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Markups Dispersion and Firm Entry: Evidence from Ethiopia*

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Abstract

This paper examines if and to what extent micro-level distortions affect structural transformation in a developing country by creating entry barriers. We show that while average price-cost margin trigger firm entry, a large dispersion of markups deters new firms from entering the market, thereby disrupting the process of new enterprise creation. We exploit information from the Ethiopian annual census of manufacturing establishments to estimate markups and then dispersion at sector and location-sector wide levels. Results show that higher markups dispersion significantly reduces entry rate into a market even in presence of expected positive average markups. Extension of our framework shows that market distortions caused by markup dispersion are related to a statistically significant drop in aggregate TFP and employment growth. Policies fostering competition on the other hand can reduce entry barriers created by market distortions.

Keywords: Firm Entry, Markup Dispersion, African Manufacturing, Ethiopia

JEL Classification: D22, L22, O14, O25

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1 Introduction

New enterprises are the engine of economic growth. They enhance the process of creative destruction, whereby non-performing firms are replaced by new ones (Bartelsman et al., 2004). This process can spur aggregate productivity growth if the least productive firms exit and the more productive ones enter (Aw et al., 2001). In some cases, the entry of new firms can stimulate incumbents to innovate and to become more efficient (Aghion et al., 2009). Moreover, new entrants dissipate monopoly rents by competing away excess profits enjoyed by incumbents (Geroski, 1995), and have the potential to generate a larger number of jobs compared to incumbents (Klapper and Richmond, 2011; Alexander et al., 2010).

Despite the potential gains from firm entry, new business formation is still low in developing countries compared to industrialised countries, whilst the scope for entry ought to be greater (Klapper et al., 2010). What does then prevent firm entry? A first-wave of literature emphasised that the prospect of market growth and profit increases firm entry, while sunk capital costs deter entry (Austin and Rosenbaum, 1990; Bresnahan and Reiss, 1991; Rosenbaum, 1993). Although higher expected profits should increase firms' entry, in reality, entry seems to react slowly to high profits (Bresnahan and Reiss, 1987; Geroski, 1995). Klapper et al. (2006) and Bruno et al. (2013) on the other hand claim that low firm entry can be attributed to business environment, excessive regulation and institutional challenges.

Against this background, this paper introduces a factor that has been so far neglected in the literature by showing that micro-level distortions can deter firm entry even in the presence of high expected profits. The core of our argument rests on partial-equilibrium analysis, which shows that producers increase of prices above marginal cost, a proxy for their market power, is always a distortion from first-best equilibrium. The presence of market power has implications for welfare and the allocation of resources, including on business dynamics.[1]

In a nutshell, markups affect the mass of potential entrants through two main interconnected mechanisms. The incentives of a potential entrant are influenced by its expected operating profits net of entry sunk cost, i.e. entry is a function of markups. While a higher aggregate markups induces entry, its distribution can also affect entry decisions. The dispersion in the distribution of markups introduces uncertainty on post-entry expected profits. Following the seminal contribution by Dixit (1989a,b) a large literature has analysed the effect of uncertainty on entry suggesting a "wait and see" attitude that can trigger discontinuities. Relatedly, markups dispersion generates misallocation of resources. An economy with a high misallocation of production factors signals inefficient market selection mechanism and hence, prospects of post-entry growth.

Our analysis draws insights from a strand of the literature that has theoretically ana-

[1] Using a rich dataset on US firms, De Loecker and Eeckhout (2017) document a significant rise in market power after the 80s, which holds a negative correlation with several macroeconomic indicators that confirm its harmful effects on economic growth.

lysed the welfare cost of markups, in particular markups dispersion, misallocation, and firm entry. Recent work by Edmond et al. (2018) shows that markup dispersion give rise to *inefficiently low rate of entry*. They establish that incentives for new firms to enter the market are determined by their markups drawn from a distribution function. The shape of the distribution therefore affects the entry incentive.

Lerner (1934) argued that the welfare cost of market power – in terms of sector-wide or economy-wide distortions – is not the sum of producer price-cost margin but rather their *deviations*. Epifani and Gancia (2011) built on Lerner's presumption and developed a theoretical model, which shows that markup heterogeneity always leads to *intersectoral misallocation* either with restricted or free entry. In summary, when the number of firms is exogenously fixed – through government regulations or business environment and institutional challenges – a necessary and sufficient condition to achieve first best allocation requires markups to be identical across all industries. Heterogeneous markups will lead to intersectoral misallocation whereby industries with below-average markups overproduce, while industries with above-average markup will underproduce, resulting in efficiency losses.[2]

When the entry restriction condition is removed, markup heterogeneity still leads to intersectoral misallocation. However, the overall welfare effect depends on the elasticity of substitution and on consumers' preference for variety. The key result of Epifani and Gancia (2011) is that, as far as markup is heterogeneous, this will always lead to a misallocation, with the magnitude of the misallocation depending on the elasticity of substitution. Given that markups vary across and within industries, the cost of misallocation is likely to be high in economies or sectors with a low elasticity of substitution.[3]

In light of the above discussion, the contribution of this paper is twofold. On the one hand, we provide empirical support to the hypothesis that the dispersion of markup can be detrimental to the formation of new enterprises, and show to what extent this relation is mediated by firm heterogeneity and policy related factors. On the other hand, we provide a preview of the social loss of markups dispersion by examining its effect on aggregate productivity and employment growth.

Our analysis is based on census level information on the universe of formal manufacturing establishments based in Ethiopia, covering a period of high economic growth in the country, i.e. 1996-2009. A contribution of this paper is to move beyond standard cross-country analysis of entry, analysing cross-location (the district)/cross-sector entry rates within a single economy. This choice is guided by findings of existing research on Ethiopia showing that, due to high intra-national transport costs, markets are prevalently local and pricing behaviour is largely affected by their remoteness (Atkin and Donaldson,

[2]The the interested reader is referred to Epifani and Gancia (2011) for theoretical illustrations leading to Prepositions 1 and 2.

[3]Not surprisingly, Figure 4 (p.5) in Epifani and Gancia (2011), shows that markup dispersion is correlated with GDP per capita, where developing countries typically exhibits high levels of markup dispersion. Firm level evidence comparing a bunch of developing countries with Germany supports this argument, showing that markup dispersion accounts for about 70 percent of relative TFP misallocation in developing countries (Bayer and Meier, 2018).

2015; Krishnan et al., 2018).

