Markups Dispersion and Firm Entry Dynamics: Evidence from Ethiopia

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Abstract

This paper examines how micro-level distortions affect structural transformation by creating entry barriers. We show that while average price-cost margin induces firm entry, a larger dispersion of markups deters new firms from entering the market thereby disrupting the process of new enterprise creation. We exploit rich information from Ethiopian annual census firm-level dataset to estimate markups and its dispersion at sector and location-sector wide levels. Results show higher markups dispersion significantly reduces entry rate into a market even in the presence of expected positive average markups. Extension of our framework shows that markup dispersion reduces other aggregate indicators such as total factor productivity growth and employment growth.

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1 Introduction

New enterprises are the engine of economic growth. They enhance the creative destruction processes in both developed and developing countries, whereby non-performing firms are replaced by new ones (Bartelsman et al., 2004). This process can spur aggregate productivity growth if resources move from exiting least productive firms to more productive firms (Aw et al., 2001). In some case, the entry of new firms can stimulate incumbents to innovate and become more efficient (Aghion et al., 2009). Moreover, new entrants dissipates monopoly rents by competing away excess profits enjoyed by incumbents (Geroski, 1995).

The role of new firms to accelerate economic growth is particularly prominent for developing countries, whereas new firms are often associated with job creation and productivity growth. Specific to our country of analysis, Shiferaw and Bedi (2013) show that firm entry accounts for at least fifty percent of new manufacturing jobs in Ethiopia. In addition, 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.

Despite the potentials 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 then prevents 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 ought to increase firm entry, a puzzling result that emerged from the literature showed that entry seems to react slowly to high profits (Bresnahan and Reiss, 1987; Geroski, 1995). Another wave of literature postulated that low firm entry can be attributed to business environment, excessive regulation, and institutional challenges (Klapper et al., 2006; Klapper and Richmond, 2011; Bruno et al., 2013).

This paper contributes to both strands of the literature by showing that micro-level distortions can deter firm entry even in the presence of high expected profits and absence of government regulation. First, the core of our argument rest on partial-equilibrium analysis, which shows that when producers raises prices above marginal cost it is always a distortion from first-best equilibrium. Secondly, as shown by Lerner (1934), in order to get the true state of sector-wide or economy-wide distortions, it is not the sum of producer degree of monopoly power (price-cost margin), but rather their *deviations*. This means the sector-wide and/or economy-wide distortions only come from the *dispersion* of market power across firms and/or industry (Epifani and Gancia, 2011).

Our first aim is to study how the dispersion of markup (a measure of market power) distorts the formation of new enterprises. In view of the above we ask what is the effect of a percentage point increase of markups dispersion on firm entry? We extend the study to analyse the effect of markups dispersion on firm's foreign market entry. Our second goal is to provide a preview of the social loss of markups dispersion by examining the effect of markups dispersion on aggregate productivity and employment growth.

2 Data

We investigate our research question by exploiting rich 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 covers all firms producing in the manufacturing, using electricity in their production process and engaging at least 10 persons (including working owners) in their activity. All firms need to comply with CSA and the census is therefore representative of formal firms in the country. For our analysis, we use information for period covering the years 1996 to 2009.[1] Information included 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.

Table 1: Yearly Firm Turnover

Year	Entrants	Exits	Net Entry	Net Incumbents
1996				623
1998	287	167	120	743
1999	121	105	16	759
2000	154	148	6	765
2001	113	91	22	787
2002	242	100	142	929
2003	144	118	26	955
2004	190	51	139	1094
2005	96	108	-12	1082
2006	201	75	126	1208
2007	461	224	237	1445
2008	431	111	320	1765
2009	655	472	183	1948
Total	3095	1770	1325	
Average	222	148	152	

It is relevant for the purposes of our analysis to show in 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, their number raised significantly at the end of the period considered, reaching about 2000 units by 2009. Data on the patterns of entry and exit, show that entries outweighed exits, especially during the more recent years, in correspondence to sustained economic growth, which interested also the manufacturing sector (Moller, 2015).

[1] 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 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.

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 spread across all sectors but rather concentrated in few sectors.

