1.17	1.43
	S.D	57.6	14,988	769	1.09	1.36
Graiin mills						
	Mean	45	30,453	1,731	1.24	1.65
	S.D	81.8	60,135	12,538	2.28	5.78
Bakeries						
	Mean	45	14,675	851	1.36	3.65
	S.D	293.1	127,680	5,929	3.64	16.71
Cinder blocks						
	Mean	21	356,067	30,682	2.53	22.14
	S.D	52.2	3,514,504	482,805	14.28	173.32

Industry *Explanatory variables:*		Ln(transport cost)	Ln(cost of license)	Ln(population	Ln(Luminosity)
Cooking oil					
	Mean	7.0	6.6	13.7	2.2
	S.D	2.3	1.9	1.9	0.6
Graiin mills					
	Mean	8.8	6.9	13.1	2.2
	S.D	2.0	1.9	2.0	0.5
Bakeries					
	Mean	7.7	6.2	13.4	2.3
	S.D	2.1	1.6	1.8	0.4
Cinder blocks					
	Mean	10.0	5.8	12.7	2.2
	S.D	2.6	1.7	2.0	0.4

Table 2: OLS regression of value added per worker on covariates of interest by industry

Variables	Cooking oil (ISIC 1514)	Grain mills (ISIC 1531)	Bakeries (ISIC 1541)	Cinder blocks (ISIC 2695)
Ln(KoverN)	-0.000315	0.184***	0.0695***	0.0575
	(0.0555)	(0.0406)	(0.0237)	(0.0374)
Ln(Employees)	-0.399***	-0.532***	-0.347***	-0.549***
	(0.143)	(0.0719)	(0.0706)	(0.0635)
Ln(population)	-0.000865	0.0671**	0.0146	-0.0165
	(0.0607)	(0.0269)	(0.0307)	(0.0289)
Ln(Trasnp, cost)	0.379***	0.258***	0.217***	0.185***
	(0.0832)	(0.0330)	(0.0336)	(0.0341)
Ln(License fee)	0.0241	0.0934***	0.0201	0.189***
	(0.0859)	(0.0307)	(0.0400)	(0.0405)
Year effects (base= 2000)				
2001	0.113	-0.0150	-0.117	0.469
	(0.527)	(0.273)	(0.260)	(0.356)
2002	0.121	-0.267	0.0814	0.241
	(0.488)	(0.273)	(0.252)	(0.316)
2003	0.252	0.0828	0.271	0.302
	(0.497)	(0.276)	(0.246)	(0.304)
2004	0.378	0.0532	0.0786	0.571*
	(0.499)	(0.267)	(0.241)	(0.316)
2006	0.0385	0.450*	0.0980	0.943***
	(0.461)	(0.260)	(0.249)	(0.315)
2007	0.543	0.598**	0.255	0.639**
	(0.492)	(0.265)	(0.244)	(0.287)
2008	0.272	1.024***	0.530**	0.852***
	(0.466)	(0.248)	(0.234)	(0.282)
2009.	0.236	0.903***	0.567**	1.084***
	(0.444)	(0.248)	(0.232)	(0.278)
2010.	0.378	1.087***	1.122***	2.175***
	(0.482)	(0.247)	(0.246)	(0.317)
Constant	3.285***	2.279***	3.855***	6.261***
	(0.913)	(0.629)	(0.486)	(0.661)
Observations	142	422	437	422
R-squared	0.202	0.380	0.214	0.325

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Elasticity of Physical TFP with respect to Market Size and the Cost of Entry

Selected Manufacturing Industries. Arellano-Bond Estimates. (Market size proxied by night time luminosity of city of location of production]

Dependent variable is the log of current TFP in physical units=Ln(TFPQ). “Lag1” refers lagged values by one year