Investigating the factors that can contribute to the entry of new firms is not only relevant from a theoretical point of view, but has also immediate policy relevance, especially for a country as Ethiopia where private sector development, job creation and structural transformation are among the priorities set by the national development plans. Shiferaw and Bedi (2013) show that firm entry accounts for at least fifty percent of new manufacturing jobs in Ethiopia while recent evidence from Jones et al. (2018) provides support to the hypothesis of improvements in allocative efficiency originating from dynamics of entry and exit among Ethiopian manufacturing firms.

Our results show that there is a negative correlation between markup dispersion and entry rate. An increase in dispersion from its mean to the values at the $90^{th} - percentile$ of the distribution is related to a 4.4 percentage points lower entry rates. This relation is robust to different estimation methods as well as to different definitions of the key variables and to different treatments. This relation can be mediated by risk averse attitudes of firms, given that it only affect the group of smaller firms. In addition, we show that the negative consequences of such distortions can be moderated by policies pushing competition, including two that are particularly relevant in the context of Ethiopia: trade liberalization and infrastructural development. Finally, extensions of our framework shows that market distortions caused by markup dispersion are related to a statistically significant drop in aggregate TFP and employment growth.

The remaining of the paper is organised as follows. Section 2 introduces the data and the main descriptives. Section 3 provides all the details on the construction of the variables of interest and the model used in the empirical analysis. Section 4 presents the main results, as well as robustness checks. Section 5 presents some extensions and Section 6 concludes.

2 Data

We exploit information on Ethiopian manufacturing firms made available from the Census of Large and Medium Scale Manufacturing and published by the Central Statistical Agency (CSA). The data are recorded at the level of the establishment, and cover all firms producing in manufacturing, using electricity in their production process with at least 10 persons (including working owners)[4] in their activity. All firms are required to comply with CSA in the compilation of the Annual Census of Large and Medium Scale Manufacturing, thus making the dataset representative of formal firms in the country. For our analysis, we use information covering the period 1996 to 2009.[5]

A limitation of this dataset is that, it excludes micro-enterprises with employees less

[4]Since the threshold is based on persons engaged and working owners, we find a number of firms with less than ten employees.

[5]In 2005 a survey, rather than a census, was conducted. In order to not lose the information, we have considered all firms that were included in the dataset both in 2004 and in 2006 as incumbents.

Table 1: Yearly Firm Turnover

Year	Entry	Exit	Net Turnover	# of Incumbents	Growth Rate
1996				623	
1998	287	167	120	743	19.26%
1999	121	105	16	759	2.15%
2000	154	148	6	765	0.79%
2001	113	91	22	787	2.88%
2002	242	100	142	929	18.04%
2003	144	118	26	955	2.80%
2004	190	51	139	1094	14.55%
2005	96	108	-12	1082	-1.10%
2006	201	75	126	1208	11.65%
2007	461	224	237	1445	19.62%
2008	431	111	320	1765	22.15%
2009	655	472	183	1948	10.37%
Total	3095	1770	1325		
Average	222	148	152		10.26%

Source: Authors' elaboration on CSA data.

Figure 1: Geographic Distribution of Average Entry Rate
Source: Authors' elaboration on CSA data.

than ten. In spite of this limitation, we are confident about the potential implication of our analysis given that the firms in our sample represent roughly 50% and 80% of total employment and value added produced in the manufacturing sector in Ethiopia.

Information in the dataset includes data on the number and type of persons employed, production, capital, investment, internationalization and details about the location of each firm. All firms are classified into industries at the 4-digit of the ISIC revision 3 classification. It is relevant for the purposes of our analysis to show (Table 1) that - over the period examined - Ethiopian manufacturing sector has experienced a rapid turnover, both in terms of exit and, especially, entry. While in 1996 the census counted only about 600 establishments, this number rises significantly reaching about 2000 units by 2009. Data on the patterns of entry and exit show that entry outweighed exit, especially during the more recent years, in correspondence to sustained economic growth, which interested also the manufacturing sector (Moller, 2015).

Table 2: Patterns and Distribution of Entrants by Sector and Firm Sizes (Percentages)

Sector	2-Digit ISIC Code	Small $1-19$	Medium $20-99$	Large >100	All
Food Products	15	15.74	7.46	2.10	25.30
Textiles	17	0.68	0.65	0.74	2.07
Wearing Apparel	18	0.81	0.61	0.58	2.00
Leather & Footwear	19	1.71	2.13	0.29	4.14
Wood Products	20	2.16	0.94	0.16	3.26
Publishing & Printing	22	1.68	1.13	0.16	2.97
Chemicals	24	1.26	1.03	0.42	2.71
Rubber & Plastics	25	0.87	1.91	0.58	3.36
Non-metallic Mineral Products	26	19.32	2.94	2.68	24.94
Metals	28	5.78	2.20	0.74	8.72
Motor Vehicles	34	1.49	0.74	0.36	2.58
Furniture	36	14.70	2.36	0.87	17.93
	Total	66.20	24.10	9.69	100

The common denominator for the relative distribution is the total number of entrants between 1998 and 2009. The figure is reported in Table 1.
Source: Authors' elaboration on CSA data.

Importantly, such patterns are not necessarily determined by a few locations (e.g. Addis Ababa, where almost 50% of the establishments are located), but it is spread across the country. Figure 1 reports the geographic distribution of the average entry rates (calculated as described in subsection 3.1) over the period considered and across the districts (woreda) where the firms are located.

Table 2 reports patterns and distribution of entrants by sector and firm sizes. Unsurprisingly, small firms accounted for the majority of entrants with 66 percent, followed by medium and large firms with 24 and 9 percent respectively. At the sector level, food products, non-metallic products, and furniture jointly accounted for 68.17% of total entry. This clearly shows that the entry pattern is not equally spread across all sectors but rather concentrated in few sectors.

3 Methodology

3.1 Measuring Entry Rates

Our dataset, as mentioned above, covers the universe of Ethiopian formal manufacturing firms across the country. Given the topography of Ethiopia, transporting products from one end of the country to the other involves a high cost; hence, producers may take advantage of their location to adopt monopolistic behaviour. Under these conditions and all other things equal, the price of the same product will vary from location to location. Therefore, location (and related transport costs) represents a key factor in determining the pricing behaviour of producers of similar goods, as demonstrated using very detailed information on the pricing of consumption goods in Ethiopia by Atkin and Donaldson (2015). To account for this, in order to derive entry measures and our subsequent empirical analysis using Ethiopia administrative division, we define a level of market including all firms in a given 4-digit sectors within each administrative district.[6]

Hence, our definition of market $m = (w, s, t)$ varies at district, sector, and time dimension. To measure the entry rate in each market, we proceed in a way similar to Dunne et al. (1988). Let:
NE_{mt} = number of firms that enter market m between census years $t-1$ and t;
NT_{mt} = total number of firms in market m between census years $t-1$ and t . This includes number of new firms.

