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Clustering as an Organizational Response to Capital Market Inefficiency

Evidence from Handloom Enterprises in Ethiopia

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ABSTRACT

Using data from microenterprises of the handloom sector in four regions of Ethiopia, the paper shows that clustering, through specialization and division of labor, can lower entry barriers by reducing the initial capital required to start a business. This effect is found to be significantly larger for microenterprises investing in districts with higher levels of capital market inefficiency, indicating the importance of clustering as an organizational response to a constrained credit environment. The findings highlight the importance of cluster-based industrial activities as an alternative method of propagating industrialization when local conditions do not allow easy access to credit.

Keywords: clustering, industrialization, finance, microenterprises, Ethiopia

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1. INTRODUCTION

Development agencies and policymakers have long stressed the economic importance of microenterprises in developing countries because of their large share in employment and their potentials to reach specialized and niche markets. Yet microenterprises often face financial constraints when both establishing and expanding their businesses (Demirgüç-Kunt and Maksimovic 1998; Rajan and Zingales 1998; Ayyagari, Demirgüç-Kunt, and Maksimovic 2008). Inefficient functioning of financial markets together with collateral requirements that increase the cost of borrowing are mentioned as major causes of microenterprises' limited access to capital (for example, Tybout 1983; Bigsten et al. 2000; Ayyagari, Demirgüç-Kunt, and Maksimovic 2008). The lack of financial development may also prevent a large number of talented entrepreneurs from starting a business (Bigsten et al. 2000; Hernández-Trillo, Pagán, and Paxton 2005; McKenzie and Woodruff 2006, 2008).

Industrial clusters are noted as one form of institution that can help ease the financial constraints microenterprises face even when there is a low level of financial market development. Various studies point to the importance of industrial clusters in facilitating access to informal finances where repeated interactions between local producers and traders promote trust that enables reciprocal exchange of information that may reduce the problem of moral hazards and the cost of monitoring in credit relationships (Becattini 1990; Grabher 1993; Schmitz 1995; Nadvi 1999; Russo and Rossi 2001, Ali and Peerlings 2010b). Collaborative networks within clusters may also reinforce mutually beneficial relationships, such as cooperation, allowing access to cheaper credit or the joint purchase of materials at lower prices (Becattini 1990). Industrial clusters can also ease the financial constraints of microenterprises by affecting the organization of production (Ruan and Zhang 2008, 2009). The production system within clusters promotes specialization and division of labor, thereby lowering the capital requirement to invest in different steps of production. By relying on components manufactured by others, a firm can specialize in its own products, which require relatively lower amounts of capital, rather than organizing the entire production process. Such division of labor can enable small entrepreneurs with limited endowments to invest in and start a business "by focusing on a narrowly defined stage of production" that best suit their capital portfolio even in the absence of a well-functioning capital market (Huang, Zhang, and Zhu 2008, 414). However, only few studies have empirically shown the role of industrial clusters as an organizational response to financial constraints (Huang, Zhang, and Zhu 2008; Long and Zhang 2010; Ruan and Zhang 2009). The few studies available focus on the Chinese experience, making it unclear whether the phenomenon exists in other countries, particularly in African countries, where the capital market is likely to be less developed than in China.

The purpose of this study is to investigate the advantage of clustering in easing the financial constraints of microenterprises operating in Africa by looking at evidence from the handloom sector in Ethiopia. Specifically, we investigate whether microenterprises investing in industrial clusters are less likely to be financially constrained when starting a business than those investing outside of clusters. In addition, we examine whether clustering can lower the capital barrier to entry by reducing the initial capital investment required to start a business. The study looks at more than 4,000 microenterprises of the handloom sector from four regions of Ethiopia operating both in clusters and in isolation. Ethiopia's handloom sector makes a good case for studying the relationship between the development of financial markets and industrial clusters because the technology is rather simple and entry is not affected by nontechnical barriers, such as those coming from product differentiation, patents over technologies, and control over supply of raw materials. The only major barrier to entry is access to capital.

The remainder of the paper is organized as follows. Section 2 briefly reviews the existing literature. Section 3 presents a theoretical framework that depicts how clustering can help ease the financial constraints of starting a business in the absence of a well-functioning capital market. Section 4 presents data and discusses Ethiopia's handloom sector. Section 5 formulates the empirical model, and Section 6 presents the empirical results. Section 7 is a conclusion and discussion.

2. LITERATURE REVIEW

Entry barriers that are further aggravated by capital market imperfections are prime obstacles for entrepreneurial activities in many developing countries (Ayyagari, Demirgüç-Kunt, and Maksimovic 2008). Studies have shown that investments in micro- and small-scale enterprises in developing countries have a high return because of high entry barriers (Udry and Anagol 2006; Banerjee and Duflo 2005; McKenzie and Woodruff 2006, 2008; de Mel, McKenzie, and Woodruff 2008). Such findings are often considered an indication of microentrepreneurs' unexploited potentials were the financial constraints to be alleviated (Grimm, Krüger, and Lay 2009).