Variables	All four industries	Cooking oil (ISIC 1514)	Grain mills (ISIC 1531)	Bakeries (ISIC 1541)	Cinder blocks (ISIC 2695)
Lag 1 (Ln(TFPQ)	-0.0572***	-0.135**	-0.112***	-0.282***	0.0380***
	(0.00706)	(0.0550)	(0.00577)	(0.0124)	(0.00630)
Ln(Luminosity)	-0.286***	0.519	-0.660***	-0.319***	0.0618**
	(0.102)	(0.344)	(0.0295)	(0.0902)	(0.0259)
Lag1(Ln(Luminosity)	-0.165	1.467***	-0.431***	-0.637***	0.326***
	(0.160)	(0.488)	(0.0610)	(0.132)	(0.0797)
Ln(Transp. cost)	0.0474***	0.133***	0.0397***	0.153***	-0.0152***
	(0.00762)	(0.0319)	(0.00373)	(0.0155)	(0.00271)
Lag1(ln(Transp.cost)	0.00698	0.0882	-0.00356	0.0602***	-0.00868*
	(0.0113)	(0.0800)	(0.00449)	(0.0180)	(0.00471)
Ln(License Fee)	-0.0161*	-0.102**	0.00840***	0.0664***	-0.0988***
	(0.00949)	(0.0500)	(0.00245)	(0.0113)	(0.0144)
Observations	345	34	115	105	91
Number of plants	171	13	55	50	53
Sargan	43.90	43.90	43.90	43.90	43.90
Chi-Squared	5892	5892	5892	5892	5892

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Elasticity of Physical TFP with respect to Market Size and the Cost of Entry

Selected Manufacturing Industries. Arellano-Bond Estimates. (Market size proxied by the size of population of the city of location of production]

Dependent variable is the log of current TFP in physical units=Ln(TFPQ). "Lag1" refers lagged values by one year

Variables	All four industries	Cooking oil (ISIC 1514)	Grain mills (ISIC 1531)	Bakeries (ISIC 1541)	Cinder blocks (ISIC 2695)
Lag 1 (Ln(TFPQ))	-0.0434***	-0.113	-0.145***	-0.267***	0.0557***
	(0.00835)	(0.101)	(0.0135)	(0.00895)	(0.00756)
Ln(population)	-1.094	-170.1	9.042***	11.70***	-30.23***
	(2.166)	(117.6)	(1.026)	(1.143)	(0.292)
Lag1(ln(population)	1.002	171.3	-9.905***	-10.86***	31.82***
	(2.118)	(116.6)	(0.998)	(1.053)	(0.171)
Ln(Transp. cost)	0.0375***	0.0769***	0.0433***	0.137***	-0.0220***
	(0.00626)	(0.0210)	(0.00721)	(0.00889)	(0.00353)
Lag1(ln(Trasnp.cost)	-0.00232	0.0289	-0.0183**	0.0306**	-0.0200***
	(0.0129)	(0.0758)	(0.00820)	(0.0142)	(0.00660)
Ln(License Fee)	-0.000380	-0.0806	0.0190***	0.0635***	-0.0934***
	(0.00969)	(0.0581)	(0.00490)	(0.00358)	(0.00167)
Observations	346	34	116	105	91
Number of plants	172	13	56	50	53
Sargan	42.84	42.84	42.84	42.84	42.84
Chi-Squared	1.339e+06	1.339e+06	1.339e+06	1.339e+06	1.339e+06

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 5: **Elasticity of Revenue TFP (TFPR) with respect of market size and cost of entry in Selected Manufacturing Industries: Arellano-Bond Estimates**

(Market size proxied by night time luminosity of city of location of production)

Dependent variable is the log of current TFP in revenue units=Ln(TFPR). “Lag1” refers lagged values by one year

Variables	All four industries	Cooking oil (ISIC 1514)	Grain mills (ISIC 1531)	Bakeries (ISIC 1541)	Cinder blocks (ISIC 2695)
Lag 1 (Ln(TFPR))	-0.118***	-0.0642	-0.313***	-0.490***	0.124***
	(0.0386)	(0.0640)	(0.0199)	(0.0161)	(0.0109)
Ln(Luminosity)	-0.140***	0.112	-0.159***	-0.662***	0.398***
	(0.0508)	(0.142)	(0.0251)	(0.0195)	(0.0347)
Lag1(Ln(Luminosity)	-0.413***	-0.476	-0.206***	-1.986***	0.663***
	(0.104)	(0.304)	(0.0394)	(0.0245)	(0.0639)
Ln(Transp. cost)	0.00564	-0.0412	0.0145	0.0125***	-0.0637***
	(0.00709)	(0.0294)	(0.0102)	(0.00372)	(0.00301)
Lag1(ln(Trasnp. cost)	-0.0327***	-0.0909*	0.0520***	-0.179***	-0.0593***
	(0.0101)	(0.0532)	(0.00511)	(0.00295)	(0.00347)
Ln(License Fee)	-0.0119	-0.1000***	-0.0203***	-0.0559***	0.0409***
	(0.00814)	(0.0307)	(0.00536)	(0.00196)	(0.00562)
Observations	348	39	115	103	91
Number of plants	174	17	55	49	53
Sargan	43.61	43.61	43.61	43.61	43.61
Chi-Squared	102934	102934	102934	102934	102934