The entry rate into a market m is:

$$EntryRate_{mt} = NE_{mt}/NT_{m(t-1)}. \tag{1}$$

where the denominator is lagged one year.

3.2 Estimating Markups

To assess the effect of markups on firm entry, we calculate price-cost margins following De Loecker and Warzynski (2012). A firm i produces output Q at time t according to the following production function:

$$Q_{it} = F_{it}(L_{it}, M_{it}, K_{it}, \omega_{it}), \tag{2}$$

where L_{it}, M_{it}, and K_{it} represent a vector of labour, intermediate materials, and capital inputs respectively; while ω_{it} denotes the firm-specific productivity. Two fundamental assumptions are imposed on equation (2) to recover firm-level markups. First, the production function $F(\cdot)$ is continuous and twice differentiable with respect to its arguments.

[6] Districts or Woreda (in Amharic) is the third-level administrative division in Ethiopia after the federal and regional levels. In additional specifications we run the same analysis using an aggregate level of market defined by 4-digit sector-wide classification. This comprises the set of firms in a given 4-digit sector classification across the country, irrespective of location.

Second, producers active in the market are cost minimizers. Given these assumptions, the estimation of markups relies on the optimal input choice of the firm. Capital is a dynamic input that requires adjustments costs. Labour can be considered as a variable input, but often subject to specific regulations and constraints. Intermediate materials are a variable argument of $F(\cdot)$.

The associated Lagrangian function is given by

$$\mathcal{L}(L_{it}, M_{it}, K_{it}, \lambda_{it}) = w_{it}L_{it} + p^m_{it}M_{it} + r_{it}K_{it} + \lambda_{it}[Q_{it} - F(\cdot)], \tag{3}$$

where w_{it}, p^m_{it} and r_{it} represent firm's input price labour, materials, and capital respectively. The first-order condition for intermediate materials is given by

$$\frac{\partial \mathcal{L}_{it}}{\partial M_{it}} = p^m_{it} - \lambda_{it}\frac{\partial Q(\cdot)}{\partial M_{it}} = 0, \tag{4}$$

whereby λ_{it} represents the marginal cost of production at a given level of output, as $\frac{\partial L_{it}}{\partial Q_{it}} = \lambda_{it}$. Rearranging terms in equation (4) and multiplying both sides by $\frac{M_{it}}{Q_{it}}$, yields

$$\frac{\partial Q_{it(\cdot)}}{\partial M_{it}}\frac{M_{it}}{Q_{it}} = \frac{1}{\lambda_{it}}\frac{p^m_{it}M_{it}}{Q_{it}} = \frac{P_{it}}{\lambda_{it}}\frac{p^m_{it}M_{it}}{P_{it}Q_{it}}, \tag{5}$$

where P_{it} is firm's output price.

By defining markup μ_{it} as the ratio of price to marginal cost, i.e., $\mu_{it} = \frac{P_{it}}{\lambda_{it}}$; equation (5) can be rearranged to derive an expression for markup:

$$\mu_{it} = \beta^m_{it}(\alpha^m_{it})^{-1}, \tag{6}$$

where $\beta^m_{it} = \frac{\partial Q_{it(\cdot)}}{\partial M_{it}}\frac{M_{it}}{Q_{it}}$ is the output elasticity of materials and $\alpha^m_{it} = \frac{p^m_{it}M_{it}}{P_{it}Q_{it}}$ is the share of expenditure in intermediate materials in total revenue.

To recover the output elasticity of materials β^m_{it}, the production function exhibited in equation (2) has to be estimated. We assume the production function is Cobb-Douglas in equation (2):

$$q_{it} = \beta_l l_{it} + \beta_m m_{it} + \beta_k k_{it} + \omega_{it} + \epsilon_{it},$$

where ϵ_{it} is idiosyncratic productivity shocks. In the absence of firm-specific output and input prices, we rewrite the production function with deflated variables:[7]

$$\tilde{r}_{it} = \beta_l l_{it} + \beta_m \tilde{m}_{it} + \beta_k \tilde{k}_{it} + \left(p^Q_{it} - \bar{p}^Q_t\right) - \beta_m\left(p^M_t - \bar{p}^M_{it}\right) + \omega_{it} + \epsilon_{it}, \tag{7}$$

where deflated revenue $\tilde{r}_{it}$ equals $q_{it} + p^Q_{it} - \bar{p}^Q_t$. Following the large literature on the estimation of the production function with focus on the endogeneity of ω_{it}, we implement the procedure proposed by Levinsohn and Petrin (2003) and subsequently modified by Ackerberg et al. (2015). With a Cobb-Douglas production function, the output elasticity of materials β^m_{it} is simply equal to the coefficient of materials input. We adjust the share

[7] We use industry-specific deflators constructed using UNIDO INDSTAT data on the basis of their indicators of industry production in current and costant terms.

of expenditure on materials, α_{it}^m to account for productivity shocks to revenue, i.e. $\alpha_{it}^m = \dfrac{exp(m_{it})}{exp(r_{it} - \hat{\epsilon}_{it})}$.

3.3 Markups Dispersion

It is worthwhile to clarify the relationship between markups dispersion and market concentration such as the commonly used Herfindal-Hirshmann Index (HHI). Although both indicators captures the "state of the market", there exist substantial differences between the two. A market with a "single seller" or a firm controlling approximately 50% of the market share is certainly a concentrated market. An etymological interpretation of this market structure suggests that increasing the number firms (or all firms sharing equal market shares) should diminish the concentration.

However, an (un)concentrated market does not provide any information on the price behaviour of firms with respect to their marginal cost. We analyse cases in which firms exercise market power by charging prices greater than marginal cost. In addition, the use of HHI as a measure of market power based on quantity competition can only be applied if products within the defined market are homogeneous. In an economy or market where products are increasing differentiated, HHI falls short as an adequate measure of market power (Bresnahan, 1989).

For the purpose of econometric estimation, it is desirable to numerically compute the dispersion of markups within a market. The Gini coefficient, which ranges from 0 (perfect equality) to 1 (perfect inequality) is one of the most widely used measures of dispersion. Although the Gini index satisfies key inequality measure criteria (mean independence, population size independence, symmetry, and Pigou-Dalton Transfer sensitivity), it is not easily decomposable and suffers statistical testability (Cowell, 2000). While statistical testability can be overcome by using bootstrap techniques to compute confidence intervals, the lack of decomposability is the most significant concern for our application.

