The links between prices, productivity and performance: Evidence from Ethiopia's manufacturing sector

Eyerusalem Siba

&

Måns Söderbom

First draft

June 11, 2010

Abstract

In this paper we investigate the relative importance of technological and demand constraints for firm performance using panel dataset of Ethiopian manufacturing sector (1996-2006). Previous empirical research on firm performance use revenue based productivity which confounds true efficiency with price effects. Using information on price and physical quantity of firms' products, we decompose revenue based productivity into physical productivity, price and idiosyncratic demand shocks. Comparison of various components of productivity across firms, using product and firm fixed effect estimation, reveals that entrants have lower demand and output prices than established firms. However, we do not find a robust difference in efficiency between entrants and established firms. Young and small firms are also found to be most vulnerable to demand constraints. Analysis of firm survival using Probit regression reveals that firms' access to secure market is an equally important determinant of survival as firm productivity is.

1. Introduction

In this study, we are interested in analyzing the relative importance of supply side and demand side growth constraints in Ethiopian manufacturing sector. Previous firm growth studies have shown that small and young firms grow faster than large and old firms in Ethiopia. (Gebreyesus and Bigsten, 2007) In this study we are interested in understanding the relative importance of productivity, prices and demand shocks in firms' growth and survival. Much of the investment climate literature focuses on supply side constraints and how these lead to higher costs and higher prices, we know very little about the relative importance of demand side constraints on enterprise performance. But if demand side effects are first order important, supply side reforms may not have much of an impact. So policy implications could be important.

Previous studies on firm performance in Ethiopia use revenue based measures of firm performance where price and true productivity are confounded in revenue based measure of productivity (TFPR). This study follows the work of Foster et al (2008) to decompose TFPR into price and physical quantity based measure of productivity (TFPQ) using range of homogenous products with comparable physical unit of output. To study the importance of demand side constraints on firm performance we need a measure of demand shock. We estimate demand equation using TFPQ as an instrument for output price. Since we used set of homogenous products and control for product-year fixed effects and instrumented prices by TFPQ, the residual of our demand equation is our measure of demand shocks unrelated to productivity shocks. While movements along the demand curve are captured by TFPQ, the residual of the demand equation captures shift in demand curve due to non-productivity related reasons. In order to ensure that any variation in output prices has nothing to do with quality difference between firms producing the same product, we focused on homogenous products. Such decomposition of TFPR into TFPQ, prices and demand shocks allows us to understand the relative importance of these variables in determining firm performance such as firm growth and survival. To our knowledge, this is the first study applying this method in census based panel of manufacturing sector in Africa.

Using census based panel of Ethiopian manufacturing sector, we will answer the following research questions. How do TFPQ and prices relate to firm performance measures such as employment growth, investment, productivity growth and survival? Do small and young firms have different price, productivity and demand than incumbents? Are small firms more/less efficient than established firms? And what drives their prices, market power or efficiency?

Our paper also relates to methodological papers on improving measures of firm productivity, output and inputs. Katayama, Lu and Tybout (2008) argue that productivity indices constructed using real sales revenues of output, depreciated capital spending and real input expenditures have little to do with technical efficiency, product quality or contributions to social welfare when applied to differentiated product industries. This is because such measures depend on scale economies and variation in prices and demand elasticities are confounded in these measures. Assuming that firms' costs and revenues reflect Bertrand-Nash equilibrium in a differentiated product markets, and incorporating demand system they impute each firm's unobserved quantities, qualities, marginal costs and prices of each product from observed revenues and costs. Firm's contribution to consumer and producer surplus is used as an alternative welfare-based measure of productivity. When comparing their welfare-based measures of productivity with conventional productivity measures using panel data on Colombian paper producers, they find that the two are only weakly correlated. Melitz (2000) demonstrates one way to incorporate consumer tastes into plant level performance measures when price and quantity data are unavailable. He notes that the residuals from a revenue function can be used to infer a quality adjusted productivity index which provides the basis for ranking firm's contributions to social output.

The presence of firm level data on prices and physical unit of output makes it easier to estimate physical output based productivity measure and decomposes TFPR into true efficiency and price effects. Using such approach Foster et al (2008) find that physical productivity is inversely related to price while revenue based productivity is positively related with price. Previous studies linking TFPR to survival confounded the separate and opposing effects of technical efficiency and demand on survival. It is also found that young producers charge lower prices than incumbents thus the use of TFPR understates new producers' productivity advantage and entry's contribution to aggregate productivity growth. Using similar approach Eslava *et al* (2008) examine the role of productivity, demand and input costs in determining plant survival. They find that higher productivity, higher demand and lower input prices increase probability of plant survival and liberalization, in Colombia, increases plant exit and makes high demand more important in determining survival[1].

The rest of the paper is organized as follows. Section 2 discusses our product selection strategy, the nature, economic significance and industry coverage of the selected products. We also discuss the construction of various productivity measures as well as their relationship with output prices and quantity. Section 3 we discuss our empirical strategy to be followed by a section summarizing our empirical results. The last section concludes and discusses policy implications.

[1] See Syverson (2010), for recent review on determinants of firm productivity and methodological issues involved in measuring productivity. See also Syverson (2004 a & b) for other applications of physical productivity measure.

2. Data and Descriptive Statistics

Using eleven year dataset and ignoring a composite product category labeled ‘other products’, we end up having around 17, 000 product year combinations in the period 1996-2006. We used the criteria that consumers should not differentiate between unlabeled products of firms producing the same product category. Even though we control for quality variation using set of homogenous products, price might still vary between firms due to localization of markets, horizontal differentiations and long established customer-supplier relationships. Foster et al (2008) In addition, we used a second criteria that, in a cross-section of firms producing a given product and ignoring time dimensions, the coefficient of variation of output price should be less than or equal to 0.5 and number of observation should be large enough to econometrically estimate our demand equation (N>100). We included some of the products even with fewer than 100 observations if deemed to be homogenous in either criterion. Using these criterions, we have chosen 27 products presented in table A1 in the appendix. Cement block, brick of clay and cotton yarn are some of the products satisfying the latter criteria whereas Tea, Soft drinks, Milled coffee, sugar, cotton fabric, Vaseline & Paraffin, Leather garments, Nails and Plastic footwear are some of the products that, we believe, satisfy the primary selection criteria that consumers do not differentiate between unlabeled products. We plan to do a robustness check on how sensitive are empirical results are to the type of products selected. Our set of selected products constitutes around 7800 product-year observations covering 13 sectors. Food, Beverage, Textiles, Footwear, Chemicals and Non-Metal sectors constitute 94% of the total product-year observations of selected products.