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: **Elasticity of Revenue TFP (TFPR) with respect of market size and cost of entry in Selected Manufacturing Industries: Arellano-Bond Estimates**-specification 2

(Market size proxied by night time luminosity of city of location of production)

Dependent variable is the log of current TFP in revenue units=Ln(TFPR) "Lag1" refers lagged values by one year

Variables	All four industries	Cooking oil (ISIC 1514)	Grain mills (ISIC 1531)	Bakeries (ISIC 1541)	Cinder blocks (ISIC 2695)
Lag 1 (Ln(TFPR))	0.213***	0.107***	0.0655	0.139***	-0.0703***
	(0.0538)	(0.0112)	(0.0424)	(0.0440)	(0.00898)
Ln(Luminosity)	0.102**	0.121***	0.0376	0.0756***	0.410***
	(0.0439)	(0.0380)	(0.0384)	(0.0140)	(0.0566)
Ln(Transport cost)	0.00333	-0.00295*	0.0219***	0.00291*	-0.0261***
	(0.00464)	(0.00162)	(0.00387)	(0.00174)	(0.00236)
Ln(License Fee)	-0.0211	0.00505	-0.0172**	-0.0113	-0.0527**
	(0.0142)	(0.0314)	(0.00774)	(0.00886)	(0.0245)
Observations	352	36	111	125	80
Number of plants	152	15	42	60	35
Sargan	18.26	18.26	18.26	18.26	18.26
Chi-Squared	6123	6123	6123	6123	6123
AR-2	2	2	2	2	2

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Elasticity of Annual Value Added Per Employees in Selected Manufacturing Industries: Arellano-Bond Estimates.

(Market size proxied by night time luminosity of city of location of production]

Dependent variables is current Ln(YoverN)=annual value added per workers: "Lag1" refers lagged values by one year; Ln(Kovern)=end-of-year fixed assets per worker

Variables	All four industries	Cooking oil (ISIC 1514)	Grain mills (ISIC 1531)	Bakeries (ISIC 1541)	Cinder blocks (ISIC 2695)
Lag1(Ln(YoverN))	-0.307***	0.0702	-0.214***	-0.256***	-0.321***
	(0.00738)	(0.0628)	(0.0504)	(0.0378)	(0.0206)
Ln(KoverN)	0.145***	0.0983	-0.0287	0.413***	-0.0172
	(0.00660)	(0.205)	(0.0388)	(0.0178)	(0.0135)
Lag1(Ln(KoverN)	0.213***	0.0145	0.137***	0.252***	-0.0216
	(0.00610)	(0.169)	(0.0270)	(0.0200)	(0.0277)
Ln(Employees)	-0.639***	-1.821***	-1.116***	-0.574***	-0.499***
	(0.0194)	(0.558)	(0.0628)	(0.0489)	(0.0733)
Ln(Transp. cost)	0.145***	-0.615	0.250***	0.260***	0.0593***
	(0.00491)	(0.377)	(0.0278)	(0.0168)	(0.0101)
Lag(Ln(Transp. Cost))	0.0610***	-0.751	0.160***	-0.201***	0.0213
	(0.00420)	(0.595)	(0.0216)	(0.0400)	(0.0193)
Ln(License Fee)	0.0300***	-0.212***	-0.0179	-0.136***	0.278***
	(0.00649)	(0.0439)	(0.0151)	(0.0197)	(0.0139)
Ln(Luminosity)	0.338***	-0.135	0.155	-0.214*	0.840***
	(0.0260)	(0.870)	(0.116)	(0.126)	(0.147)
Lag1(Ln(Luminosity)	0.0747	-2.045	0.339	-1.697***	0.705***
	(0.0777)	(1.554)	(0.216)	(0.130)	(0.112)
Observations	306	34	92	99	81
Number of plants	165	15	50	49	51
Sargan	41.65	41.65	41.65	41.65	41.65
Chi-Squared	53871	53871	53871	53871	53871