To overcome these concerns, a number of general entropy measures which satisfy all necessary and sufficient conditions for inequality measurement have been proposed.[8] The Theil index is a special case of the generalised entropy index and one of the most used measures. Specifically it is derived as:

$$Theil_{mt} = \frac{1}{n_m} \sum_{i=1}^{n_m} \frac{\mu_{imt}}{\bar{\mu}_{mt}} \log\left(\frac{\mu_{imt}}{\bar{\mu}_{mt}}\right), \tag{8}$$

where μ_{imt} is the markup of firm i in market m at time t and $\bar{\mu}_{mt} = \frac{1}{n_m}\sum_{i=1}^{n} \mu_{imt}$ is the average markup of market m at time t.

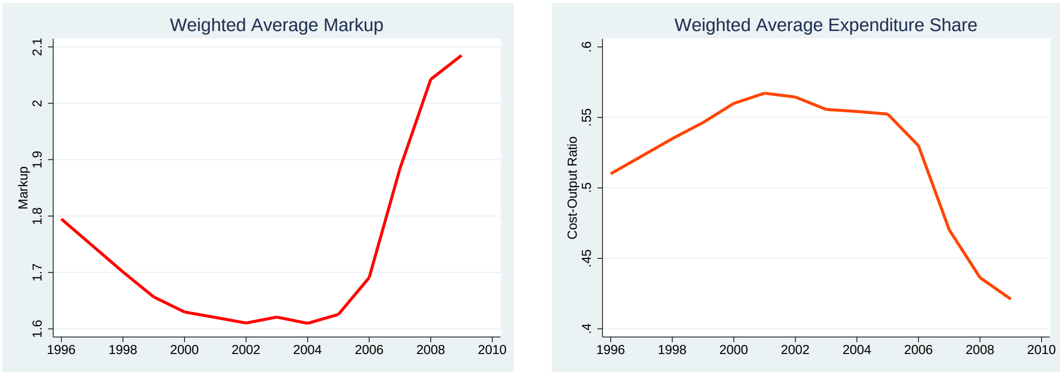
While we claim that markup dispersion is likely to reduce firm entry, the average markup must be sufficiently high to make entry attractive. To account for market shares

[8] The general entropy formula of degree α is given by: $GE(\alpha) = \frac{1}{\alpha^2-\alpha}\left[\frac{1}{n}\sum_{i=1}\left(\frac{y_i}{\bar{y}}\right)^{\alpha} - 1\right]$, when $\alpha \neq 0, 1$.

differences, we compute the weighted average markup for each market at each time period:

$$\bar{\mu}_{mt}^{w} = \frac{\sum_{i=1}^{n} ms_{imt} \cdot \mu_{imt}}{\sum_{i=1}^{n} ms_{imt}} \tag{9}$$

where ms_{imt} is the market share of firm i in market m at time t.



(a)

(b)

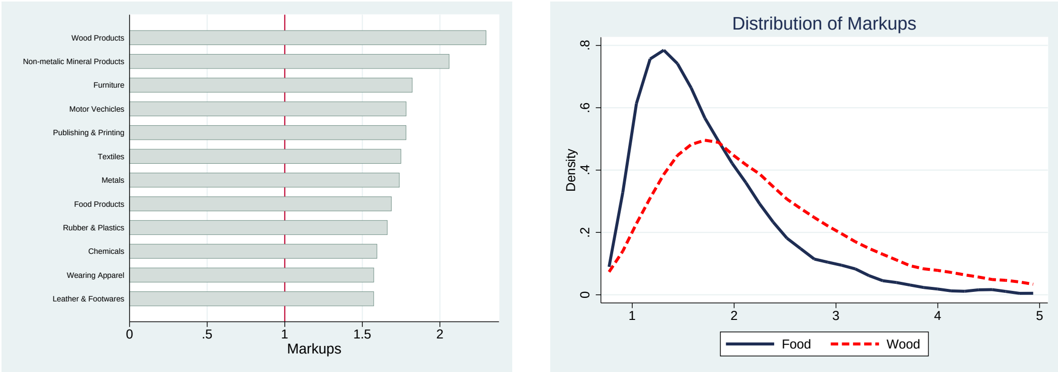
Figure 2: Evolution of Markups and Expenditure Share in Output

Panel (a) of Figure 2 plots average markup weighted by firm-level market share of sales across the economy from 1996 to 2009. The trend in average markup can be grouped into three phases over the period under consideration. In the first phase average markups decreased from approximately 1.80 in 1996 to 1.61 2001 (i.e. a reduction of 10.56%). Markups then remained stable till 2005. The last phase saw an exponential rise in markup from 1.63 in 2005 to 2.09 in 2009 (i.e. an increase of 28.22%).

The exponential increase in markups from 2005 onwards is consistent with the global trend in market power documented in De Loecker and Eeckhout (2018). To single out a potential source of the increase, we plot the trend in expenditure share of materials in total revenue in panel (b) of Figure 2. Whenever markup is reducing, cost-output ratio is increasing and vice versa, suggesting that the recent spike in markups levels is potentially due to decreasing marginal costs.[9]

Unsurprisingly, the average markups levels at the two-digit sector is high for all sectors as shown in panel (a) of Figure 3. While average levels are undoubtedly high, the distribution is uneven within sectors. It can be observed in panel (b) of Figure 3, that the sector with

[9] Drawing insight from related literature, we can speculate on some reasons behind the fall in marginal cost and the rise in market power. On one hand, input tariffs liberalization could lead to lower marginal cost, however, the fall in cost is not completely passed-through to consumers in a form lower prices (see De Loecker et al. (2016) for evidence from India). On the other hand, potential increases in total factor productivity can also lead to lower marginal cost of production for producers.



(a)

(b)

Figure 3: Average Markups and Distribution Heterogeneity for Two-digit Sector

the highest average markups – wood – shows a wider dispersion in the distribution of markups compared to the food sector. The distribution of markups for food and wood sectors in panel (b) of Figure 3 underlines the potential importance of markup dispersion for firm entry. The food and wood sectors are relatively low-technology industries, which may not require a high capital intensity expenditure for potential entrants. However, the two sectors have different entry rates. Table 2, showed that the food sector accounted for 25.30% of the total number of entrants, whilst the wood sector accounted for just 3.26% of total entrants.