In our dataset, while most of the products, such as bricks of clay, cement blocks, nails, sugar, bread and wheat flour, are reported separately as a single product, some of our products can be considered to be a composite product aggregating over similar products. These products include: edible oil, liquor and soft drinks among others. This is the level of aggregation CSA uses and we take that as given and assume that there is high substitutability between the components of such aggregated products. The product soft drink for example contains Coca Cola, Fanta and other similar brands of soft drinks. Even though consumers can differentiate between such products, we assume that there is high substitutability between such products and treat soft drink as homogenous product. The same type of argument follows for products such as Tea, Milled Coffee, Edible oil, Liquor, Beer. This also the approach followed by Foster et al (2008)

Another concern to be discussed here is that, in our dataset, firms sometimes report same product using different unit of measurement, ton and KG for example. This has an important implication for demand equation estimation. Suppose the units actually vary within our product – e.g. suppose all we observe is ‘biscuits’, but suppose in reality there are small and large units of biscuits. We will then have observations for which price is high and volume is low (large units) combined with observations for which price is low and volume is high (small units). Price and quantity are then clearly negatively correlated in the data, but this does not tell us anything about the price elasticity. So basically, for our estimates to be convincing we need to be sure the products and units we are observing are (reasonably) homogeneous. Therefore we have standardized all our price and quantity measures into a common unit of measurement[2]. In such way we make sure that all weights are measured in KG, volumes in liter, area in square meter or square feet depending on the product…etc[3].

In table A1, we present summary statistics of nominal output prices of our selected products after controlling for outliers by ignoring the bottom and top 3 percent of our observation on product prices. This provides us with reduced CV ranging from 0.1 in the case of liquor to 0.76 in the case of leather garments. Since we are ignoring the fact that prices will change over time in A1 this will presumably drive up standard deviation and the coefficient of variation of prices. So we expect that the price range for the selected products are a bit tighter at a given point in time than our standard of deviation of log price seem to indicate, supporting low variation in product quality of our selected products.

Besides having wide industry coverage, our selected products have a major economic significance for their producers. Nine of our 27 selected products have a revenue share of more than 50% in firm's total output. The mean revenue share in our sample is 41 % when treating the products individually and ignoring the time dimension. However, firms often produce more than one product and the combined revenue share of firm's selected products in its total output provides us with a better picture of specialization. The average combined revenue share in our selected sample is 92% with median share of 100%. Table A2 in the appendix presents the summary statistics of revenue share of our selected products when these products are firm's major product. We define major product as the product with maximum revenue share in total output among set of firm's selected products. This will give us a smaller sample size of about 3500 where the average revenue share is 74%. Among firms' major products, all products except Leather garment, Crust and Wet blue hides; and Wires have a median revenue share of 50% or more. We think Leather garment, and Crust and Wet blue hides have lower share because products like semi processed skin, which are likely to be major products in combination with these products, are not included due to the concern of homogeneity.

[2] If a price of half a liter of edible oil is 10 birr and the firm sold 100 units of such a product, the firm sold 50 liters of edible oil with revenue of 1000 birr. We convert the price and quantity of this firm into 20 birr per liter and the quantity into 50 liters without altering its total revenue. This conversion makes comparison of this firm's price with other firms stating their price using other unit of measurement of edible oil. In general, we created a variable for unit of measurement converter and divide prices and multiplied quantities by the conversion variable to get standardized price and quantities. The major limitation of such conversion is that, in reality the price of 1 liter of edible oil is usually less than twice the price of 0.5 liter.

[3] It is sometimes the case that a product can be reported using liter and KG as a unit of measurement which are not directly comparable. Edible oil is one such example. Such cases require that we use density of a product to convert volume into mass or vice versa. Through our correspondence with CSA, we learned that they avoid this complication by treating 1 Liter of Edible oil= 1 KG of edible oil and we follow the same approach.

On TFP calculation

We construct two measures of total factor productivity, the conventional revenue based productivity (TFPR) and physical quantity based productivity (TFPQ). We use the following production function:

$$Y_i = A_i F(K_i, L_i, M_i) \quad (1)$$

Where Yi is firm i's output, Ai is measure of firms productivity, Ki is capital stock, Li is labor input and Mi is firm's raw material inputs. Expressing equation 1 in log terms:

$$\ln A_i = \ln Y_i - \ln F(K_i, L_i, M_i)$$
$$where \ \ln F(K_i, L_i, M_i) = \alpha_K \ln K_i + \alpha_L \ln L_i + \alpha_M \ln M_i \quad (2)$$

Our two measures of productivity differ in the way we measure our output. While TFPR uses real revenue from sales of output, TFPQ uses log of physical quantities of output sold. Instead of estimating productivity as a residual of a production function, we calculated input component of equation 2 assuming CRS and estimating factor shares from our dataset. We then take sector average shares of the inputs to calculate equation 2. Factor share of labor is calculated as a ratio of wage bill in total firm's output whereas that of raw material is calculated using total raw material expenditure's share of firm's output. The share of capital is then the residual share after deducting the shares of labor and raw material from one. Labor is measured as the number of workers, whereas deflated firm's expenditure on raw material and fixed capital are used to measure raw materials and capital using GDP deflator[4]. Since we use the value instead of physical quantity of capital and raw material inputs, our measure of productivity will be contaminated by input prices with firms facing higher input prices appearing as less efficient firm. Whereas TFPQ confounds input prices with true efficiency as measured by physical unit of output produced per unit of inputs used, TFPR additionally confounds output prices with true efficiency

Another concern in our TFP calculation is that, we have data for inputs used for each firm not per product making the calculation of output per unit of input complicated. Moreover, not all products a firm produces are selected into our sample of homogenous products and ignoring the output of non-selected products, will underestimate the productivity of multi-product firms. To correct for these concerns, for multi-product firms, we divided the total input used by the combined revenue share of all firm's selected products in firm's total output, and deduct log of the combined revenue share from equation 2. This will give as an expression for our TFPR measure when all the selected products are considered and input costs are adjusted for revenue shares in equation 3. According to this calculation, a firm whose products are all selected will look like a single product firm revenue share of one. In this case the log share term will disappear and equation 3 becomes equitation 2.