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: **Elasticity of Revenue TFP (TFPR) with respect of market size and cost of entry in the textile, apparel and footwear industries: Arellano-Bond Estimates**-

(Market size proxied by night time luminosity of city of location of production)

Dependent variable is the log of current TFP in revenue units=Ln(TFPR). "Lag1" refers lagged values by one year

Variables	All eleven industries	All three industries	Weaving & spinning (ISIC 1710)	Wearing apparel (ISIC1810)	Footwear Industries (ISIC 1920)
Lag 1 (Ln(TFPR))	0.197***	0.143***	0.113	-0.00967	0.00644
	(0.0534)	(0.0150)	(0.288)	(0.0257)	(0.0143)
Ln(Luminosity)	0.0604**	0.0519***	-0.0208	0.0464	0.00790
	(0.0243)	(0.00327)	(0.0596)	(0.0339)	(0.00922)
Lag1(Ln(Luminosity)	0.0343	-0.076***	0.00708	0.0453	-0.164***
	(0.0315)	(0.00759)	(0.0479)	(0.0363)	(0.00356)
Ln(Transport cost)	0.00198	0.0102***	0.0198	-0.0335	0.00800*
	(0.00647)	(0.00364)	(0.0319)	(0.0286)	(0.00417)
Lag1(ln(Transport cost)	-0.00897	0.0145***	-0.167**	-0.0051**	0.0174**
	(0.0123)	(0.00275)	(0.0825)	(0.00224)	(0.00691)
Ln(License Fee)	-0.005	-0.0010	-0.046	0.027	-.032***
	(0.00878)	(0.00311)	(0.0169)	(0.0184)	(0.00708)
Observations	824	214	55	48	111
Number of plants	324	63	15	16	32
Sargan	27	27	27	27	27
Chi-Squared	268819	268819	268819	268819	268819
AR-2	2	2	2	2	2

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 9: **Elasticity of Revenue TFP (TFPR) with respect of market size and cost of entry in wood products, plastic products, structural metal products and the furniture industry: Arellano-Bond Estimates**-

(Market size proxied by night time luminosity of city of location of production)

Dependent variable is the log of current TFP in revenue units= Ln(TFPR). "Lag1" refers lagged values by one year

Variables	All four industries	Wood products (ISIC 2000)	Plastic products (ISIC 2520)	Structural metal products (ISIC 2811)	Furniture industry (ISIC 3610)
Lag 1 (Ln(TFPR))	-0.0680	-0.269	-0.371***	-0.162***	0.0406***
	(0.0430)	(0.175)	(0.0108)	(0.0553)	(0.0115)
Ln(Luminosity)	-0.0211	0.00677	-0.0335	0.150***	-0.0316***
	(0.0196)	(0.0211)	(0.0231)	(0.0367)	(0.00664)
Lag1(Ln(Luminosity)	0.0133	-0.0383	0.00857	-0.0219	0.0441***
	(0.0202)	(0.0257)	(0.0185)	(0.0478)	(0.0139)
Ln(Transport cost)	0.00428	0.0471	0.00461	0.0330	-0.00396
	(0.00813)	(0.0491)	(0.00383)	(0.0209)	(0.00360)
Lag1(ln(Transport. cost)	0.00906	-0.0243**	-0.0644***	0.0281	-0.00517
	(0.00834)	(0.0104)	(0.00965)	(0.0409)	(0.00506)
Ln(License Fee)	-0.00635	-0.0110	-0.0174***	0.0253	-0.0131***
	(0.00726)	(0.0162)	(0.00473)	(0.0172)	(0.00424)
Observations	299	20	79	49	151
Number of plants	126	11	28	20	67
Sargan	36.08	36.08	36.08	36.08	36.08
Chi-Squared	2912	2912	2912	2912	2912
AR-2	2	2	2	2	2

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10: **Elasticity of Revenue TFP (TFPR) with respect of market size and cost of entry in the textile, apparel and footwear industries: Arellano-Bond Estimates**- specification 2

(Market size proxied by night time luminosity of city of location of production)

Dependent variable is the log of current TFP in revenue units=Ln(TFPR). "Lag1" refers lagged values by one year