Following such potentials, financial programs that target micro- and small-scale industries, such as microfinance programs, have been widely called for in developing countries (Murdoch 1999). Without denying the importance of financial development for industrial development, we point out that developing a well-functioning financial market is a daunting task. Informal finances are also thought to have potential to finance small businesses that are beyond the reach of formal systems (Adams 1992; Wai 1992; Steel et al. 1997; Allen, Qian, and Qian 2005). However, the potential of informal finances could be small as a large proportion of people in developing countries are poor and have limited savings for informal financing.

In this paper, we argue that clustering, by promoting specialization and division of labor, could act as one form of organization of production where many of the financial constraints microenterprises face can be reduced. Studies have shown how the level of financial market development, among other factors, can affect the organizational choice of production. Using historical evidence, Haber (1991) noted that in the early periods of industrialization (1840–1880) the level of specialization in the cotton textile industry of a number of Latin American countries was significantly higher than it was in the United States, where the financial market was more developed. Following the creation of modern financial intermediaries in the last decades of the 19th century, however, the level of specialization in the Latin American textile industry declined substantially. Acemoglu, Johnson, and Todd (2009) also showed empirically that in countries where there has been greater financial market development together with higher contracting costs, vertical integration is the common production system. With inefficiently functioning financial markets, on the other hand, a more specialized production would prevail. This is due to the advantage of specialization, which allows firms to break down the more complex and integrated production process and concentrate on activities in which they have a comparative advantage in terms of skills, resources, and capital endowments (Huang, Zhang, and Zhu 2008; Ruan and Zhang 2009). However, there are costs involved with specialization, such as the expense of coordinating the various producers involved in different steps of production. The benefits of specialization might therefore best occur when there is clustering that helps to economize coordination costs through proximity that facilitates trust-based transactions (Stigler 1951). Industrial clusters would then replace the "internal economies of scale that had been the basis of large scale production within a single firm by external economies of scale arising from the division of labor between a number of small firms" (Helmsing 1999, 11). Although coordination costs might be generally lower in industrial clusters, the continuing new entry due to specialization and division of labor may result in diseconomies of agglomeration (Sonobe and Otsuka 2006a). These could arise from congestion, which would then lead to fierce completion for limited resources such as land (Lall, Shalizi, and Deichmann 2003). In order to counter these negative economies of scale that could eventually reduce enterprises' profitability, there needs to be an improvement in productivity and product quality. The extent of quality improvement further depends on the degree of imitation, which is expected to be common among microenterprise clusters in developing countries[1].

A large body of literature has posited the advantages of clustering in terms of information spillover, labor pooling, and market linkages (Marshall 1920; Schmitz 1995; Visser 1999; Sonobe and Otsuka 2006a; Ali and Peerlings 2010a). However, very few studies have empirically examined the role

[1] Detailed discussion how microentrepreneurs in developing countries can break through the problem of imitation at an early stage of industrialization is provided by Sonobe and Ostuka (2006a).

of clustering in reducing financial constraints. Using a sample of 140 footwear-producing enterprises in China's Wenzhou province, Huang, Zhang, and Zhu (2008) show how industrial clusters can best explain the rapid industrialization of that region despite a lack of basic conditions necessary for economic growth. The authors show that clustering, through division of labor, enabled a large number of small entrepreneurs to enter the industry by helping them overcome the capital constraints in the early stage of industrialization. For the cashmere sweater cluster of northern Zhejiang province in China, Ruan and Zhang (2008) found a positive correlation between the capital barrier to entry and return on capital when the financial market is not well developed. They also conclude that the division of labor in the cashmere sweater cluster helped "tap the entrepreneurial talents that are scattered in rural areas, thus making better use of capital" (Ruan and Zhang 2008, 22). Using firm-level data from China's industrial census for the years 1995 and 2004, Long and Zhang (2010) show how clustering eases both starting and working capital constraints through two possible mechanisms. One such mechanism is the division of labor within clusters that allowed a large number of poorly endowed entrepreneurs from rural areas to become part of the industrial process. The second mechanism is the proximity of various agents within clusters who work to facilitate trade credit, and hence reduce working capital.

The current study differs from previous work in at least two ways. First, it is the first empirical study to look at the relationship between microenterprise industrial clusters and financial constraints from an African perspective, using handloom producers in Ethiopia as an example. Second, it compares the financial constraints and entry barriers of microenterprises in industrial clusters with those of microenterprises outside of clusters.

3. THEORETICAL FRAMEWORK: CLUSTERING, CAPITAL MARKET IMPERFECTION, AND ENTRY BARRIERS

In this section, we discuss how clustering could help ease the financial constraints of microenterprises when starting a business by lowering the required start-up capital in the absence of a well-functioning capital market. For the moment, we assume that entrepreneurs can invest only their capital endowment—that is, they cannot obtain credit from the capital market.