[4] We plan to construct own firm and/or sector specific price deflators since we observe output prices in our dataset to see results are robust to the use of alternative deflators.

$$TFPR_i = \ln\left(\sum_K P_K Q_K\right) - \ln F(K_i, L_i, M_i) - \ln Sh_i$$

$$where\ \ Sh_i = \frac{\sum_K P_K Q_K}{P_i Q_i}\ \ and\ \ k = selected\ \ products \qquad (3)$$

Following the above logic TFPQ is calculated as:

$$TFPQ_i = \ln\left(\sum_K Q_K\right) - \ln F(K_i, L_i, M_i) - \ln Sh_i$$

$$where\ \ Sh_i = \frac{\sum_K P_K Q_K}{P_i Q_i}\ \ and\ \ k = selected\ \ products \qquad (4)$$

Whereas calculation of TFPR for multi-product firm is straight forward, a few aggregation problems arise when one tries to estimate TFRQ for multi-product firm. Since we are measuring output using physical units, we cannot just sum up different physical units to come up with aggregate output of the firm. Aggregation of product is easier in equation 3 as our output is measured in values, which is not the case in equation 4. Alternatively, we weighted the physical quantities of a firm by average price of each product across all the firms producing similar product at a given point in time ($\overline{P}_K$).

$$TFPQ2_i = \ln\left(\sum_K \overline{P}_K Q_K\right) - \ln F(K_i, L_i, M_i) - \ln Sh_i$$

$$\text{where}\ \ Sh_i = \frac{\sum_K P_K Q_K}{P_i Q_i} \qquad (5)$$

This simple measurement is telling us how productivity would differ if everyone had the same prices – i.e. by definition quantity-oriented productivity in log terms. Hence, the use of $\overline{P}_K$ helps us to aggregate different physical products of multi-product firms.[5] To check if TFPQ2 has characteristics of the ideal TFPQ measure, we focus on the major product of firms and calculated TFPQ without facing the above aggregation problem. For multi-product firms, only their major product is included where a product with maximum revenue share is defined as a major product. In this case, revenue share in equation 6 contains the individual revenue share of the single product selected as major product. Our ideal measure of TFPQ is then defined as:

[5] One concern we have in equation 5 is whether one should include own price in the calculation of $\overline{P}_K$. If our number of observation is small it may be driving $\overline{P}_K$. We will do some robustness check for that.

$$TFPQ\_slct_i = \ln Q_K - \ln F(K_i, L_i, M_i) - \ln Sh_i$$

$$\text{where } Sh_i = \frac{P_K Q_K}{P_i Q_i} \quad and \;\; k = \text{the selected major product} \qquad (6)$$

Revenue based productivity for firm's major product corresponding to TFPQ_slct will be:

$$TFPR\_slct_i = \ln P_K Q_K - \ln F(K_i, L_i, M_i) - \ln Sh_i$$

$$\text{where } Sh_i = \frac{P_K Q_K}{P_i Q_i} \quad and \;\; k = \text{the selected major product} \qquad (7)$$

When running pair wise correlation of our TFP measures in table 2, with log of price and quantity, we found that TFPQ_slct is negatively related to price while TFPR_slct is positively related to price. This is not surprising as it is possible that more efficient firms have lower costs which they pass on to consumers as lower output prices. It is this feature of physical productivity measure that makes it a candidate instrumental variable for output prices in our estimation of demand equation. However, the aggregation strategy, when physical output is multiplied by $\overline{P}_K$ (TFPQ2) instead gives us a positive relationship between price and TFPQ2. When we use simple sum of physical output to aggregate as in equation 4 to get TFPQ, we obtain the desired result of negative relationship between price and physical productivity. In order to avoid the uncertainties of our aggregation over different physical output strategy, we focus on TFPQ_slct where firm's major product is used to construct physical for the subsequent analysis. It is also worth noting that revenue based productivity measures for major products (TFPR_slct) is weakly correlated with TFPQ_slct (0.26) and TFPQ (0.27) but highly correlated with TFPQ2 where simple summation of physical products is applied (0.88). This indicates that price effects may have significant influence on revenue based productivity measures. Imperfect correlation of the two measures is also noted in Tybout et al 2008.

3. Empirical Strategy

Estimating demand equations is central part of our analysis where we will obtain, price elasticity and our measure of demand shocks.

$$\ln Q_{ijt} = \beta_0 + \beta_1 \ln P_{it} + \beta_2 \ln(local \quad income)_t + \sigma_t + \lambda_i + \varepsilon_{ijt} \qquad (8)$$

Where Qji is firm j's output i in physical unit and Pi is product i's price, local income is average income in the firm's local market. We assume town to be the relevant locality of firms and control for average income in the town of firms using town fixed effects due to the lack of income data for each town. σ_t is year fixed effect to control for economy-wide variation in demand for the product. λ_i is product fixed effect. And finally ε_{ijt} is product and firm specific error term. If we don't control for product heterogeneity, the residual of the above demand equation captures quality variation of products for which we are estimating the demand equation. Whereas estimating the above demand equation on restricted set of homogenous products the residual of demand equation captures shifts in demand curve due to idiosyncratic demand shocks which are orthogonal to production technology or product quality. To study the effect of various component of revenue based productivity on firm performance, we focus on the set of homogenous products with comparable product quality and estimate our demand equation using physical productivity as an instrument for output prices. To avoid aggregation over products issue when calculating TFPQ discussed in section 2, we focus on firms' major products.

Estimation of our demand equation using OLS will give us biased estimates of price elasticity as output price is positively associated with demand shocks. This is because firms optimally increase output prices as a result of favorable demand shocks. We need an instrument closely related to prices but orthogonal to demand shocks. Supply side variables, such as physical productivity and input prices, are potential candidates as they are correlated with production cost and hence output price. Physical productivity is relevant IV as efficient firms are likely to have lower costs and pass this to customers by charging lower output prices. However, as discussed earlier, physical productivity confounds true efficiency with input prices making firms facing higher input prices look less efficient. This does not cause a problem as higher input prices are also translated into higher production costs and higher output prices. Since demand shocks and output prices are positively correlated, we would expect a larger negative coefficient when using IV strategy than OLS to estimate our demand equation. After instrumenting price with physical productivity and controlling for income effect using town dummies, the residual of demand equation is used to measure demand shocks. Comparison of physical productivity, output price and demand shock of entering and exiting firms with that of incumbents is made using equation 9.

$$\ln Y_{ijt} = \alpha_0 + \alpha_1 * Entering_t + \alpha_2 * Exiting_t + \alpha_3 * \ln(firm\,size)_t + \alpha_4 * \ln(firm\;age)_t$$
$$+\sigma_t + \lambda_i + \varepsilon_{ijt} \qquad (9)$$

Where Yij contains various component of productivity: price, physical productivity and idiosyncratic demand for product i of firm j at year t. *Entering* is a dummy variable with value one if firm j enters in between t-1 and t where as *Exiting* is a dummy variable equal to one if firm j exits the market between t and t+1. The base category in this specification is incumbents. We control for log of firm size and age for period t. As above σ_t and λ_i are year and product fixed effects. ε_{ijt} is product and firm specific error term. We sometime control for firm fixed effect or cluster standard errors at firm level for robustness check. Equation 9 enables us to compare productivity and demand differences between entering and existing firms. We control for firm size for two reasons. First, since idiosyncratic demand is measured as a residual of the demand equation, the unusually high output given price may capture the possibility that larger firms are producing more or having large demand. Second, it is of interest to see whether small firms have different demand and supply side constraints than larger and more established firms. In some of empirical specifications we also include interaction of firm age and size to see if young and small firms have lower prices and productivity and if they catch up with larger and established firms overtime. When comparing physical productivity of different firms we use initial firm size, as measured by logged capital and labor, as the contemporary capital and labor enter the dependent variable when calculating physical productivity in section 2.