Empirical Specification

For exposition clarity we choose the location-sector-wide market as our main domain analysis.[10] To relate entry rate, markups dispersion, and average price-cost margin, reported in equations (1), (8), and (9) respectively, we estimate the following entry equation

$$ER_{wst} = \alpha + \lambda_1 Theil_{wst-1} + \lambda_2 \bar{\mu}^{w}_{wst-1} + \mathbf{Z}'\gamma_{wst-1} + (\delta_w \times \delta_t) + (\delta_w \times \delta_s) + \varepsilon_{wst}, \quad (10)$$

where the dependent variable is the entry rate in woreda w, in 4-digit sector s at time t. Besides markup dispersion and weighted average markup, we account for other factors that may affect entry rate in the control vector $\mathbf{Z}'$. These include the rate of capital intensity, measured as the ratio of capital over labour; and the average firm size. We also include a granular set of fixed effects to account for factors that we cannot otherwise control for in our analysis. In order to account for time variant factors specific to each location that can affect entry decisions of firms, we include a set of time varying fixed effects at the level of each woreda. In addition, we account for industry effect that are specific to each location to control for, among the others, the spatial clustering of specific activities in some locations. Finally, standard errors are clustered at the sector level to account for the

[10] We present estimates at the sector level market in subsequent section as robustness check.

hierarchy nature of the econometric setup.

Notice that our two main variables of interest and the control variables have been lagged one year. This is because changes in the market conditions are less likely to have simultaneous effect on entry rate. Given the sunk cost of entry, prospective entrepreneurs will observe the market conditions before making entry decision. Therefore, the entry decision in a year is likely to be associated with conditions observed in the previous year.

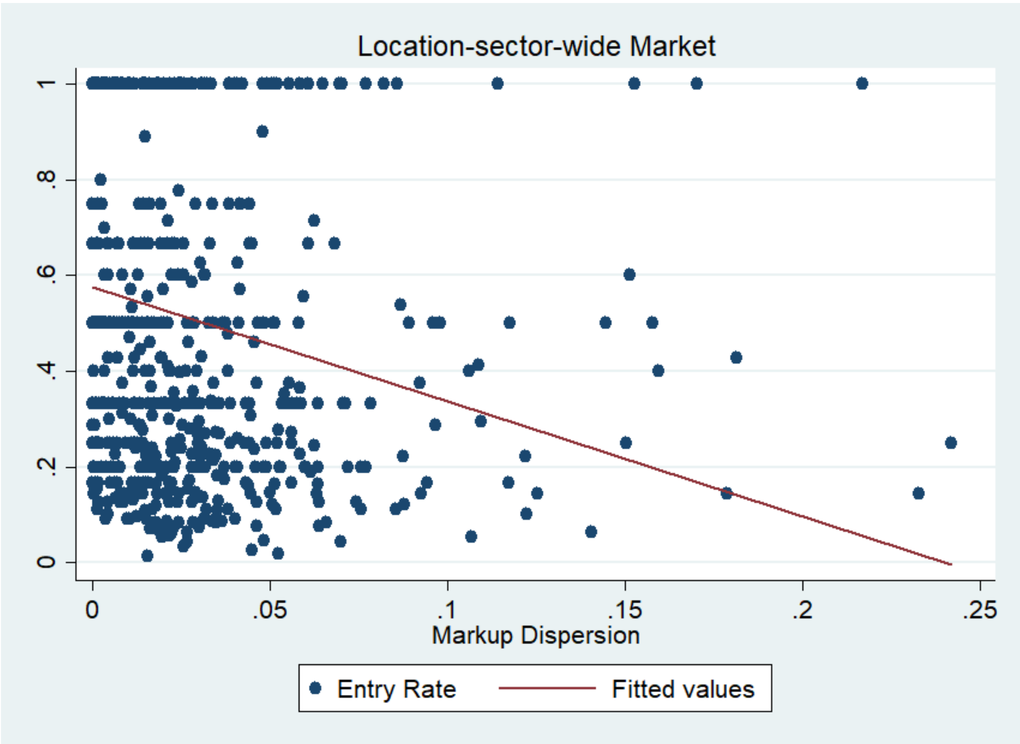


Figure 4: Entry Rate and Markup Dispersion

Figure 4 provides a graphical descriptive on the direction of the relation under exam, by plotting correlation between entry rate and markup dispersion for location-sector level market. The figure suggests a negative correlation between markup dispersion and entry rate.

4 Discussion of Results

Table 3 reports linear estimates of the entry equation 10. Columns (1) and (2) report correlations between entry rate and the two main variables of interest: markups dispersion and weighted average markups level. The coefficient for the Theil index is negative and significant suggesting that an increase in markup dispersion reduces entry rate. On the other hand, weighted markups average is positive and significant, signalling that an increase in price-cost margin encourages firms to enter that market.

We estimate the impact of markup dispersion and average markup over entry rate without control variables (Column (3)). The reported coefficients and their level of statistical

Table 3: Main Results: Entry Equation at Woreda-Sector Level Market

VARIABLES	(1) Entry Rate	(2) Entry Rate	(3) Entry Rate	(4) Entry Rate
$Theil_{wst-1}$	-1.128***		-1.195***	-1.184***
	(0.340)		(0.357)	(0.343)
$\bar{\mu}^{w}_{wst-1}$		0.0474**	0.0521**	0.0600**
		(0.0228)	(0.0234)	(0.0239)
Capital Intensity$_{wst-1}$				-0.0324**
				(0.0153)
Average Firm Size$_{wst-1}$				-0.0138
				(0.0235)
Observations	2,760	2,567	2,567	2,513
R-squared	0.396	0.444	0.445	0.453
Woreda × Year FE	✓	✓	✓	✓
Woreda × Sector FE	✓	✓	✓	✓

Estimates in all columns include location-year fixed effects ($\delta_w \times \delta_t$) and location-sector fixed effects ($\delta_w \times \delta_s$). Robust standard errors in parentheses clustered at 4-digit sector level $***p < 0.01, **p < 0.05, *p < 0.1$

significance are consistent with results in the previous two columns. Results in Column (3) seems to provide strong evidence for our working hypothesis.

Our preferred specification is Column (4) where all the variables are included in the estimation. The results confirm our hypothesis that markup dispersion reduces firm entry. Specifically, to put the effect of markups dispersion on entry rate reported in Column (4) into perspective, an increase in the Theil index by **1 decimal unit** reduces the entry rate by **1.18%**. Recalling that the Theil index varies between 0 and ∞, at zero value (no dispersion) there is no effect, while moving from zero to 0.01 reduces entry rate by 1.18%. For our sample, this implies that an increase in the value of Theil from its average to the $90^{th} - percentile$ of its distribution corresponds to about a 4.4 percentage point reduction in firms' entry.