Let an entrepreneur with a certain capital endowment plan to start a business. The entrepreneur faces a production function Y that is a function of fixed capital stock K, variable inputs X, and fixed inputs Z:

$$Y(K, X, Z). \tag{1}$$

Given the simplicity of production in many microenterprises in developing countries in general, we do not consider entrepreneurial talent as a factor of production in this model.

Let an entrepreneur also face fixed transaction costs given by T, which is a function of the concentration of firms producing similar and related goods in nearby areas. Such transaction costs can be incurred while procuring inputs and selling outputs. With the concentration of input suppliers and output buyers in close proximity, as in the case of industrial clusters, the transaction costs for an entrepreneur will be lower (Becattini 1990; Grabher 1993; Schmitz 1995). This could be due either to a reduced transportation cost stemming from proximity or to the developed networks among different agents that help to facilitate the transaction through the flow of information and mutual trust.

For a given level of capital stock and fixed inputs and prices of outputs and variable inputs, the short-run profit function for an entrepreneur is then given by

$$\pi(K, Z, w_X, p, T) = max_{Y,X}\ pY - w_X X - T, \tag{2}$$

where π is profit, p is output price, and w_X is the variable input price.
Given the capital endowment of an entrepreneur, one would invest in a project if and only if there is a positive profit—that is,

$$\pi(K, Z, w_X, p, T) = \max_{Y,X}\ pY - w_X X - T \geq 0 \tag{3}$$

and

$$\pi^1(K, Z, w_X, p) = \max_{Y,X}\ pY - w_X X \geq T, \tag{4}$$

where $\pi^1(K, Z, w_X, p)$ is optimal profit excluding the fixed transaction costs T.

From the preceding formulation, let K^m be the capital stock at which given the values of w_X, p, and Z, profit is equal to the fixed transaction costs T, which is the minimum capital stock required to start a business:

$$\pi^m(K^m, Z, w_X, p) = T\,, \tag{5}$$

where $\pi^m(K^m, Z, w_X, p)$ is profit that equals the fixed transaction costs T at the minimum capital stock K^m.

Following the standard theory of profit maximization, the first-order derivative of profit with respect to capital is positive and equal to the shadow price of capital. At the point where the capital stock is equal to K^m, the shadow price of capital is then given by

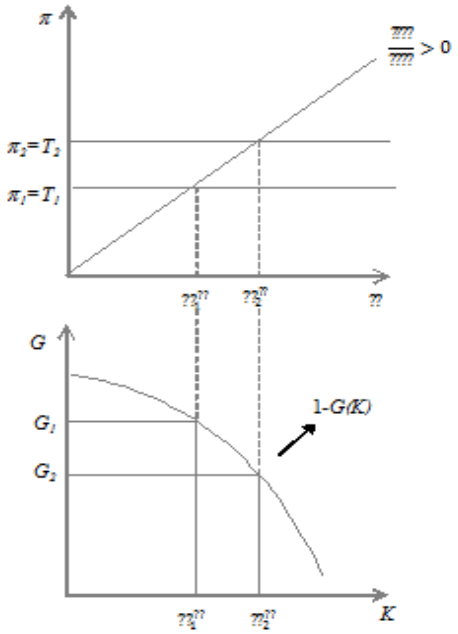
$$\frac{\partial \pi^m(K^m, Z, w_X, p)}{\partial K} = w_K(K^m, Z, w_X, p) \geq 0, \tag{6}$$

where w_K is the shadow price of capital.

Because the first-order derivative is positive, it can be inferred from equations (5) and (6) that there is a positive relationship between the fixed transaction costs T and the minimum required capital stock K^m. This implies that a reduction in transaction costs (for example, due to clustering) will result in a reduction of the minimum initial capital amount required to start a business. This could be because an enterprise operating inside a cluster can specialize in activities for which it has a comparative advantage or because the other parts and components can be accessed easily at a lower cost from nearby firms. With an increase in transaction costs, on the other hand, the initial capital stock required is higher since the enterprise would have to produce the intermediate parts itself because it is costly to get them from the market. Krugman and Venables (1996) noted that with increased distance between firms, transaction costs tend to increase leading to the emergence of large and vertically integrated industries since the various firms that would provide parts and components are not found in nearby locations. With the concentration of the producers of final and intermediate goods in close proximity, more division of labor and specialization would prevail requiring a relatively lower amount of capital to start a business (Lall, Shalizi, and Deichmann 2003).