The importance of demand and productivity on firm performance is investigated by estimating a probit estimation of firm survival:

$$\Pr(Exit_t = 1 | X) = \theta_0 + \theta_1 * TFPQ + \theta_2 * Demand + \theta_3 * \ln(firm\;size) + \theta_4 * \ln(firm\;age)$$
$$+\sigma_t + \lambda_i + I_S + e_{ijt} \qquad (10)$$

Where TFPQ measures physical productivity of firm j's major product i. $Exit_t$=1 if firm j exits the market between t and t+1. Demand is log of residual of demand equation in 8. Alternatively, we use log output price to capture demand. Controlling for productivity, higher price might indicate higher demand or product quality. Since we controlled for product homogeneity, price is more likely to capture demand effect than product quality. We also control for log of firm size and firm age which are conventional determinants of firm survival. Time, product and industry fixed effect are controlled for by including the respective dummies. e_{ijt} is firm and product specific error term which is assumed to be normally distributed. We cluster standard errors either at firm or sector level. Table 1 presents descriptive statistics of the variables used.

4. Results

Table 3 presents our demand equation using product fixed effect estimations with and without instrumenting output price by physical productivity (TFPQ_slct). Price elasiticy using OLS specification using product fixed effects ranges from - 0.701 (column 1) to -0.723 (column 3). As expected, estimating the demand equation using TFPQ as an IV for price provides us with a larger negative price elasiticity with firms operating in an elastic demand curve[6]. Since we are estimating the demand equation of different products across different firms, we would ideally like to cluster the standard errors at product and firm level using two-way clustering. However, in column 3-4 we are simply controlling for product fixed effect by including product dummies and cluster the standard errors at firm level.[7] Consequently, we find a rise in standard error in column 6 compared to column2 when standard errors are clustered at firm level. It is also worth noting that controlling for income effect by including town dummies reduces the price elasticity from 0.723 to 0.701 in OLS specification and from 2.318 to 2.192 in IV specification respectively in absolute terms. The residual of demand specification in column 6 is used as the basis for calculating idiosyncratic demand shocks.

Comparison of price and demand shocks of various firms is provided in table 4 using product or firm fixed effect estimations. In column 1-5, we compare log output price of entering and exiting firms with that of incumbents. Controlling for physical productivity and firm size, we find that entrants have significantly lower price than established firms whereas the coefficient estimate for exiting firms is also negative though not statistically significant. More productive firms, as measured by physical productivity, are found to have lower output prices. Similarly, firms with larger capital stock are found to charge lower prices possibly due to lower input prices as they might have better access to capital. It could also be the case that large firms operate in a more competitive market than small firms or are able to survive even charging lower prices. The result that entering firms charge lower prices is robust to controlling for firm age and clustering standard errors at firm level as in column 3. We find a quadratic relationship between prices and firm age indicating that prices increase overtime though it starts at a lower level. Since log capital stock and labor are included in the calculation of physical productivity, we use startup capital stock and labor instead in column 4 and 5. Tough the firm size effect is not robust to the inclusion of firm age in column 5, the effect of entry dummy and TFPQ persists. The significance of entry dummy in column 5 is weakened but we still find significant age effect on prices leading us to conclude that prices are lower for young and sometimes small firms. This is our first evidence that young and small firms are vulnerable to demand side constraints.

---

[6] In the first stage regession, we found a negative and significant relationship between output price and our IV: physical productivity with the coefficient of -0.061 and significant at 1% for column 2 for instance.

[7] Two-way clustering is not accommodated in the STATA version 10.

In column 6-10 of table 4, we compare idiosyncratic demand shocks of entering and exiting firms with incumbents using residual of the demand equation in column 6 of table3. We find that entrants have lower level of idiosyncratic demand than established firms controlling for firm size and age. In column 6, we find that larger firms, as measured by capital and labor, have higher idiosyncratic demand though the significance is only retained for log of labor input when firm fixed effect is employed in column 7. We found a quadratic effect of firm age on demand shocks in column 8, similar to the trend we found for output price in columns 2, 3 and 5. Column 10 includes firm size, firm age and their interaction additionally. The additional insight we get from this column is that larger firms have higher demand than smaller firms but the demand gap closes with time. Alternatively, the significance of the interaction term of log capital stock and log firm age could indicate that small and young firms are more vulnerable to demand constraints. Taking the price and demand comparison together, there is clear evidence that small and young firms are vulnerable to demand side constraints. This is true in light of the evidence that absence of/limited market access is the firms major growth constraints reported by firms in our dataset.

Comparison of physical productivity of entering and exiting firms with that of incumbents is presented in table 5. Entrants do not have different productivity level than established firms controlling for output price, firm size and firm age.[8] In addition, in columns 1-6 we do not find any evidence that younger firms are less productive than established firms. Since the dependent variable contains log of capital and labor in the construction of physical productivity, we included startup capital and labor to see if there is significant size effect on productivity. We found that firms with larger startup capital stock are less productive which is somewhat surprising. This could be due to the case that startup capital is positively correlated with current capital which in turn is negatively correlated with physical productivity by construction. Results are fairly similar when using alternative definition of productivity in columns 7-11. We do not find statistically significant productivity difference between entrants and established firms and larger startup capital has a negative coefficient as in the previous estimates. On the other hand, we find a significant firm age effect on productivity, in columns 7-10, with younger firms having lower productivity though they catch up over time. This may be evidence towards learning by doing model of Jovanovich (1982), where new firms learn to be more efficient over time as they get experienced. The firm fixed effect estimate with product dummies included, in column 11, also shows that entrants have lower productivity than established firms. We do not find any significant productivity difference between exiting firms and established firms.

[8] In column 1-6 the dependent variable is physical productivity using $\ln Q_K$ =log (physical output) in equation 6 where as in column 7-11, $\ln Q_K$ =log (physical output ***per unit***) is used when calculating physical productivity in equation 6 above.

Taken together, we found clear evidence that small and young firms face a significant demand constraints, i.e, lower prices and idiosyncratic demand, early on when they enter the market. There is some evidence that entering firms are less efficient but not robust to alternative specifications and definition of productivity. The good news is that there is some evidence for catching up effect over time both for demand and technological gaps though how long it takes to close the gaps may matter for firm survival. Next we investigate the relative importance of demand and physical productivity for firm survival.

Relative importance of physical productivity and demand is investigated using a simple probit estimation with standard errors clustered at firm level. The dependent variable is exit dummy equal to one if a firm exits between t and t+1 and zero otherwise. All the explanatory variables on the other hand are for period t. while we include physical productivity always when doing such comparisons; we include either output price or demand residuals, but not both at the same time, to capture demand side effects. In column 1 and 2 of table 6, we make the comparison without controlling for sector and product fixed effects. In line with the conventional studies on firm survival, we find that efficient firms and firms with higher output prices are less likely to exit the market. Controlling for productivity, the price effect indicates that firms with higher demand for their product, and hence higher output price, are more likely to survive. We find similar result when using demand shock where firms with higher demand having higher likelihood of survival. Larger firms are more likely to survive than small firms.