3 Methodology

It is worthwhile to clarify whether markups dispersion is the same as a measure of market concentration such as the commonly used Herfindal-Hirshmann index. 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, (un)concentrated market does not provide any information on the price behaviour of firms with respect to their marginal cost. We are concerned in scenarios in which firms exercise market power by charging prices greater than marginal cost. Moreover, deviations of firms market power constitute misallocation of resources, which has economic and social cost, such as entry rate, productivity growth, and employment growth.

Epifani and Gancia (2011) developed a theoretical model, which shows that markup heterogeneity will always lead to *intersectoral misallocation* either with restricted or free entry.[2] In a nutshell, when the number of firms is exogenously fixed – through government regulations or business environment and institutional challenges typically in developing countries – a necessary and sufficient condition to achieve first best allocation requires markups to be identical across all industries. Whenever markup becomes heterogeneous, leading to the violation of the above condition, this will lead to intersectoral misallocation whereby industries with below-average markups overproduce, while industries with above-average markup will underproduce.[3]

When the entry restriction condition is removed, markup heterogeneity will lead to intersectoral misallocation. However, the overall welfare effect depends on the elasticity of substitution and consumers' preference for variety. The key result of Epifani and Gancia (2011) is that so 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 industries and within industries, the cost of misallocation is likely to be high in economies or sectors with a low elasticity of substitution.[4]

3.1 Measuring Entry Rates and Entry Patterns

Our dataset covers the universe of Ethiopian formal manufacturing firms across the country. Given the topography of Ethiopia, assuming transporting products from one end of the country to the other end involves a high cost, producers may take advantage of their location to adopt monopolistic behaviour. Under these conditions and all other things being equal, the price of the same product will vary from location to location. Therefore, location (and related transport costs) could represent a key factor to determine the pricing behaviour of producers of similar goods, as demonstrated with very detailed information on the pricing of consumption goods in Ethiopia by Atkin and Donaldson (2015). To account for this, we distinguish between two levels of market definition to derive entry measures and subsequent empirical analysis.

The first level of market is 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. Using Ethiopia administrative division, we define a second level of market, which comprises the set of firms in a given 4-digit sectors within each administrative district.[5]

Hence, the first level market $m^1 = (s, t)$ varies at sector and time dimension, while the second level market $m^2 = (w, s, t)$ varies at district, sector, and time dimension. To measure entry rate in each market, we proceed similar to Dunne et al. (1988), let:
$NE_{m^i t}$ = number of firms that enter market m^i between census years $t-1$ and t;
$NT_{m^i t}$ = total number of firms in market m^i between census years $t-1$ and t . This

[2]Epifani and Gancia (2011) provides evidence that shows that markup heterogeneity and markup dispersion has increased overtime.

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

[4]Not surprisingly, Figure 4 (p.5) in Epifani and Gancia (2011), shows that markup dispersion is correlated with GDP per capita, where developing typically exhibits high levels of markup dispersion

[5]Districts or Wereda (in Amharic) is the third-level administrative division in Ethiopia after the federal and regional levels. We do not observe firms changing location over time.

includes number of new firms.

Then entry rate into a market m^i is:

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

Notice that the denominator is lagged at year $t-1$.

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.

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. While labour can be considered as a variable input, it can be subjected to specific regulations and constraints. Hence, we consider intermediate materials as the versatile of the arguments 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 the following expression:

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

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 given as

$$\mu_{it} = \beta_{it}^m (\alpha_{it}^m)^{-1}, \tag{6}$$

where $\beta_{it}^m = \frac{\partial Q_{it(\cdot)}}{\partial M_{it}} \frac{M_{it}}{Q_{it}}$ is the output elasticity of materials and $\alpha_{it}^m = \frac{p_{it}^m M_{it}}{P_{it} Q_{it}}$ is the share of expenditure in intermediate materials in total revenue.