Previously we assumed there was a fixed capital endowment. In the case of a perfect capital market, entrepreneurs can adjust their capital stock to the profit-maximizing optimum, in which case the shadow price of capital equals the market price. However, if a business activity requires a higher level of start-up capital than the capital endowment, and that extra capital cannot be obtained from the capital market, then entrepreneurs become financially constrained. The high level of start-up capital would then prevent a large number of poorly endowed entrepreneurs from entry with only a few wealthy people being able to invest in a more integrated production. On the other hand, with the colocation of intermediate input suppliers and output buyers, there would be increased specialization and division of labor that lowers the required start-up capital. Hence, even in the absence of a well-functioning capital market, entrepreneurs in industrial clusters would be less likely to be financially constrained with a relatively large share of them investing according to their level of capital endowment. This argument is further depicted in Figure 1, which shows the relationship between start-up capital, transaction costs, and the proportion of entrepreneurs who can potentially invest, given their endowment.

Figure 1. Transaction costs, entry barrier, and entrepreneurship



Source: Authors' calculation.

Let the distribution of capital endowment be given by the function $G: [0, \overline{K}] \rightarrow [0,1]$, such that $G(K)$ is the proportion of entrepreneurs whose endowment is less than or equal to a certain capital amount K. That is, the proportion of entrepreneurs with an endowment less than or equal to zero is zero, and the proportion of entrepreneurs with an endowment less than or equal to $\overline{K}$, which is the highest capital amount required to start a business, is 1.

According to Figure 1, at relatively high transaction costs, T_2, the initial capital required to start a business is K_2^m and the proportion of entrepreneurs with a capital endowment greater than or equal to $\mathrm{K}_2^{\mathrm{m}}$ is the distance from zero up to G_2. At lower transaction costs, T_1, a lower amount of initial capital, K_1^m , is required, which also corresponds to a larger proportion of potential entrepreneurs with capital endowment greater than or equal to K_1^m, given by the distance from zero up to G_1.

4. DATA

Data Source and Definition of Key Variables

For this study, we look at 4,347 microenterprises operating in the handloom sector in 118 districts of four different regions of Ethiopia, namely, Amhara, Tigray, Addis Ababa, and the Southern Nations, Nationalities, and People (SNNP). The data are obtained from the 2002–2003 Cottage/Handicraft Manufacturing Survey conducted by the Central Statistical Agency of Ethiopia (CSAE). In that survey, information specific to an enterprise, such as the value of its starting capital, whether it was financially constrained when it started its business, and its main sources of starting capital, is included. Information regarding the schooling, experience, and age of the owner-operator is also included. Additional location-specific variables, such as distance to the nearest all-weather road, are obtained from the 2002–2003 Welfare Monitoring Survey conducted by the CSAE. We also use the CSAE's 2002–2003 Large and Medium Scale Manufacturing Survey to define clustering.

To define clustering, we quantify the level of concentration of the handloom sector at the district level. Different indexes have been developed in the literature to measure the level of clustering of certain activities in certain locations. A *location quotient* that quantifies how concentrated a certain sector is in a certain location compared with a larger geographic unit is one of the widely used measures of clustering (O'Donoghue and Gleave 2004). The location quotient for the handloom sector is calculated for the most detailed spatial unit possible, the district, by using the zone, which is the higher spatial unit next to a district, as a reference point:

$$LQ_d = (H_d/M_d)/(H_Z/M_Z), \tag{7}$$

where LQ_d is the location quotient of the handloom sector at district d; H_d is employment of the handloom sector at district d; M_d is total manufacturing employment at district d; H_Z is employment of the handloom sector at zone z; and M_Z is total manufacturing employment at zone z. Here total manufacturing employment includes employment in micro-, medium-, and large-scale manufacturing industries. The Cottage/Handicraft Manufacturing Survey and the Large and Medium Scale Manufacturing Survey were both used in the calculation of the location quotient.

Although one can reasonably assume that Ethiopia's financial market is not well developed, there could be differences between locations with respect to how accessible capital is from both formal and informal sources. Such differences could arise, for example, from the presence of banks and microfinance institutions and variations in household savings. To account for differences in level of access to both formal and informal finances, we define the level of financial market inefficiency in each district. Under a perfect capital market, agents can borrow and lend freely at the market interest rate, and the marginal product of capital should be equal among enterprises and across different locations. Following the works of Zhang and Tan (2007), Hsieh and Klenow (2009), and Long and Zhang (2010), we use the variation in the marginal product of capital as a measure of financial market inefficiency.

For a production function with a constant return to scale, the marginal product of capital MP_K is proportional to the average product of capital. If we assume a Cobb-Douglas production function of the formula $Y = K^{\alpha}X^{\beta}Z^{\gamma}$, the marginal product of capital is given by

$$MP_K = \alpha\left(\frac{Y}{K}\right), \tag{8}$$

where Y is the value of output; K is the capital stock; X is the variable input; Z is the fixed input; and α, β, γ are the elasticities of output with respect to capital, variable inputs, and other fixed inputs, respectively.