The results also confirm that high average profit among incumbent firms is an attractive factor for potential entrants. Hence, potential entrants are motivated by the prospect of earning profit, however, the higher the dispersion, the less likely is entry. In the following sections, we test the robustness of our results to different empirical specification methods and to different definitions of our variable of interest. Note that, as a first set of robustness checks in additional specifications we have also tried to account for different sets of fixed effects, for instance by adding to our main specification industry varying effects to account for the potential effects of industry specific shocks, such as industrial policies that have been targeted to some industries. Results remain strongly consistent also in this more computationally intensive setting.[11]

[11] We have also run the same results reported in Table 3 excluding the year 2005, which was characterized by a representative survey of firms, rather than a census. Also in this case, results remain unaffected by

4.1 Robustness: Accounting for Zeroes

Figure 4 shows that the distribution of entry rate is skewed towards the left with some markets reporting zero entry. This calls into question whether the linear estimates in Table 3 are appropriate for our estimation. We therefore apply Poisson Pseudo-Maximum Likelihood (PPML) procedure since it has been observed by Silva and Tenreyro (2006) that the PPML estimator, unlike the linear model, not only represents a natural way to treat zero-value observations but also performs well even with a large number of zeroes and heteroskedastic errors.

Table 4: Entry Equation at Woreda-Sector Level Market: PPML (Marginal Effects)

VARIABLES	(1) Entry Rate	(2) Entry Rate	(3) Entry Rate	(4) Entry Rate
$Theil_{wst-1}$	-1.555***		-1.573***	-1.625***
	(0.551)		(0.595)	(0.608)
$\bar{\mu}^{w}_{wst-1}$		0.0233*	0.0252**	0.0366***
		(0.0133)	(0.0124)	(0.0121)
Capital Intensity$_{wst-1}$				-0.0200**
				(0.00902)
Average Firm Size$_{wst-1}$				-0.0340**
				(0.0150)
Observations	2,826	2,614	2,614	2,564
R-squared	0.213	0.205	0.221	0.233
Woreda FE	✓	✓	✓	✓
Sector FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓

Table report marginal effects of covariates on entry rate computed using the delta method. Estimates in all columns includes year fixed effects, sector fixed effects, and location fixed effects. Robust standard errors in parentheses clustered at 4-digit sector level $***p < 0.01, **p < 0.05, *p < 0.1$

Table 4 reports the marginal effects obtained from non-linear estimation results of equation (10) using PPML. Note that, for computational reasons, we cannot include the full combination of two-dimensional fixed effects as used in Table 3, and so we add location, industry, and year fixed effects separately. Columns (1) - (3) of Table 4 are very similar to those of Table 3 further supporting the relationship between markups and firms' entry. Also our preferred specification in Column (4) produces very similar results (including in the magnitudes of marginal effects) as those obtained with linear estimates, the only difference being that average firm size, which is statistically significant under the non-linear estimation and it was not in the linear case.

We plot the predicted mean entry rate using estimates from Column (4) of Table 4. Starting with a very low level of dispersion, where the Theil index equals 0.01, we predict an average entry rate of 21% across each location sector market. At the smallest

the cut in the data. All these results are not reported for reasons of space but available upon requests.

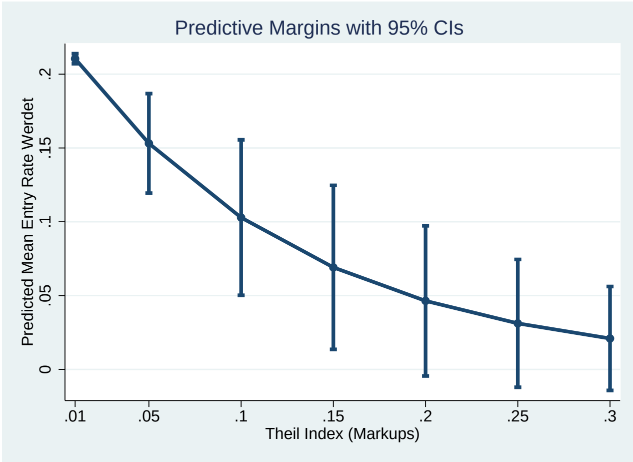


Figure 5: Predicted Entry Rate and Markup Dispersion

level of Theil index, the projected confidence interval is also the smallest. The confidence interval gradually increases till the Theil index equals 0.15, when it starts to decrease. Additionally, the projected confidence intervals show that beyond a Theil index of 0.20, entry rate can be negative, which means there is the likelihood that some incumbent firms may exit the market in response to increase in markup dispersion.

The predicted mean entry rates plotted in Figure 5 are very similar to those obtained from the linear estimator. For example, the predicted mean entry rate from the linear at a Theil index value of 0.05 is 13.28%, while that of the non-linear estimate is 15.31%.[12]

4.2 Robustness: Alternative Measures of Dispersion

Let us now test the robustness of our preferred measure of markups dispersion against other measures. We chose two commonly used entropy measures: the mean log deviation and the coefficient of variation. The mean log deviation is expressed as:

$$MLD_{wst} = \frac{1}{n_{wst}} \sum_{i=1}^{n_{wst}} log \frac{\bar{\mu}_{wst}}{\mu_{iwst}},$$

while the coefficient of variation is:

$$CV_{wst} = \frac{1}{\bar{\mu}_{wst}} \left[\frac{1}{n_{wst}} \sum_{i=1}^{n_{wst}} (\mu_{iwst} - \bar{\mu}_{wst})^2 \right]^{1/2}.$$

These measures are special cases of the generalised entropy of degree zero and two respectively.

Table 5 reports linear and non-linear estimates of the main specification using the alternative measures of dispersion. Both measures are lagged at time $t-1$ as done with

[12]The difference in the predicted mean entry rate is possibly due to the structure of fixed effects. However, the correlation coefficient between between predicted mean entry rates from linear and non-linear estimates is 0.9541.

all variables. Results are consistent with estimates obtained in Tables 3 and 4. This suggests that the results are not driven the choice of a particular measure of dispersion.