However, the effect of productivity and demand on firm survival is sensitive to the inclusion of sector and/or product dummies in columns 3-6. The effect of productivity is robust to the inclusion of sector dummies but not product dummies. On the other hand, the demand effect is weakly significant when we include sector dummies and insignificant with the inclusion of product dummies only. We investigate how revenue based productivity behaves when including sector and/or product dummies in columns 7-10. Revenue productivity is significant determinant of firm survival with and without inclusion of sector or inclusion of sector and product dummies jointly. It becomes insignificant when just product dummies are included on their own. Therefore, we will include sector dummy or sector and product dummies in subsequent regressions.

Controlling for sector, product and time fixed effects; more productive firms are more likely to survive as shown in column 1 of table 10. Statistical significance of productivity effect gets improved when standard errors are clustered at sector level than firm level in column 2. Young and small firms are less likely to survive. Controlling for productivity, we do not find significant relationship between output price and survival in column 1 and 2. When using demand residual instead, the significance of productivity effect vanishes though it is with the correct sign. Idiosyncratic demand, on the other hand, becomes a significant determinant of firm survival with significance getting stronger when standard errors are clustered at sector level in column 4. Using sector and time dummies without the product fixed effects provides us with more sensible results where both physical productivity and output demand are significant determinants of firm survival. Firm age and startup size are also positively associated with firm survival.

Table 8 compares relative importance of physical productivity and demand shocks on firm survival with and without inclusion of firm size. Ignoring the effect of firm size, as measured by log capital stock, column 2 presents the marginal effect of productivity, demand and firm age evaluated at their mean values whereas column 3 provides us with the effect of one standard deviation increase in physical productivity and demand shocks on probability of exit. While one standard deviation increase in physical productivity increases (decreases) probability of survival (exit) by 3.85%, a similar increase in idiosyncratic demand leads to a 7% increase in probability of survival. Controlling firm size drives down the effect of demand shocks. This is due to the residual of demand equation can capture firm size and larger firms may produce more or it may be easier for them to secure demand for their product. Controlling for firm size, we find that the effect of one standard deviation increase in demand leads to a 3.16% increase probability of survival. Though this effect is lower than the productivity effect (3.74%), it is of comparable importance in determining firm survival.

5. Conclusions

In this study we investigate the relative importance of supply and demand side constraints to firm performance. Previous firm level studies on productivity and firm performance are limited by the use of revenue based productivity measure which confounds true efficiency with price effect. The current study takes advantage of the availability of both price and physical quantity of firms' products to decompose revenue based productivity into efficiency and price effects using 11 year panel dataset of Ethiopian manufacturing sector.

When comparing physical productivity and demand of entering and exiting firms with more established ones, we find some but not robust productivity difference between entering and established firms whereas young and small firms are faced with significant demand constraint making them most vulnerable. Though we find some evidence for catching up effect in closing demand and productivity gap with firm age, how long this process takes may matter as firms might be forced to exit the market before they are able to catch up and compete with more established firms.

When analyzing probability of exit using physical productivity and demand side variables using Probit regression, firms with higher physical productivity and idiosyncratic demand are less likely to exit. While it is important that exit is primarily due to low productivity, the current study has shown that firms' access to secure market is an equally important determinant of survival. Securing access to markets by creating backward and forward linkages during most vulnerable stage of firm entry may be the way to go in terms of policy implication. Sensitivity analysis of the results to using broader definition of entry, product selection, and aggregation of physical productivity for multi-product firms is the natural next step. One can also extend the analysis to firm growth and other performance measures.

References

Eslava, Marcela, John C. Haltiwanger, Adriana Kugler and Maurice Kugler. 2008. "Foster, Lucia, John C. Haltiwanger, and Chad Syverson. 2008. "Reallocation, Firm Turnover, and Efficiency: Selection on Productivity or Profitability?" *American Economic Review*, *98*(1): 394-425.

Foster, Lucia, John C. Haltiwanger, and Chad Syverson. 2009. "The Slow Growth of New Plants: Learning about Demand?" Working Paper.

Gebreeyesus, Mulu & Arne Bigsten, 2007, 'The Small, the Young, and the Productive: Determinants of Manufacturing Firm Growth in Ethiopia', Economic Development and Cultural Change, Volume 55 No. 4

Gebreeyesus, Mulu, 2008, Firm turnover and productivity differentials in Ethiopian manufacturing, Journal of Productivity Analysis, Special issue on transition economies V. 29, Number 2 / April, 2008, 113-129

Jovanovic, Boyan. 1982. "Selection and the Evolution of Industry." Econometrica 50, no. 3:649–70.

John Page (2010), 'Should Africa Industrialize?' The Brookings Institution

Katayama, H., S. Lu and J. R. Tybout (2008), 'Firm-level Productivity Studies: Illusions and a Solution.'

Melitz, Marc (2000) "Estimating Productivity in Differentiated Product Industries," Department of Economics, Harvard University.

Melitz J. Marc (2003), ''The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity'' *Econometrica*, 71(6): 1695-1725.

Roberts, Mark J, and Dylan Supina. 2000. "Output Price and Markup Dispersion in Micro Data: The Roles of Producer Heterogeneity and Noise." *In Advances in Applied Microeconomics,Vol. 9, Industrial Organization*, ed. Michael R. Baye, 1–36. Greenwich: JAI Press.

Roberts, Mark J, and Dylan Supina. 1996. "Output Price, Markups, and Producer Size." *European EconomicReview*, 40(3–5): 909–21.

Shiferaw, A. (2007). "Firm Heterogeneity and Market Selection in Sub-Saharan Africa: Does it Spur Industrial Progress?" Economic Development and Cultural Change 52 (2), 393-423.

Shiferaw, Admassu (2009), 'Survival of Private Sector Manufacturing Firms in Africa: The Role of Productivity and Ownership', World Development 37(3), pp. 572-584.

Siba Eyerusalem (2010), Returns to Capital and Informality, University of Gothenburg, Mimeo

Sleuwaegen, l. & M. Goedhuys (2002). Growth of firms in developing countries, evidence from Cote d'Ivoire. Journal of Development Economics, 68 pp. 117-135.

Syverson, Chad. 2004a. "Product Substitutability and Productivity Dispersion." *Review of Economics and Statistics*, 86(2): 534-550.

Syverson, Chad. 2004b. "Market Structure and Productivity: A Concrete Example." *Journal of Political Economy*, 112(6): 1181-1222.

Syverson, Chad. 2007. "Prices, Spatial Competition, and Heterogeneous Producers: An Empirical Test." *Journal of Industrial Economics*, 55(2): 197-222.