The financial market inefficiency I is then calculated by taking the standard deviation σ of the logarithm of equation (8) at the district level d:

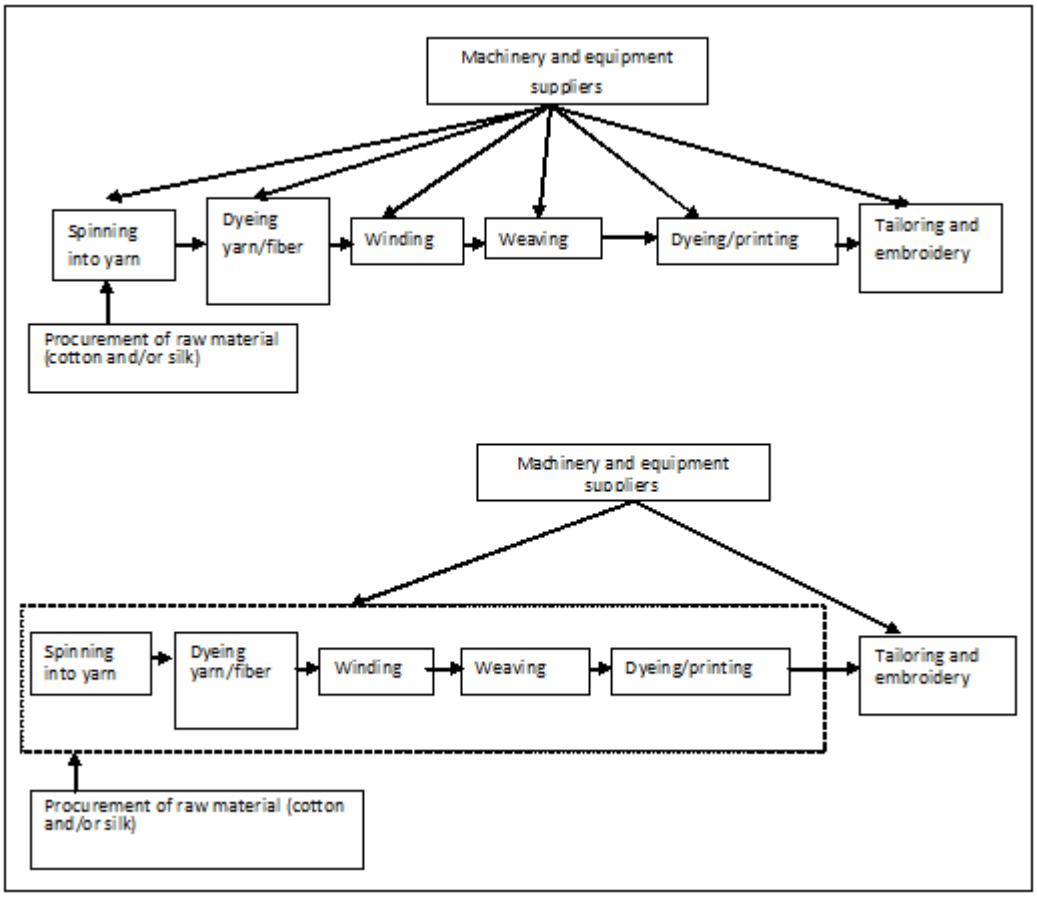
$$I = \sigma\left(log\left(\alpha\frac{Y}{K}\right)\right)_d = \sigma\left(log\left(\frac{Y}{K}\right)\right)_d. \quad (9)$$

The preceding formulation indicates that in a perfect financial market, the standard deviation of the marginal product of capital among enterprises in a given district would be zero. The larger the deviation, the larger would be the financial market inefficiency. Data for the value of output and capital stock are obtained from the 2002–2003 Cottage/Handicraft Manufacturing Survey and the Large and Medium Scale Manufacturing Survey, both conducted by the CSAE.

Description of the Handloom Sector

The handloom sector engages more than 221,000 workers, 55 percent of whom operate in rural areas and 48.5 percent of whom are women (CSAE 2003). Producers in the sector often use simple tools, mainly specializing in handwoven textiles and not using power-driven machines. Microenterprises in the handloom sector mostly consist of owner-operators with an average employment size of 1.4 persons. The sector comprises, on average, six different activities ranging from the spinning of cotton into yarn to the tailoring and embroidery of weaved products (Figure 2). These activities are either performed by different specialized producers or integrated in one enterprise. In the specialized system of production, often women engage in the pre- and postweaving activities, whereas the weaving is predominantly done by males.

Figure 2. Specialized versus integrated production system in the handloom sector



Source: Authors' compilation.

As with many other microenterprises in developing countries, financial constraints, especially when starting a business, form a major obstacle in the handloom sector. Table 1 shows this to be the case for 49 percent of the microenterprises in the survey. Microenterprises in the handloom sector also have limited access to loans from formal banks and lending agencies. As Table 1 depicts, none of the responding producers in the sample had borrowed money from a formal bank when starting his or her business. Instead, personal savings and informal sources of finance played an important role, with 43 percent and 23 percent of respondents having sourced their starting capital from own savings and friends and relatives, respectively. Assistance from government and nongovernmental organizations also represented a considerable share, while credit from microfinance institutions remained minimal at best (Table 1). The comparison between enterprises in more and less concentrated districts further indicates that a lower proportion, 42 percent, of producers operating in more concentrated districts were financially constrained when starting a business compared with 58 percent of producers in less concentrated districts.[2] Borrowing from friends and relatives was the most important source of start-up capital for enterprises in more concentrated districts, indicating the importance of informal financing in industrial clusters, whereas personal savings and informal money lenders were important to those in less concentrated districts (Table 1).