To recover the output elasticity of materials β_{it}^m, the production function exhibited in equation (2) ought to be estimated. We assume a Cobb-Douglas functional form underlying the production function 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:

$$\tilde{r}_{it} = \beta_l l_{it} + \beta_m \tilde{m}_{it} + \beta_k \tilde{k}_{it} + \left(p_{it}^Q - \bar{p}_t^Q\right) - \beta_m \left(p_t^M - \bar{p}_{it}^M\right) + \omega_{it} + \epsilon_{it}, \tag{7}$$

where deflated revenue $\tilde{r}_{it}$ equals $q_{it} + p_{it}^Q - \bar{p}_t^Q$. 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_{it}^m is simply equal to the coefficient of materials input. We adjust the share 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

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 decomposability criteria 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.[6]. The most often used of these measures, the Theil index, is a special case of the generalised entropy index. Specifically it is derived as:

[6]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 $\alpha \neq 0, 1$.

$$Theil_{m^it} = \frac{1}{n_{m^i}} \sum_{i=1}^{n_{m^i}} \frac{\mu_{im^it}}{\bar{\mu}_{m^it}} \log\left(\frac{\mu_{im^it}}{\bar{\mu}_{m^it}}\right), \qquad m^i = 1, 2 \tag{8}$$

where μ_{im^it} is the markup of firm i in market m^i at time t and $\bar{\mu}_{m^it} = \frac{1}{n^i_m} \sum_{i=1}^{n} \mu_{im^it}$ is the average markup of market m^i at time t; with markets defined at sector-wide and location-sector-wide levels.

While we hypothesis 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 differences, we compute the weighted average markup for each market at each time period. The weighted average markup in each market is given by:

$$\bar{\mu}^w_{m^it} = \frac{\sum_{i=1}^{n} ms_{im^it} \cdot \mu_{im^it}}{\sum_{i=1}^{n} ms_{im^it}} \tag{9}$$

where ms_{im^it} is the market share of firm i in market i at time t.

Empirical Specification

For exposition clarity we choose the location-sector-wide market as our main domain analysis.[7] 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

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

where the dependent variable is the entry rate in wereda (district location) w, in 4-digit sector s at time t. Besides markup dispersion and weighted average markup, which we have stated our hypothesis of correlation, we account for other factors that may affect entry rate in the control vector $\mathbf{Z}'$. This include the rate of capital intensity, measured as the ratio of capital over labour; and the average firm size. In order to account for time variant factors specific to each location that can affect entry decisions of firms we include a set of location-year fixed effects. In addition, we account for industry specific effect to correct for any potential confounding factor affecting the relations under exam that can be industry-specific. Finally, standard errors are clustered at the location-sector level to account for the 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. However, given the sunk cost of entry, prospective entrepreneurs will observe the market conditions before making entry decision. Therefore, the entry decision in the year is associated with conditions observed in the previous year.

Figure 1 provides a first evidence on the direction of the relation under exam, by plot-

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

ting correlation between entry rate and markup dispersion for sector level market and location-sector level market, respectively. The figures show in both cases a negative correlation between markup dispersion and entry rate. Moreover, the slope of the correlation is steeper in the location-sector market than in the sector-wide market.