Syverson, Chad (2010), 'WHAT DETERMINES PRODUCTIVITY?' NBER working paper 15712

Söderbom, Måns, Francis Teal, and Alan Harding. 2006. “The Determinants of Survival among African Manufacturing Firms.” *Economic Development and Cultural Change* 54 (April): 533–55.

Table 1: Descriptive statistics of variables used

variable		mean	p50	sd
TFPR_slct	Revenue based productivity using firm's major product	2.171525	2.104137	.8367398
TFPQ_slct	Physical productivity using firm's major product	-.9410757	-.4863339	2.280843
TFPQ_slctU	Physical productivity using firm's major product's physical per unit	.2417982	.6204132	1.624144
lp_unit	Log output price per unit	2.018869	1.492904	1.5851
R_ueS	Demand shocks (in Logs)	-.013149	-.099598	2.779889
Firm age	Firm age in years	15.62292	9	15.92673
Log firm age	Log of firm age in years	2.266328	2.197225	1.023622
Firm age2	Firm age squared	497.6636	81	1179.541
lnK	Log of firm's capital stock	13.36066	13.20805	2.574736
lnL	Log of firm's labor input	4.445904	4.141147	1.667623
lnKi_f	Log of startup capital stock	13.18534	13.18693	2.750842
lnLi_f	Log of startup labor	4.371265	4.060443	1.650714
$entry_t$	$Entry_t$=1 if firm enters between t-1 and t	.2216553	0	.4154193
$exit_t$	$Exit_t$=1 if firm exits between t and t+1	.154195	0	.3612038

Table 2: Pair-wise correlation of price, TFP and output

	lp_unit	TFPR_slct	TFPR	TFPQ_slct	TFPQ	TFPQ2	lQ_unit
lp_unit	1.0000						
TFPR_slct	0.1573*	1.0000					
TFPR	0.1087*	1.0000*	1.0000				
TFPQ_slct	-0.2906*	0.2642*	0.2642*	1.0000			
TFPQ	0.0417*	0.8811*	0.8798*	0.2781*	1.0000		
TFPQ2	-0.3053*	0.2676*	0.3252*	0.9908*	0.3409*	1.0000	
lQ_unit	-0.5207*	0.1338*	0.1284*	0.0545*	0.1665*	0.0878*	1.0000

Note: * = significant at 1%

Table 3. Demand equation for major products

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	OLS_slct2	IV_slct2	OLS_slctC	IV_slctC	OLS_slct2C	IV_slct2C
Log price$_t$	-0.701***	-2.192***	-0.723***	-2.318***	-0.701***	-2.192***
	(0.245)	(0.348)	(0.130)	(0.518)	(0.129)	(0.522)
Constant	13.14***	15.50***	9.849***	22.31***	12.34***	11.49***
	(0.417)	(0.871)	(2.091)	(3.698)	(1.660)	(1.963)
Year	yes	yes	yes	yes	yes	yes
Town dummies	yes	yes	no	no	yes	yes
Product dummies			yes	yes	yes	yes
Products included	major	major	major	major	major	major
Observations	3265	3265	3329	3329	3265	3265
R-squared	0.117		0.689	0.643	0.713	0.674
Number of products	27	27				

Notes: Log of physical quantity of output per unit is used as a dependent variable. Standard errors clustered at product level in columns 1 & 2 in fixed effect regression, whereas standard errors are clustered at firm level in column 3-6 after including product dummies in OLS and IV specifications. TFPQ_slct is used as an IV for price in all IV specifications.
*** p<0.01, ** p<0.05, * p<0.1

Table 4. comparing price and Demand shocks of entering and exiting firms with that of incumbents

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	p2_2	p4_2	p5_1	p2_1	p4_1	D1	D2	D3	D4	D5
			Price					Demand shocks		
$Entry_t$	-0.0643***	-0.0439**	-0.0439**	-0.0551***	-0.0350*	-0.302***	-0.224***	-0.171**	-0.220***	-0.187**
	(0.0186)	(0.0191)	(0.0198)	(0.0187)	(0.0192)	(0.0754)	(0.0709)	(0.0768)	(0.0719)	(0.0763)
$Exit_t$	-0.00330	-0.00117	-0.00117	-0.000115	0.000870	-0.0978	-4.13e-05	-0.0732	-0.00175	-0.0593
	(0.0193)	(0.0192)	(0.0186)	(0.0197)	(0.0196)	(0.0777)	(0.0769)	(0.0769)	(0.0772)	(0.0770)
TFPQ_slctU	-0.244***	-0.247***	-0.247***	-0.228***	-0.231***					
	(0.01000)	(0.0101)	(0.0284)	(0.00996)	(0.0100)					
lnK	-0.0194***	-0.0164***	-0.0164**			0.209***	0.0308	0.238***	0.0326	0.291***
	(0.00443)	(0.00447)	(0.00720)			(0.0164)	(0.0285)	(0.0167)	(0.0289)	(0.0238)
lnL	-0.00138	-0.00798	-0.00798			0.459***	0.199***	0.390***	0.198***	0.380***
	(0.00563)	(0.00606)	(0.00799)			(0.0225)	(0.0275)	(0.0241)	(0.0277)	(0.0320)
Firm age		0.00679***	0.00679***		0.00671***			0.0291***	0.00911	0.0488***
		(0.00133)	(0.00201)		(0.00136)			(0.00530)	(0.0180)	(0.00962)
Firm age2		-0.000100***	-0.000100***		-9.69e-05***			-0.000265***	-8.33e-05	
		(2.12e-05)	(3.52e-05)		(2.15e-05)			(8.42e-05)	(0.000246)	
lnKi_f (start up)				-0.00586*	-0.00389					
				(0.00352)	(0.00361)					
lnLi_f (start up)				0.000350	-0.00641					
				(0.00559)	(0.00624)					
Firm age*lnL										0.000568
										(0.00128)
Firm age*lnK										-0.00262***
										(0.000800)
Constant	2.186***	2.121***	2.103***	1.977***	1.926***	-4.497***	0.841	-4.882***	0.578	-5.489***
	(0.0585)	(0.0596)	(0.433)	(0.0513)	(0.0522)	(0.214)	(0.595)	(0.219)	(0.623)	(0.291)
year	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Product dummy			yes				yes		yes	
Observations	2494	2493	2493	2383	2382	2478	2478	2477	2477	2477
R-squared	0.234	0.242	0.957	0.222	0.230	0.321	0.278	0.337	0.278	0.338
No of product	27	27		27	27	27		27		27
No. of firm							633		632	

Notes: Dependent variable is log output price in columns 1-5 and demand residual in columns 6-10. Standard errors clustered at firm level in column 3. Product fixed effect estimations in all columns except column 7 and 9. *** p<0.01, ** p<0.05, * p<0.1