Variables	All eleven industries	All three industries	Weaving & spinning (ISIC 1710)	Wearing apparel (ISIC1810)	Footwear Industries (ISIC 1920)
Lag 1 (Ln(TFPR))	0.189***	0.0864	0.0971***	0.0278	-0.0154
	(0.0572)	(0.0691)	(0.0308)	(0.0237)	(0.0604)
Ln(Luminosity)	0.0860**	0.0911**	0.0714***	0.0992***	0.0928***
	(0.0359)	(0.0450)	(0.0165)	(0.0190)	(0.0221)
Ln(Transport cost)	0.00892*	0.0114*	0.0323***	0.0155***	0.00427
	(0.00477)	(0.00664)	(0.0109)	(0.00158)	(0.00543)
Ln(License Fee)	-0.00405	0.0222**	-0.0279***	0.0829***	-0.00114
	(0.0123)	(0.0101)	(0.00565)	(0.00250)	(0.0133)
Observations	897	222	57	54	111
Number of plants	353	67	16	19	32
Sargan	17	17	17	17	17
Chi-Squared	23.41	23.41	23.41	23.41	23.41
AR-2	2	2	2	2	2

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: **Elasticity of Revenue TFP (TFPR) with respect of market size and cost of entry in wood products, plastic products, structural metal products and the furniture industry: Arellano-Bond Estimates**-specification 2

(Market size proxied by night time luminosity of city of location of production)

Dependent variable is the log of current TFP in revenue units=Ln(TFPR). "Lag1" refers lagged values by one year

Variables	All four industries	Wood products (ISIC 2000	Plastic products (ISIC 2520)	Structural metal products (ISIC 2811)	Furniture industry (ISIC 3610)
Lag 1(Ln(TFPR))	-0.00126	-0.467***	-0.289***	-0.202***	0.0706
	(0.0801)	(0.0271)	(0.0161)	(0.00924)	(0.0530)
Ln(Luminosity)	-0.0140	0.0235***	-0.0300	0.0930***	-0.0171
	(0.0438)	(0.00613)	(0.0266)	(0.00466)	(0.0311)
Ln(Transport cost)	0.0223**	0.0481***	0.0182***	0.000975***	-0.00143
	(0.0103)	(0.000299)	(0.00323)	(0.000263)	(0.00552)
Ln(License Fee)	-0.000359	-0.0107	-0.00389	0.0618***	-0.00284
	(0.0127)	(0.00815)	(0.00901)	(0.00932)	(0.0129)
Observations	323	23	82	55	163
Number of plants	134	12	29	23	70
Sargan	20.59	20.59	20.59	20.59	20.59
Chi-Squared	5.151	5.151	5.151	5.151	5.151
AR-2	2	2	2	2	2

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6B: **Elasticity of Revenue TFP (TFPR) with respect of market size and cost of entry in Selected Manufacturing Industries: Arellano-Bond Estimates**-specification 2

(Market size proxied by night time luminosity of city of location of production)

Dependent variable is the log of current TFP in revenue units=Ln(TFPR) "Lag1" refers lagged values by one year

Variables	All four industries	Cooking oil (ISIC 1514)	Grain mills (ISIC 1531)	Bakeries (ISIC 1541)	Cinder blocks (ISIC 2695)
Lag 1 (Ln(TFPR))	0.333***	-0.0538	0.182***	0.0361	0.218**
	(0.0607)	(0.411)	(0.0202)	(0.0287)	(0.0974)
Ln(Luminosity)	-0.0303	-1.624	-0.0824***	0.0999***	0.202***
	(0.0354)	(1.927)	(0.0163)	(0.0100)	(0.0686)
Ln (Transport cost)	-0.00952*	0.438*	0.0662***	0.214***	-0.0435***
	(0.00515)	(0.227)	(0.0130)	(0.0231)	(0.00302)
Ln (License Fee)	-0.0105	-0.0286	0.0218***	-0.135***	0.0134
	(0.0122)	(0.0330)	(0.00428)	(0.0217)	(0.0502)
Ln (Cost of power)	-0.147***	-0.116	-0.0977***	-0.107***	-0.337***
	(0.0268)	(0.143)	(0.00616)	(0.0190)	(0.0333)
Ln (Bank charges)	-0.0951***	-0.364	-0.154***	-0.0371***	-0.0534***
	(0.0151)	(0.272)	(0.00868)	(0.00482)	(0.0182)
Observations	135	25	59	27	24
Number of plants	64	8	28	18	10
Sargan	5.355	5.355	5.355	5.355	5.355
Chi-Squared	110538	110538	110538	110538	110538
AR-2	2	2	2	2	2