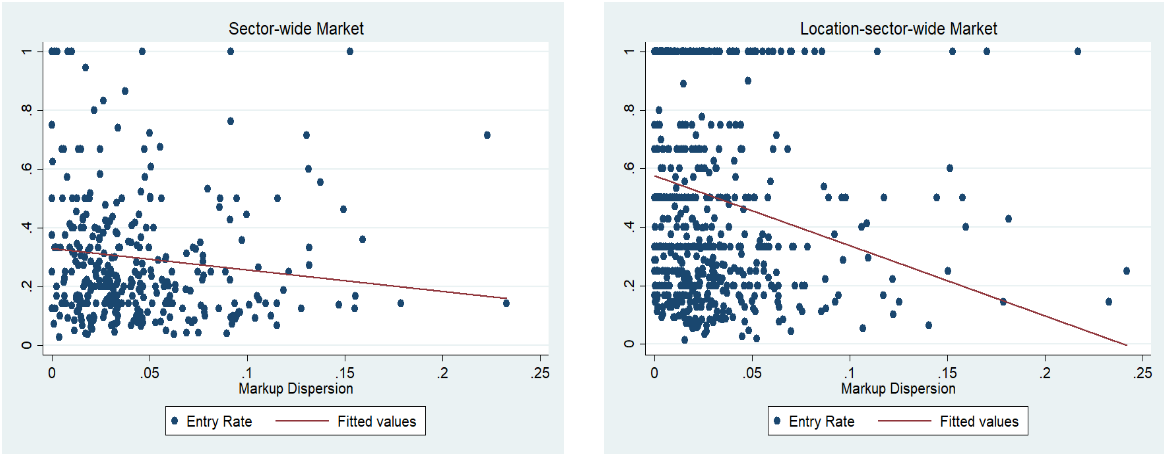

Figure 1: Entry Rate and Markup Dispersion

4 Discussion of Results

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

Having established the correlations between markup dispersion and average price-cost margin, we can further determine if the results are consistent by adding a number of control variables. In Column (3), we estimate markup dispersion and average markup over entry rate without control variables. The reported coefficients and their level of statistical significance are consistent with results reported in the previous two columns. With a marginal increase in the regression fit, results in Column (3) appears to offer strong evidence for our working hypothesis.

Columns (4) and (5) estimate our main variable of interest with the control variables separately to test for consistency of the results. In Column (4), the sign and level of statistical significance between markup dispersion and entry rate remain unchanged. In addition, the coefficient for capital intensity is negative and significant, confirming textbook theory that capital intensity constitute an entry barrier. The fact that both capital intensity and markup dispersion are negative and significant dispels any concern that Theil index might have picked-up other measures of entry barriers. Adding capital intensity and average firm size to price-cost margin in Column (5) does not change the result reported

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

VARIABLES	(1) entry rate	(2) entry rate	(3) entry rate	(4) entry rate	(5) entry rate	(6) entry rate
$Theil_{wst-1}$	-1.149***		-1.202***	-1.091***		-1.184***
	(0.333)		(0.351)	(0.329)		(0.343)
$\bar{\mu}^{w}_{wst-1}$		0.0494**	0.0539**		0.0583**	0.0626**
		(0.0230)	(0.0235)		(0.0230)	(0.0235)
Capital Intensity				-0.0390**	-0.0365**	-0.0353**
				(0.0168)	(0.0157)	(0.0151)
Average Firm Size				-0.0226	-0.0158	-0.0167
				(0.0295)	(0.0238)	(0.0238)
Observations	2,702	2,514	2,514	2,621	2,461	2,461
R-squared	0.399	0.448	0.450	0.419	0.456	0.458
Wereda × Year FE	Y	Y	Y	Y	Y	Y
Wereda × Sector FE	Y	Y	Y	Y	Y	Y

Robust standard errors in parentheses clustered at 4-digit sector $***p < 0.01, **p < 0.05, *p < 0.1$

in Column (2).

Our preferred specification is Column (6) where all variables are present in the estimation. The result confirm our hypothesis that markup dispersion reduces firm entry. Specifically, an increase in markup dispersion by **(insert xx%)** percentage point reduces entry rate by **(insert xx%)**. The result 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 to enter the market, however, the higher the dispersion the less likely entry will take place.

4.1 Robustness: Accounting for Zeroes

A look at Figure 1 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 is appropriate for our estimation. To address this concern we apply, Poison Pseudo-Maximum Likelihood (PPML) procedure introduced by Silva and Tenreyro (2006).

Table 4 report non-linear estimation results of equation (10) using poison pseudo-maximum likelihood. Columns (1) - (3) show very similar results for the relationship between entry rate, markup dispersion, and average markup as those in those in Columns (1) - (3) of Table 3. This further fortifies the relationship between markups and firm entry. Our preferred specification in Column (6) produces similar results as those obtained with linear estimates, with the only difference being average firm size, which is statistically significant under the non-linear estimation.

Table 4: Entry Equation at Werdet-Sector Level Market: PPML

VARIABLES	(1) entry rate	(2) entry rate	(3) entry rate	(4) entry rate	(5) entry rate	(6) entry rate
$Theil_{wst-1}$	-7.543***		-7.689***	-7.816***		-7.954***
	(2.670)		(2.907)	(2.700)		(2.978)
$\bar{\mu}^{w}_{wst-1}$		0.114*	0.123**		0.176***	0.179***
		(0.0652)	(0.0606)		(0.0644)	(0.0594)
Capital Intensity				-0.0646	-0.106**	-0.0977**
				(0.0426)	(0.0482)	(0.0441)
Average Firm Size				-0.152**	-0.173**	-0.167**
				(0.0720)	(0.0773)	(0.0733)
Constant	-2.510***	-2.488***	-2.608***	-2.539***	-2.389***	-2.557***
	(0.322)	(0.359)	(0.360)	(0.470)	(0.402)	(0.396)
Observations	2,826	2,614	2,614	2,737	2,564	2,564
R-squared	0.213	0.205	0.221	0.224	0.214	0.233
Year FE	Y	Y	Y	Y	Y	Y
Sector FE	Y	Y	Y	Y	Y	Y
Wereda FE	Y	Y	Y	Y	Y	Y