Table 5. comparing TFPQ of entering and exiting firms with that of incumbents

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
VARIABLES	tf1	tf4_1	tf4	tf6	tf6_1	tf7_1	tfu2	tfu4	tfu6	tfu6_1	tfu8
$Entry_t$	-0.0328	-0.0239	-0.0504	-0.129	-0.108	-0.107	-0.0242	-0.0145	-0.0529	-0.0305	-0.0722*
	(0.0787)	(0.0811)	(0.0794)	(0.0810)	(0.0825)	(0.0994)	(0.0395)	(0.0359)	(0.0358)	(0.0396)	(0.0413)
$Exit_t$	0.120	0.127	0.127	0.0715	0.0733	0.0975	0.0449	0.0492	0.0121	0.0140	0.00769
	(0.0818)	(0.0820)	(0.0803)	(0.0826)	(0.0841)	(0.108)	(0.0393)	(0.0363)	(0.0365)	(0.0404)	(0.0451)
Log price			-0.789***	-0.746***				-0.827***	-0.803***		
			(0.0761)	(0.0787)				(0.0343)	(0.0348)		
lnKi_f (startup)				-0.119***	-0.129***				-0.0640***	-0.0747***	
				(0.0149)	(0.0152)				(0.00660)	(0.00730)	
lnLi_f (startup)				0.0118	0.0179				0.00145	0.00810	
				(0.0263)	(0.0268)				(0.0116)	(0.0129)	
Firm age		-0.000728	0.00261	-0.000627	-0.00403		0.00943***	0.0140***	0.0130***	0.00930***	
		(0.00557)	(0.00546)	(0.00572)	(0.00582)		(0.00275)	(0.00247)	(0.00253)	(0.00280)	
Firm age2		5.53e-05	-2.27e-05	-1.04e-05	5.67e-05		-7.31e-06	-0.000103**	-0.000102**	-3.01e-05	
		(9.07e-05)	(8.91e-05)	(9.08e-05)	(9.22e-05)		(4.48e-05)	(4.02e-05)	(4.01e-05)	(4.43e-05)	
Constant	-0.910***	-0.928***	0.488***	1.953***	0.741***	-1.076*	0.0949***	1.787***	2.610***	1.306***	-0.917***
	(0.0964)	(0.108)	(0.172)	(0.248)	(0.217)	(0.640)	(0.0307)	(0.0778)	(0.110)	(0.104)	(0.266)
Year	yes	yes	yes	yes	yes	yes		yes	yes	yes	yes
Product d						yes					yes
Fixed effect	Product	Product	Product	Product	Product	Firm	Product	Product	Product	Product	Firm
Observations	2494	2493	2493	2382	2382	2494	2493	2493	2382	2382	2494
R-squared	0.074	0.075	0.114	0.144	0.112	0.145	0.036	0.234	0.266	0.099	0.296
No of product	27	27	27	27	27		27	27	27	27	
No of firm						644					644

Notes: In column 1-6 the dependent variable is physical productivity using $\ln Q_K$ =log (physical output) in equation 6 where as in column 7-11, $\ln Q_K$ =log (physical output ***per unit***) is used when calculating physical productivity in equation 6 above. Product fixed effect estimations in all columns except column 6 and 11. *** p<0.01, ** p<0.05, * p<0.1

Table 6. Probability of exit after controlling product/sector fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	exit6	exit5	surv3	surv4	surv5	surv6	tfpr	tfpr_sec	tfpr_sp	tfpr_p
$TFPQ\_slctU_t$	-0.184***	-0.0572**	-0.149***	-0.0901***	-0.0947	-0.0678				
	(0.0538)	(0.0273)	(0.0544)	(0.0295)	(0.0615)	(0.0566)				
Log $price_t$	-0.214***		-0.113*		-0.00798					
	(0.0593)		(0.0646)		(0.100)					
Demand $shock_t$		-0.0686***		-0.0368*		-0.0237				
		(0.0199)		(0.0207)		(0.0280)				
$TFPR\_slct_t$							-0.151***	-0.153***	-0.107*	-0.0918
							(0.0495)	(0.0548)	(0.0596)	(0.0618)
Log $labor_t$	-0.134***	-0.123***	-0.102***	-0.0832***	-0.0791***	-0.0686**	-0.0977***	-0.0991***	-0.0760**	-0.0806***
	(0.0283)	(0.0294)	(0.0282)	(0.0301)	(0.0301)	(0.0315)	(0.0272)	(0.0280)	(0.0302)	(0.0301)
Log $capital_t$	-0.123***	-0.0766***	-0.122***	-0.107***	-0.112***	-0.104***	-0.130***	-0.124***	-0.115***	-0.110***
	(0.0196)	(0.0178)	(0.0197)	(0.0189)	(0.0227)	(0.0239)	(0.0183)	(0.0198)	(0.0226)	(0.0227)
Log firm age_t			-0.113***	-0.124***	-0.131***	-0.135***	-0.128***	-0.111***	-0.123***	-0.130***
			(0.0393)	(0.0393)	(0.0414)	(0.0415)	(0.0381)	(0.0393)	(0.0412)	(0.0413)
Constant	1.538***	0.457*	1.616***	1.141***	2.135**	1.879*	1.709***	1.684***	2.022***	2.115**
	(0.306)	(0.244)	(0.304)	(0.268)	(0.976)	(1.021)	(0.272)	(0.299)	(0.466)	(1.005)
Sector			yes	yes				yes	yes	
product					yes	yes			yes	yes
year	yes	yes								
Observations	2231	2213	2486	2463	2332	2309	2489	2486	2329	2332
Pseudo R2	0.1303	0.1259	0.1000	0.1028	0.0878	0.0896	0.0872	0.0994	0.0908	0.0875

Note: Dependent variable is dummy variable $Exit_t=1$ if a firm exits between t and t+1. Clustered standard errors at firm level in all columns.

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

Table 7. Probability of exit after controlling product, sector and year fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	surv10	surv10_1	surv9	surv9_1	surv11_1	surv11
TFPQ_slctU$_t$	-0.129*	-0.129***	-0.0586	-0.0586	-0.104***	-0.104***
	(0.0675)	(0.0441)	(0.0599)	(0.0600)	(0.0325)	(0.0225)
Log price$_t$	-0.0825	-0.0825				
	(0.112)	(0.0933)				
Demand shock$_t$			-0.0541*	-0.0541**	-0.0518**	-0.0518***
			(0.0279)	(0.0264)	(0.0226)	(0.00942)
Log firm age$_t$	-0.153***	-0.153***	-0.147***	-0.147***	-0.115***	-0.115***
	(0.0421)	(0.0352)	(0.0428)	(0.0241)	(0.0431)	(0.0208)
Log capital$_t$	-0.152***	-0.152***	-0.125***	-0.125***		
	(0.0229)	(0.0133)	(0.0248)	(0.0235)		
lnKi_f (startup)					-0.0698***	-0.0698***
					(0.0240)	(0.00791)
lnLi_f (startup)					-0.0812**	-0.0812***
					(0.0334)	(0.0184)
Constant	2.144*	2.144***	1.513	1.513***	0.651*	0.651***
	(1.182)	(0.303)	(1.211)	(0.462)	(0.344)	(0.129)
Sector	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes
Product	yes	yes	yes	yes		
Se clustered at	firm	sector	firm	sector	firm	sector
Observations	2086	2086	2068	2068	2108	2108
Pseudo R2	0.1352	0.1352	0.1354	0.1354	0.1371	0.1371