Table 1. Problems upon starting a business and most important sources of capital

	Total		**More Concentrated Districts**		**Less Concentrated Districts**	
	Freq	%	Freq	%	Freq	%
The most important problems faced when starting the business						
Financial constraint	2,121	48.74	890	41.96	1,231	58.04
Lack of technical know-how	354	8.14	164	46.33	190	53.67
Lack of working premises	99	2.28	49	49.49	50	50.50
Lack of access to raw material	74	1.70	44	59.46	30	40.54
Government rules and regulations	5	0.11	1	20.00	4	80.00
No problem	1,623	37.30	586	36.11	1,037	63.89
Others	75	1.72	20	26.67	55	73.33
Total	4,351	100.00	1,754	40.35	2,597	59.74
The most important sources of initial capital						
Informal sources						
Own savings	1,876	43.16	695	37.05	1,181	62.95
Friends and relatives	1,007	23.17	522	51.84	485	48.16
Informal money lenders	108	2.48	31	28.70	77	71.29
Inherited	139	3.20	53	38.13	86	61.87
Formal sources						
Large formal banks	0	0	0	0	0	0
Microfinance institutions	9	0.21	4	44.44	5	55.55
Assistance from government/nongov. org.	923	21.23	363	39.33	560	60.67
Others	285	6.56	85	29.82	200	70.18

Source: Authors' calculation based on the 2002–2003 Cottage/Handicrafts Manufacturing Survey.

[2] The distinction between more and less concentrated districts is made based on the median value of the location quotient at the district level.

Microenterprises in the surveys reported average start-up capital of 132.69 birr (US$14.91)[3] (Table 2)[4]. That is even lower than the average minimum wage in the public sector, which is around 320 birr ($22.86) in 2010[5]. Using a more recent data of 2008 on handloom clusters in Ethiopia, Ayele et al.(2009) reported a similarly low average value of start-up capital that ranges from $12.82 in non-electrified rural areas to $21.68 in the capital city Addis Ababa.Overall, initial investment levels are fairly low for microenterprises in the handloom sector compared with those of the large textile factories, which have an average initial investment level of 44,500,000 birr ($5,000,000) (Table 2). Microenterprises in more concentrated districts reported even a smaller amount of start-up capital compared with those in less concentrated districts (Table 2). Figure 3 shows a similar relationship, that is, a negative correlation between the value of start-up capital and the level of clustering as captured by the location quotient. Although informal finances, such as those from friends and relatives, could enable entrepreneurs in industrial clusters to access finance and invest more, increased specialization and division of labor in industrial clusters, on the other hand, might reduce the start-up investment needed to establish a business.

Table 2. Comparison of starting capital across regions and production systems (currency in birr)

	Min.	Max	Mean	Mean Capital-Labor Ratio
Large Textile factories	3000	222,000,000	44,500,000 ($5,000,000)	177,752.20
Microenterprises	2	4515	132.69 ($14.91)	338.85
Tigray	2	3340	157.37 ($17.68)	462.87
Amhara	2	4515	123.84 ($13.91)	282.52
SNNP	2	2720	175.56 ($10.84)	242.45
Addis Ababa	2	2720	175.56 ($19.73)	491.27
More concentrated district	2	4515	123.53 ($13.87)	263.19
Less concentrated districts	2	3113	149.89 ($16.84)	480.77
Districts with high financial inefficiency	2	2720	114.36 ($12.85)	359.54
Districts with low financial inefficiency	2	4515	155.27 ($17.45)	410.84

Source: Authors' calculation based on the 2002–2003 Cottage/Handicrafts Manufacturing Survey and the 2002–2003 Large and Medium Scale Manufacturing Survey.