Table 5: Entry Equation with alternative Measures of Dispersion

	LINEAR		NON-LINEAR	
VARIABLES	(1)	(2)	(3)	(4)
Coefficient of Variation$_{wst-1}$	-0.530***		-0.473***	
	(0.0958)		(0.133)	
Mean Log Deviation$_{wst-1}$		-1.155***		-1.623**
		(0.368)		(0.651)
$\bar{\mu}^{w}_{wst-1}$	0.0594**	0.0599**	0.0326***	0.0366***
	(0.0233)	(0.0240)	(0.0118)	(0.0122)
Capital Intensity$_{wst-1}$	-0.0299**	-0.0325**	-0.0188**	-0.0200**
	(0.0146)	(0.0153)	(0.00872)	(0.00897)
Average Firm Size$_{wst-1}$	-0.0173	-0.0139	-0.0349**	-0.0341**
	(0.0236)	(0.0236)	(0.0145)	(0.0151)
Observations	2,513	2,513	2,564	2,564
R-squared	0.458	0.453	0.251	0.232
Woreda × Year FE	✓	✓		
Woreda × Sector FE	✓	✓		
Woreda FE			✓	✓
Sector FE			✓	✓
Year FE			✓	✓

Linear estimates columns (1) and (2) include location-year fixed effects ($\delta_w \times \delta_t$) and location-sector fixed effects ($\delta_w \times \delta_s$), while non-linear estimates in columns (3) and (4) includes year fixed effects, sector fixed effects, and location fixed effects.
Robust standard errors in parentheses clustered at 4-digit sector level $***p < 0.01, **p < 0.05, *p < 0.1$.
Non-linear estimates in columns (3) and (4) are marginal effects (not estimated coefficients)obtained using delta method.

4.3 Robustness: Entry at Sector Level Market

In our last robustness check, we show that results obtained at the location-sector-wide level are consistent with a sector-level definition of market when we remove geographic element. Tables 6 and 7 present linear and non-linear estimates of the main specification as in Tables 3 and 4 respectively.[13] Our preferred specification in Column (4) confirms that markup dispersion reduces entry rate while average markup has positive impact on entry.

The only difference is the level of statistical significance of the control variables. The general picture that emerged from the analysis at the sector level is consistent with those at the location-sector level.

[13] All robustness checks were also performed at the sector level. Results were consistent with those obtained at location-sector level. They are available on request.

Table 6: Entry Equation at Sector Level Market

VARIABLES	(1) Entry Rate	(2) Entry Rate	(3) Entry Rate	(4) Entry Rate
$Theil_{st-1}$	-0.922*		-0.782**	-0.755**
	(0.539)		(0.366)	(0.366)
$\bar{\mu}^{w}_{st-1}$		0.0801**	0.0923**	0.0931**
		(0.0401)	(0.0429)	(0.0436)
Capital Intensity$_{st-1}$				-0.0313
				(0.0205)
Average Firm Size$_{st-1}$				0.0373
				(0.0402)
Observations	552	544	544	544
R-squared	0.161	0.338	0.344	0.350
Woreda × Year FE	✓	✓	✓	✓
Woreda × Sector FE	✓	✓	✓	✓

Estimates in all columns include sector fixed effects (δ_s) and year fixed effects (δ_t). Robust standard errors in parentheses clustered at 4-digit sector level $***p < 0.01, **p < 0.05, *p < 0.1$

Table 7: Entry Equation at Sector Level Market: PPML (Marginal Effects)

VARIABLES	(1) Entry Rate	(2) Entry Rate	(3) Entry Rate	(4) Entry Rate
$Theil_{st-1}$	-1.295**		-0.798***	-0.807***
	(0.619)		(0.265)	(0.263)
$\bar{\mu}^{w}_{st-1}$		0.0561***	0.0633***	0.0669***
		(0.0200)	(0.0187)	(0.0190)
Capital Intensity$_{st-1}$				-0.000149
				(0.00186)
Average Firm Size$_{st-1}$				0.0346
				(0.0378)
Observations	546	538	538	538
R-squared	0.301	0.386	0.401	0.402
Woreda FE	✓	✓	✓	✓
Sector FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓

Estimates in all columns includes year fixed effects, and sector fixed effects. Robust standard errors in parentheses clustered at 4-digit sector level $***p < 0.01, **p < 0.05, *p < 0.1$.

5 Extensions

We now extend our analysis to account for some of the potential heterogeneity in the relation examined, as well as to provide some evidence on the extent to which, by affecting business dynamics, micro distortions can negatively affect the growth potential of the Ethiopian manufacturing sector.

5.1 Heterogeneity: Does Size Matter?

The relationship between markup dispersion and entry rate seems to suggest that firms are risk-averse in their entry decision. However, one can argue that, so far as firms are profit-maximizers and expected profit is positive, firms ought to be risk-neutral. We distinguish between entry by small, medium, and large firms to assess whether the results remain stable.

Based on the cumulative distribution of the data, we define firms small if they have less than 19 employees; medium between 20 and 99 employees; large with more than 100 employees. We re-estimate our main model separating these three groups. The main difference being only that the nominator of our dependent variable is now modified to account for the number of firms entering the market based on their size group as defined above.

Table 8: Entry by Firm Sizes

VARIABLES	Small (1)	Medium (2)	Large (3)
$Theil_{wst-1}$	-0.954***	-0.184	-0.0519
	(0.250)	(0.229)	(0.0660)
$\bar{\mu}^{w}_{wst-1}$	0.0312*	0.0261	0.00111
	(0.0178)	(0.0161)	(0.00480)
Capital Intensity	-0.0176	-0.0136**	-0.00293
	(0.0129)	(0.00618)	(0.00358)
Average Firm Size	-0.0914***	-0.00461	0.0143
	(0.0164)	(0.00832)	(0.0127)
Observations	2,486	2,486	2,486
R-squared	0.496	0.336	0.340
Woreda × Year FE	✓	✓	✓
Woreda × Sector FE	✓	✓	✓

Estimates in all columns include location-year fixed effects ($\delta_w \times \delta_t$) and location-sector fixed effects ($\delta_w \times \delta_s$). Robust standard errors in parentheses clustered at 4-digit sector level $***p < 0.01, **p < 0.05, *p < 0.1$

Table 8 reports the results and shows that smaller firms are most likely not to enter the market in the presence of high markup dispersion. On the other hand, medium and large firms are likely to be risk-neutral, i.e. the dispersion of markups does not seem to have effect on their entry decision. In Table 2 we showed that, smaller firms accounted for 66.20% of the total number of entrants, while Shiferaw and Bedi (2013) evidenced that small firms create the largest share of new jobs in Ethiopia. Hence, our results suggest that the potential impact on the economy in terms of employment creation is likely to be high.