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 10B: **Elasticity of Revenue TFP (TFPR) with respect of market size and cost of entry in the textile, apparel and footwear industries: Arellano-Bond Estimates**- specification 2. **(Market size proxied by night time luminosity of city of location of production)**

Dependent variable is the log of current TFP in revenue units=Ln(TFPR). “Lag1” refers lagged values by one year

Variables	All eleven industries	All three industries	Weaving & spinning (ISIC 1710)	Wearing apparel (ISIC1810)	Footwear Industries (ISIC 1920)
Lag 1 (Ln(TFPR))	0.245***	0.0263	-0.0992	-0.0346	0.0436
	(0.0650)	(0.0542)	(0.123)	(0.101)	(0.0651)
Ln(Luminosity)	0.0191	0.0935***	0.177***	-0.0852	0.0880***
	(0.0347)	(0.0261)	(0.0250)	(0.0522)	(0.0322)
Ln (Transport cost)	-0.0120**	-0.0107***	-0.0131	0.0245	-0.0117***
	(0.00567)	(0.00267)	(0.0202)	(0.0373)	(0.00308)
Ln (License Fee)	0.0178*	0.0107	-0.00733	0.0441	-0.0192**
	(0.0106)	(0.00720)	(0.0120)	(0.0480)	(0.00852)
Ln (Cost of power)	-0.122***	-0.111***	-0.336***	-0.166*	-0.0528***
	(0.0226)	(0.0175)	(0.0484)	(0.0940)	(0.00907)
Ln (Bank charges)	-0.0568***	-0.0320***	-0.00970	-0.0410	-0.00841
	(0.0118)	(0.00948)	(0.00883)	(0.0285)	(0.0109)
Observations	453	145	42	37	66
Number of plants	176	43	13	11	19
Sargan	13.98	13.98	13.98	13.98	13.98
Chi-Squared	1055	1055	1055	1055	1055
AR-2	2	2	2	2	2

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11B: **Elasticity of Revenue TFP (TFPR) with respect of market size and cost of entry in wood products, plastic products, structural metal products and the furniture industry: Arellano-Bond Estimates**-specification 2 **(Market size proxied by night time luminosity of city of location of production)**

Dependent variable is the log of current TFP in revenue units=Ln(TFPR). "Lag1" refers lagged values by ne year

Variables	All four Industries	Wood products (ISIC 2000)	Plastic products (ISIC 2520)	Structural metal products (ISIC 2811)	Furniture industry (ISIC 3610)
Lag 1 (Ln(TFPR))	-0.130**	-0.252	-0.380***	-0.114	-0.0525
	(0.0582)	(0.499)	(0.00251)	(0.112)	(0.0387)
Ln(Luminosity)	-0.0285	-0.0698	-0.00471	0.0672	-0.0655***
	(0.0446)	(0.158)	(0.0187)	(0.128)	(0.0217)
Ln (Transport cost)	0.0162	0.0945	-0.0220***	0.0232**	-0.0237**
	(0.0141)	(0.170)	(0.00676)	(0.00944)	(0.0114)
Ln (License Fee)	-0.000299	-0.0394	0.00878**	-0.0643**	0.0162***
	(0.0112)	(0.0375)	(0.00355)	(0.0302)	(0.00510)
Ln (Cost of power)	-0.110***	0.0260	-0.0519***	-0.201**	-0.190***
	(0.0218)	(0.101)	(0.00728)	(0.0791)	(0.0165)
Ln (Bank charges)	0.00403	-0.144	0.0293***	0.0118	-0.0140**
	(0.0136)	(0.320)	(0.00371)	(0.0338)	(0.00603)
Observations	173	7	63	28	75
Number of plants	69	3	24	10	32
Sargan	19.50	19.50	19.50	19.50	19.50
Chi-Squared	678.6	678.6	678.6	678.6	678.6
AR-2		2	2	2	2