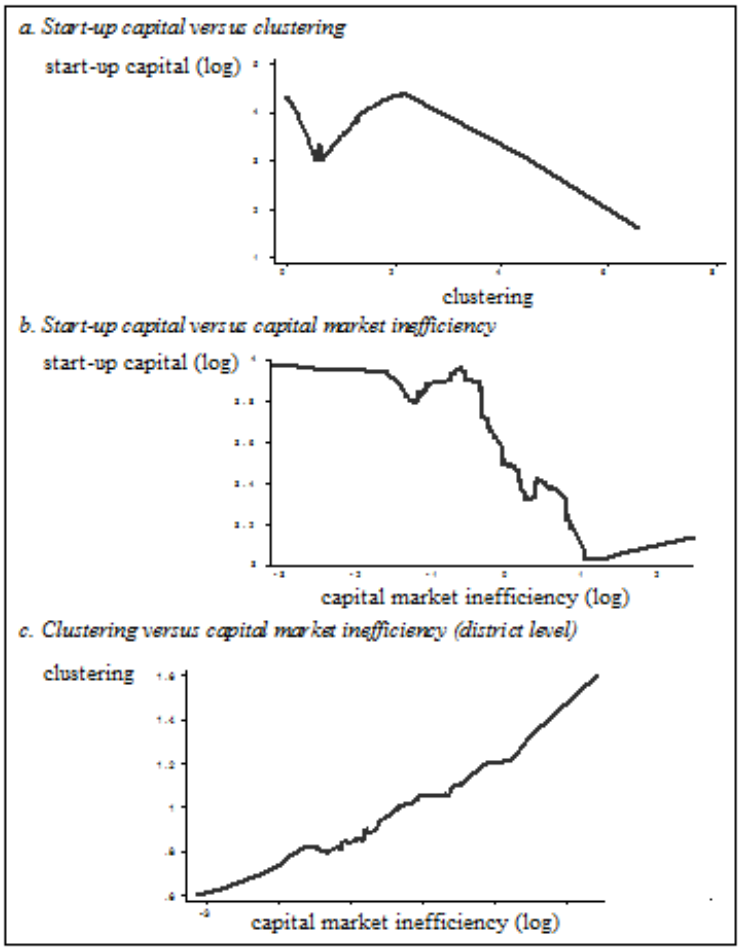
Notes: The average start-up capital is calculated only for the newly established enterprises, that is, those formed in the five years preceding the survey. The average exchange rate from 1998–1999 until the time of the survey, 2002–2003, was 1 US$ = 8.9birr. SNNP = Southern Nations, Nationalities, and People.

[3] All dollars are U.S. dollars.

[4] The values in Table 2 are converted to U.S. dollars using the 5 years average exchange rate (1U.S.$ = 8.9 birr) from 1998–1999 until 2002–2003.

[5] The average exchange rate for 2010 was 1U.S.$ = 13.99 birr.

Figure 3. Correlation between clustering, start-up capital, and capital market inefficiency using locally weighed least-squared smoothing technique



Source: Authors' calculation based on the 2002–2003 Cottage/Handicrafts Manufacturing Survey and the 2002–2003 Large and Medium Scale Manufacturing Survey.

Note: The correlation is depicted for newly established enterprises, that is, those formed in the five years preceding the time of the survey. The unit of the start-up capital is birr.

Microenterprises operating in districts characterized by high levels of financial market inefficiency reported less start-up capital on average than those operating in districts with lower levels of financial market inefficiency (Table 2). Figure 3b depicts a similar relationship—that is, there is a negative correlation between the value of start-up capital and the level of financial market inefficiency. This may illustrate the poor access to both formal and informal finances in financially inefficient districts, causing entrepreneurs to invest in activities that require relatively less capital. The relationship between clustering and financial market inefficiency at the district level (Figure 3c) also reflects the fact that clustering is more common in districts characterized by high levels of financial market inefficiency. This suggests that industrial clusters may act as an organizational response to capital market inefficiency.

Tables 1 and 2 show two important points that correspond with the predictions of the theoretical model presented in Section 3. First, the majority of microenterprises in highly concentrated districts were not financially constrained when starting their business. In addition, they reported low start-up capital versus those operating in less concentrated districts. We argue that this could be a result of specialization and division of labor in more concentrated districts that lowers entry barriers for entrepreneurs, enabling them to invest in activities that best suit their capital endowment without them necessarily being

financially constrained. In addition, the informal financing that is common in industrial clusters could also have played a role in easing their financial constraint when establishing a business. Second, the majority of those in less concentrated districts were financially constrained and yet had higher start-up capital costs compared with those operating in more concentrated districts. This may be because those investing in less concentrated districts follow a more integrated form of production due to the absence of firms providing parts and components in nearby areas, which could then result in relatively higher start-up capital costs. In the absence of a well-functioning capital market, the high start-up capital costs might cause the majority of entrepreneurs investing in less concentrated areas to be financially constrained. The capital-to-labor ratios in Table 2 also show that producers in less concentrated districts were relatively more capital intensive than their more concentrated counterparts.

5. EMPIRICAL MODEL

Clustering and Financial Constraint When Starting a Business

To empirically test whether microenterprises investing in industrial clusters are less likely to be financially constrained when starting a business than those investing outside of clusters, we formulate the following probit regression:

$$P(FC) = \beta_1 LQ + \beta_2 I + \beta_3 R + \beta_4 W + \gamma E + \varepsilon. \quad (10)$$

In the 2002–2003 Cottage/Handicrafts Manufacturing Survey, producers were asked to state the most important problem they faced when starting their business. Accordingly, a dummy (FC) is defined that has a value of one if a producer responded that being financial constrained was the most important problem he or she faced when starting a business and zero otherwise. $P(.)$ is the probability that $FC = 1$, and LQ and I are measures of clustering and financial market inefficiency at the district level, respectively, as formulated in Section 4.1.