5.2 The Role of Policies

Having detected a nexus between market distortions and entry, we now try to argue whether it is possible to identify some factors (especially policy related ones) that can moderate this relationship and attenuate its negative impact on the economy. Considering our focus on distortions related to the existence of market power, factors that increase competition are likely to affect this relationship. In the specific context of our analysis, two natural candidates are the recent efforts made by Ethiopian authorities to spur the economy by means of trade liberalisation and infrastructural development policies.[14]

The pro-competitive effects of trade liberalisations are well-known and have been robustly tested by several studies, including on Ethiopia (Bigsten et al., 2016). Most important for our purpose, however, by fostering competition, trade liberalization can reduce markup dispersion, as recently shown in an empirical contribution on China (Lu and Yu, 2015). Similarly, recent investments in the construction and improvement of road infrastructures across the country have led to a significant increase in entry of new firms, spurring local competition and decreasing the cost of transport (Shiferaw et al., 2015).

In what follows, we interact our variable of interest with two variables constructed as follows: (1) the level of output tariff computed at each 4-digit ISIC industry and covering all the years in our sample (sourced by World Bank's WITS database); and (2) a measure of travel distance computed by means of GIS service analysis tools, and measuring the distance (in km) that can be run in 1 hour departing from the centre of each geographic node.[15] Note that in this case the coefficient of the infrastructures cannot be estimated, since is it perfectly identified in the location varying $(\delta_w \times \delta_t)$ fixed effects. In both cases results show that the coefficient of markup dispersion loses its significance, either introduced independently and in the interaction term, supporting the assumptions that measures stimulating competition can represent an antidote to the potential negative effects of misallocation on firms' growth.

5.3 Effect on Aggregate Indicators

If firm entry can increase aggregate productivity through selection mechanism whereby new entrants have higher productivity compared to firms exiting the market, then results shown in the previous sections have a wider impact on the economy.[16] To assess this impact, we estimate three measures of markup dispersion on aggregate total factor productivity (TFP) growth and employment growth at the location-sector level market. Table 9 reports results of our estimates. All three measures of markup dispersion negatively and significantly affect TFP and employment growth.

[14]Starting in 1993, and up to 2003, Ethiopia undertook six waves of liberalization leading to a significant reduction in applied tariffs in all sectors of the economy. In addition, starting in 1997, the Road Sector Development Plan lead to high investments in the ri-qualification and the construction of road infrastructures all over the country.

[15]Note that this measure varies over time and allows to capture local improvements in infrastructures.

[16]We do find that entry rate increases productivity and employment growth in our data. Estimates are available on request.

Table 9: Markup Dispersion and Aggregate Indicators

	TFP Growth			Employment Growth		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Theil	-3.093***			-2.438**		
	(0.929)			(1.048)		
Mean Log Deviation		-3.173***			-2.358**	
		(0.927)			(1.076)	
Coefficient of Variation			-1.192***			-0.741***
			(0.321)			(0.232)
Observations	2,664	2,664	2,572	2,733	2,733	2,572
R-squared	0.270	0.270	0.271	0.252	0.252	0.242
Woreda × Year FE	✓	✓	✓	✓	✓	✓
Woreda × Sector FE	✓	✓	✓	✓	✓	✓

All three measures of markups dispersion are lagged at time $t-1$.
Estimates in all columns include location-year fixed effects ($\delta_w \times \delta_t$) and location-sector fixed effects ($\delta_w \times \delta_s$). Robust standard errors in parentheses clustered at 4-digit sector level $***p < 0.01, **p < 0.05, *p < 0.1$

6 Conclusions

Firms' dynamics, and especially entry, represents an important factor to explain a country capacity to increase employment and productivity, among others. This is especially true in developing countries, where however a dynamic private sector - especially within the manufacturing - is hardly flourishing. Understanding which factors hampers the entry of new firms is therefore important in both academic and policy circles. In this paper we try to complement existing literature on firms entry dynamics by showing that micro-level market distortions can deter firm entry, especially small firms, even in the presence of high expected profits. We do this by computing the dispersion of markups within the same industry and local market using annual census data of Ethiopian manufactures from 1996 to 2009.

Our results show that an increase in markup dispersion, measured by the Theil index, is related to a statistically and economically significant drop in the entry rate. These results are more likely to concern risk-adverse small firms and are fairly robust to different specifications and methods.

In some extensions of our analysis we find that (i) market distortions caused by markup dispersion are related to a statistically significant drop in aggregate TFP and employment growth; (ii) policies fostering competition can act as deterrent and downsize the entry barriers created by market distortions if properly targeted.

Overall, while we believe our contribution highlights the importance of micro level market distortions to the development of the private sector in rapidly growing developing countries, there are some limitations that we hope to address in future research. One important limitation is that although our sample is representative of manufacturing firms in Ethiopia, it does not include the smallest (as well as the informal) firms that are a majority in the country. Understanding whether market distortions like the one we examined affect their entry pattern, growth and transition of informal firms to formality would be important to address the potential scale of the issue examined.

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A Appendix

Table A.1: Summary Statistics

VARIABLES	N	mean	sd	min	max
Entry Rate	3,034	0.192	0.555	0	9
Theil	3,777	0.0256	0.0306	0	0.310
$\bar{\mu}^w$	3,489	1.825	0.715	0.864	7.263
Capital Intensity	3,678	30.25	2,381	0	275,947
Average Firm Size	3,731	88.86	210.7	0	4,785

B Appendix

Table B.2: Policy Variables and Entry Rates

VARIABLES	(1) Entry Rate	(2) Entry Rate	(3) Entry Rate
$Theil_{wst-1}$	-1.632	-0.154	0.217
	(1.372)	(2.939)	(7.874)
Output Tariffs$_{st-1}$	0.00343		
	(0.00339)		
$Theil_{wst-1}$ × Output Tariffs$_{st-1}$	0.0179		
	(0.0462)		
$\bar{\mu}^w_{wst-1}$	0.0588**	0.0674**	0.0673**
	(0.0243)	(0.0265)	(0.0266)
Capital Intensity	-0.0305**	-0.0460**	-0.0461**
	(0.0151)	(0.0197)	(0.0197)
Average Firm Size	-0.0158	-0.0356	-0.0355
	(0.0245)	(0.0268)	(0.0270)
Theil Travel Distance		-0.130	
		(0.366)	
Theil Area			-0.172
			(0.974)
Observations	2,504	2,308	2,308
R-squared	0.454	0.462	0.462

Estimates in all columns include location-year fixed effects ($\delta_w \times \delta_t$) and location-sector fixed effects ($\delta_w \times \delta_s$). Robust standard errors in parentheses clustered at 4-digit sector level $***p < 0.01, **p < 0.05, *p < 0.1$