Robust standard errors in parentheses $***p < 0.01, **p < 0.05, *p < 0.1$

4.2 Robustness: Accounting for Age of Entry

One could argue that administrative procedures in the collection of the dataset may not be aligned with when a firm entered the market and when a firm entered the census database. Moreover, considering the prevalence of informality in developing economies, a firm may start operation for a period of time before undertaking official registration. To address these concerns we restrict the numerator in equation (1) by considering only the number of new firms less than three years old. By considering entry and firm age simultaneously, we do away with scenarios described above.

Table 5 reports linear and non-linear estimates of entry and firm age. Columns (1) and (2) are the same specifications as Columns (3) and (6) of the main results in Table 3. With the obvious differences in the magnitude of the coefficient, the direction of relationship is consistent with that of the main results. With regards to non-linear estimates, the results confirm the relationship although the coefficient for average price-cost margin is not statistically significant.[8]

4.3 Robustness: Are all Firms Risk-Adverse?

The relationship between markup dispersion and entry rate suggest that firms are risk-adverse in their entry decision. However, one can argue that, so far as firms are profit-

[8]The reported p-value for the coefficient of average markups in Columns (3) and (4) is 0.15 and 0.11 respectively.

Table 5: Entry Equation Accounting for Age of Entry

	LINEAR		NON-LINEAR	
VARIABLES	(1)	(2)	(3)	(4)
$Theil_{wst-1}$	-0.626**	-0.625**	-8.684*	-8.990*
	(0.266)	(0.253)	(4.838)	(4.995)
$\bar{\mu}^{w}_{wst-1}$	0.0304*	0.0346**	0.120	0.154
	(0.0165)	(0.0164)	(0.0869)	(0.0977)
Capital Intensity		-0.0244*		-0.111**
		(0.0127)		(0.0447)
Average Firm Size		-0.0260		-0.0687
		(0.0190)		(0.0769)
Constant			-3.624***	-3.028***
			(0.677)	(0.734)
Observations	2,567	2,486	2,324	2,275
R-squared	0.443	0.454	0.249	0.253
Year FE	Y	Y	Y	Y
Sector FE	Y	Y	Y	Y
Wereda FE	Y	Y	Y	Y

Robust standard errors in parentheses $***p < 0.01, **p < 0.05, *p < 0.1$

maximizers and expected profit is positive, then firms ought to be risk-neutral. We distinguish between entry by small, medium, and large firms to access whether the results remain stable.

Based on the cumulative distribution of the data, we define small firms are those with less than 19 employees; medium firms with employees between 20 and 99, while large firms have more than 100 employees. The nominator of our dependent variable is now modified to account for the number of firms entering the market based on their size as defined above. Table 6 report results of the estimates.

As it can be noted in Table 6 small firms are most likely to decide against entering into market in the presence of high markup dispersion. On the other hand, medium and large firms are likely to be risk-neutral whereby the dispersion of markups has no effect on their entry decision. However, considering that the a high proportion of entrants are small firms, the economy looses a large share of potential employment taking into account the contribution of small firms in job creation.

4.4 Robustness: Alternative Measures of Dispersion

In this subsection we 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

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

Table 6: 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
Wereda × Year FE	Y	Y	Y
Wereda × Sector FE	Y	Y	Y

Robust standard errors in parentheses $***p < 0.01, **p < 0.05, *p < 0.1$

while the coefficient of variation is expressed as

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

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

Table 7 report 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 all variables. Results are consistent with the main estimates, confirming the robustness of our estimates.

4.5 Robustness: Entry at Sector Level Market

In our last robustness check, we show that results obtained at the location-sector-wide level are consistent at a restrictive definition of market when we remove geographic element. Tables 8 and 9 present linear estimates and a non-linear estimates of the main specification as done in Tables 3 and 4 respectively.[9] Our preferred specification in Column (6) of each table confirm that markup dispersion reduces entry rate while average markup have positive impact on entry.