Note: Dependent variable is Exit$_t$=1 if a firm exits between t and t+1. Clustered standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 8. Probability of Exit controlling for industry and year fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	surv_A	Mfx_A	1 std	surv_B	Mfx_B	1 std
$TFPQ\_slctU_t$	-0.110***	-.0237***	-.0385	-0.111***	-.0231***	-.0374
	(0.0313)			(0.0316)		
Demand $Shock_t$	-0.118***	-.0255***	-.0710	-0.0548***	-.0114***	-.0316
	(0.0187)			(0.0207)		
Log Capital $stock_t$				-0.133***	-.0275***	
				(0.0186)		
Log firm age_t	-0.112***	-.0242***		-0.159***	-.0329***	
	(0.0391)			(0.0405)		
Constant	-0.584***			1.204***		
	(0.139)			(0.293)		
Sector	yes			yes		
Year	yes			yes		
Observations	2206			2206		
Pseudo R2	0.1172			0.1431		

Note: Dependent variable is $Exit_t$=1 if a firm exits between t and t+1. Probit estimation with standard errors clustered at firm level.
*** p<0.01, ** p<0.05, * p<0.1

Appendix

Table A1. Unit price summary for P within P3 and P97

p41c4_	**Unit**	Mean(p)	p50(p)	min(p)	max(p)	sd(p)	sd(lp)	cv(p)	N(p)
Tea	KG	11.51375	10.8	5.94	19.23	3.605473	.3188294	.3131449	126
Edible oil	KG/LT	9.621965	9.07	5.69	16.2	2.37102	.2431566	.2464174	382
Oil cakes	KG	.4516434	.4	.06	1.5	.2593364	.6203459	.574206	283
Flour (wheat)	KG	2.577765	2.65	1.0884	3.795	.5373561	.2380541	.2084581	743
Bread (for metric unit only)	KG	4.328014	4	2.5	10	1.384864	.2798264	.2541508	727
Sugar	KG	4.562897	4.21595	2.5656	10.8411	1.704542	.2982124	.3735657	40
Liquor	LT	16.32336	16.8	10.5	20	1.696183	.1085016	.1039114	413
Beer	LT	5.957133	6.301515	3.08	12.9193	1.750648	.2992096	.2938742	158
Lemonade (soft drinks)	LT	4.221937	4.166667	3.125	5.22	.5415168	.1308305	.1282626	227
Cotton fabrics	SQM	6.74187	5.985	2.55	17.27	3.283965	.4517855	.4871001	292
Cotton yarn	KG	21.16431	19	12.44	51.8	7.691528	.3082716	.3634198	132
Nylon fabrics	SQM	8.455517	8.51	4.87	12.39	1.750792	.2187746	.2070592	58
Leather garment	SQF	10.70731	9.23	1.44	41	8.157958	.6218656	.7619057	81
Crust hides and wetblue hides	SQF	6.412759	5.8	.89	15	3.354631	.5404076	.5231183	80
Leather shoes and boots	PAIRS	61.65437	58.42	25	126.18	20.66206	.3365625	.3351272	486
Timber	CUB.M	1783.654	1778	495	3800	697.2754	.42268	.3909253	167
Gravel	CUB.M	95.90831	90	39.1	195	33.52443	.3483421	.3495467	290
Plastic footwear	PAIRS	8.242137	6.9	3.04	36	5.450559	.4667361	.6613041	498
Bricks of clay	PCS	.6915603	.6	.4	1.32	.2463302	.3308411	.3561948	109
Cement blocks	PCS	2.257217	2.1	1.25	4.37	.5879784	.2434398	.2604881	1316
Cement floor tiles	SQM	40.50493	37.44	7	166	21.72471	.5029547	.5363473	175
Cement	KG	.7016772	.65335	.435	1.4901	.2638925	.3170769	.3760882	46
Nails	KG	6.206165	5.77	3.93	11.98411	1.582849	.2413431	.2550446	65
Wires	KG	8.223145	7.985	2.46	12.94	2.215233	.2940674	.26939	60
Vaseline	KG	18.16026	17	7.829999	35.33	6.017519	.3174564	.3313564	81
Paraffin	KG/LT	27.66651	20.15	8.98	83.91	18.83157	.5407912	.6806629	287
Coffee (Milled)	KG	22.8061	24	8.17	33.6	7.230071	.3778923	.3170236	41

Table A2. Revenue share of a product selected as major product among selected products

Product	mean	p50	sd	min	max	N
Tea	.7642337	.776008	.2181177	.1502504	1	45
Edible oil	.8450001	.9100978	.1677542	.3112822	1	298
Oil cakes	.5967218	.5877863	.0988283	.5102041	.7538735	5
Flour (wheat)	.9342096	1	.1643112	.0021914	1	583
Bread	.7515118	.9501183	.309753	.0081185	1	488
Sugar	.9304569	.9817675	.1243751	.5177934	1	31
Liquor	.5935034	.5999656	.2086854	.0076474	1	90
Beer	.8150789	.8723925	.1425953	.4872943	1	57
Lemonade (soft drinks)	.555601	.533848	.1061218	.2656777	1	59
Cotton fabrics	.5875103	.5187968	.2522806	.2029806	1	68
Cotton yarn	.5260595	.4967197	.2371481	.1522658	1	48
Nylon fabrics	.5298888	.5424613	.1068792	.3576697	.7146561	11
Leather garment	.2498415	.1038942	.2889866	.0004916	.9624314	26
Crust hides and	.2982448	.1665148	.2943526	.0012479	1	50
Leather shoes an	.7890972	.846727	.225266	.0249161	1	249
Timber	.9001228	1	.2424061	.0442101	1	123
Gravel	.6388954	.6026786	.2975923	.0901382	1	121
Plastic footwear	.5765909	.5234326	.3169391	.0032079	1	169
Bricks of clay	.9377542	1	.1442788	.3888889	1	59
Cement blocks	.6204691	.5831944	.2445371	.0067595	1	599
Cement floor tile	.5338686	.4990259	.2828305	.0427433	1	84
Cement	.9101429	1	.1437082	.5300261	1	39
Nails	.7790731	1	.3124588	.029105	1	67
Wires	.4207218	.2172211	.5090111	.0449441	1	3
Vaseline	.620885	.6158112	.2332482	.027773	1	30
Paraffin	.6190832	.5559087	.2478832	.2702311	1	82
Coffee (Milled)	.9689603	1	.0968267	.601117	1	31
Total	.7387405	.8448988	.2811175	.0004916	1	3515