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A1: **Elasticity of Revenue TFP (TFPR) with respect of market size and cost of entry in Selected Manufacturing Industries: Arellano-Bond Estimates**

(Market size proxied by the size of population city of location of production]

Dependent variable is the log of current TFP in revenue units= Ln(TFPR). “Lag1” refers lagged values by one year

Variables	All four industries	Cooking oil (ISIC 1514)	Grain mills (ISIC 1531)	Bakeries (ISIC 1541)	Cinder blocks (ISIC 2695)
Lag(Ln(TFPR))	-0.113**	-0.0535	-0.254***	-0.372***	0.169***
	(0.0450)	(0.0996)	(0.0153)	(0.0315)	(0.0123)
Ln(population)	2.363	210.8***	-4.684***	7.859*	-23.51***
	(4.705)	(41.73)	(0.770)	(4.130)	(0.853)
Lag1(ln(population)	-2.671	-210.3***	4.444***	-8.281**	23.68***
	(4.628)	(41.44)	(0.837)	(4.083)	(0.733)
Ln(Transport cost)	0.00759	-0.0743**	0.0225***	0.00787	-0.0507***
	(0.00915)	(0.0295)	(0.00838)	(0.00669)	(0.00211)
Lag1(ln(Transport cost)	-0.0413***	-0.172***	0.0328***	-0.216***	-0.0600***
	(0.0145)	(0.0411)	(0.00560)	(0.00546)	(0.00249)
Ln(License Fee)	-0.0250***	-0.117***	-0.0222***	-0.0676***	0.0426***
	(0.00856)	(0.0207)	(0.00246)	(0.00287)	(0.00249)
Observations	351	41	116	103	91
Number of estid	177	19	56	49	53
Sargan	42.86	42.86	42.86	42.86	42.86
Chi-Squared	686188	686188	686188	686188	686188

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2: Elasticity of Annual Value Added Per Employees in Selected Manufacturing Industries: Arellano-Bond Estimates. (Market size proxied by the size of population city of location of production]

Dependent variables is current Ln(YoverN)=annual value added per workers: “Lag1” refers lagged values by one year; Ln(Kovern)=end-of-year fixed assets per worker

	(1)	(2)	(3)	(4)	(5)
	All four industries	Cooking oil (ISIC 1514)	Grain mills (ISIC 1531)	Bakeries (ISIC 1541)	Cinder blocks (ISIC 2695)
Variables					
Lag1(Ln(YoverN))	-0.334***	0.0417	-0.220***	-0.347***	-0.196***
	(0.0128)	(0.0446)	(0.0319)	(0.113)	(0.0263)
Ln(KoverN)	0.142***	-0.0245	0.0223	0.408***	-0.0567*
	(0.00494)	(0.0453)	(0.0251)	(0.0747)	(0.0333)
Lag1(Ln(KoverN)	0.223***	0.115	0.110***	0.263***	-0.0507***
	(0.00685)	(0.0903)	(0.0401)	(0.0735)	(0.0154)
Ln(Employees)	-0.599***	-1.224***	-1.136***	-0.554***	-0.454***
	(0.0231)	(0.241)	(0.0481)	(0.142)	(0.0660)
Ln(Transp. cost)	0.106***	-0.174	0.224***	0.255***	0.0356
	(0.00752)	(0.114)	(0.0313)	(0.0741)	(0.0230)
Lag(Ln(Transp. Cost))	0.0138**	-0.181	0.127***	-0.232**	-0.00338
	(0.00630)	(0.148)	(0.0225)	(0.112)	(0.0363)
Ln(License Fee)	0.0269***	-0.326***	0.00308	-0.152**	0.278***
	(0.00587)	(0.0685)	(0.0124)	(0.0702)	(0.0219)
Ln(population)	2.962**	616.9***	7.307***	9.005	-48.42***
	(1.487)	(141.7)	(2.587)	(12.91)	(4.584)
Lag1(Ln(Population))	1.133	-618.4***	-5.114**	-5.671	54.89***
	(1.376)	(141.3)	(2.102)	(12.73)	(4.741)
Observations	309	36	93	99	81
Number of plants	168	17	51	49	51
Sargan	39.68	39.68	39.68	39.68	39.68
Chi-Squared	171342	171342	171342	171342	171342

Standard errors in parentheses

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