The only marginal difference is the level of statistical significance of the control variables. In spite of these marginal difference the general picture that emerged from the

[9]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 7: Alternative Measures of Dispersion

VARIABLES	LINEAR (1)	(2)	NON-LINEAR (3)	(4)
Coefficient of Variation	-0.530***		-2.313***	
	(0.0958)		(0.650)	
Mean Log Deviation		-1.155***		-7.941**
		(0.368)		(3.184)
$\bar{\mu}^{w}_{wst-1}$	0.0594**	0.0599**	0.159***	0.179***
	(0.0233)	(0.0240)	(0.0577)	(0.0595)
Capital Intensity	-0.0299**	-0.0325**	-0.0921**	-0.0978**
	(0.0146)	(0.0153)	(0.0427)	(0.0439)
Average Firm Size	-0.0173	-0.0139	-0.171**	-0.167**
	(0.0236)	(0.0236)	(0.0708)	(0.0737)
Constant			-2.549***	-2.643***
			(0.396)	(0.368)
Observations	2,513	2,513	2,564	2,564
R-squared	0.458	0.453	0.232	0.251
Year FE	Y	Y	Y	Y
Sector FE	Y	Y	Y	Y
Wereda FE	Y	Y	Y	Y

Robust standard errors in parentheses $***p < 0.01, **p < 0.05, *p < 0.1$

Table 8: Entry Equation at Sector Level Market

VARIABLES	(1) entry rate	(2) entry rate	(3) entry rate	(4) entry rate	(5) entry rate	(6) entry rate
$Theil_{st-1}$	-0.922*		-0.782**	-0.925		-0.755**
	(0.539)		(0.366)	(0.581)		(0.366)
$\bar{\mu}^{w}_{st-1}$		0.0801**	0.0923**		0.0813**	0.0931**
		(0.0401)	(0.0429)		(0.0408)	(0.0436)
Capital Intensity				-0.0170	-0.0331	-0.0313
				(0.0420)	(0.0206)	(0.0205)
Average Firm Size				-0.122	0.0359	0.0373
				(0.196)	(0.0405)	(0.0402)
Observations	552	544	544	552	544	544
R-squared	0.161	0.338	0.344	0.165	0.344	0.350
Sector FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

Robust standard errors in parentheses $***p < 0.01, **p < 0.05, *p < 0.1$

analysis at the sector level is consistent with those at the location-sector level.

Table 9: Entry Equation at Sector Level Market: PPML

VARIABLES	(1) entry rate	(2) entry rate	(3) entry rate	(4) entry rate	(5) entry rate	(6) entry rate
$Theil_{st-1}$	-5.467**		-3.837***	-5.611**		-3.880***
	(2.316)		(1.274)	(2.573)		(1.264)
$\bar{\mu}^{w}_{st-1}$		0.269***	0.304***		0.285***	0.321***
		(0.0961)	(0.0897)		(0.0981)	(0.0913)
Capital Intensity				0.00585	-0.000974	-0.000718
				(0.0117)	(0.00932)	(0.00894)
Average Firm Size				-0.209	0.155	0.166
				(0.319)	(0.181)	(0.182)
Constant	-2.264***	-2.904***	-2.669***	-1.434	-4.027***	-4.002***
	(0.477)	(0.209)	(0.213)	(1.729)	(1.045)	(1.031)
Observations	546	538	538	546	538	538
R-squared	0.301	0.386	0.401	0.345	0.388	0.402

Robust standard errors in parentheses $***p < 0.01, **p < 0.05, *p < 0.1$

5 Extensions

From theoretical foundations, if entry rate 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 has a wider impact on the economy.[10] To access 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 10 reports results of our estimates on markup dispersion and aggregate indicators. All three measures show a negative and significant relationship between markup dispersion and TFP growth as well as employment growth. This suggests that higher markup dispersion negatively affect the economy.

6 Conclusion

To be added.

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

Table 10: 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
Wereda × Year FE	Y	Y	Y	Y	Y	Y
Wereda × Sector FE	Y	Y	Y	Y	Y	Y

All three measures of markups dispersion are lagged at time $t-1$.
Robust standard errors in parentheses $***p < 0.01, **p < 0.05, *p < 0.1$

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