If there is increased specialization and division of labor in industrial clusters, we would expect β_1 to be negative—that is, the probability of being financially constrained would decline with clustering even after controlling for financial market inefficiency. On the other hand, β_2 is expected to have a positive sign—that is, the higher the capital market inefficiency in a given district, the higher would be the probability of an entrepreneur being financially constrained when starting a business.

The average distance at each district level from the nearest all-weather road is depicted by R. This variable is used as an indicator of the value of the location in which the entrepreneur is establishing a business. For example, accessible locations with good infrastructure might be valued higher than remote locations. This can be reflected by a high value of land or high rental prices for buildings, which could also increase the start-up capital. After controlling for the level of financial market inefficiency, those entrepreneurs investing in high-value locations could therefore be financially constrained to start their business. With this, we would expect β_3 to be negative.

The wealth of an entrepreneur, indicated by W, can also affect the likelihood of being financially constrained when starting a business as it might be easier for wealthy entrepreneurs to either invest their own savings or have enough collateral to reduce their cost of borrowing. As an indicator of wealth, we use a dummy that captures whether an entrepreneur owns a nonresidential building.

E is a vector of enterprise-specific factors such as the age, schooling, and gender of the owner-operator. Regional and urban dummies are also included to capture regional variations. The corresponding enterprise-specific parameters are captured by the vector γ, and ε is a random term.

Clustering and the Capital Barrier to Entry

To investigate whether those entrepreneurs investing in industrial clusters face lower entry barriers than their dispersed counterparts, we regress the initial capital investment $(K_{initial})$ on a similar set of explanatory variables as used in the probit regression:

$$K_{initial} = \beta_1 LQ + \beta_2 I + \beta_3 R + \beta_4 W + \gamma E + \varepsilon. \quad (11)$$

We would expect β_1 to be negative; that is, with increased clustering, entrepreneurs tend to invest a lower amount of capital due to a reduced entry barrier following specialization and division of labor in industrial clusters. Similarly, β_2 is expected to be negative indicating that with increased financial market inefficiency, entrepreneurs tend to have a limited access to capital (both formal and informal) that could then lead them to invest in activities that require a relatively lower start-up investment.

The coefficient of the district-level average distance to the nearest all-weather road (β_3) is expected to have a negative sign showing that entrepreneurs investing in remote areas would have low start-up capital because the location is valued less than other relatively accessible locations in terms of land and rental prices. On the other hand, we would expect β_4 to be positive implying that wealthy entrepreneurs, as indicated by owning a nonresidential building, would make a large initial investment. The same enterprise-specific variables and regional and urban dummies as in the probit regression are also used as additional control variables.

We further investigate the relationship between the capital entry barrier and clustering between enterprises investing in districts with low and high financial market inefficiencies. The distinction is made based on the median value of the financial market inefficiency at the district level. Based on this, two separate regressions are performed for the two groups where the coefficients of the location quotient are compared. We would expect the impact of clustering in reducing the entry barrier of the initial capital investment to be higher (in absolute terms) for microenterprises investing in districts with high financial market inefficiencies.

In this study, due to unavailability of data we are unable to control for the possibility of differences in relative input prices between clustered and dispersed locations, which could also affect the initial investment size.

6. EMPIRICAL RESULTS

Location-specific variables, such as the location quotient, level of financial market inefficiency, and distance to the nearest all-weather road, and enterprise-specific variables, such as the age and schooling of the owner-operator, are all based on current information at the time of the survey. On the other hand, information on start-up capital and whether an enterprise was financially constrained when starting a business was asked for at the time of the survey but involves information about the time when the business was actually established. Due to the gap in timing between the dependent and many of the explanatory variables, we have restricted the regression analyses to only enterprises established in the five years previous to the time of the survey. Twenty-five percent of enterprises in the sample started their business during this period, giving us 1,325 observations with which to do the regressions. We can also reasonably assume that location-specific variables did not change significantly during this period.

Clustering and Financial Constraints When Starting a Business

Column I of Table 3 reports the marginal effects of the probit regression on the probability of being financially constrained when starting a business. The results show that as the level of financial market inefficiency in a given district increases, the likelihood of an entrepreneur being financially constrained when starting a business increases. That is an indication of reduced access to both formal and informal finances in such locations. Increased clustering, on the other hand, is shown to reduce the probability of being financially constrained when starting a business, even after controlling for financial market inefficiency. This illustrates that clustering, through specialization and division of labor, eases the financial constraints of entrepreneurs by allowing them to invest in activities that best suit their capital endowment, without them necessarily being financially constrained.

As expected, those investing in accessible locations have a higher probability of being financially constrained probably due to the increased value of the location, which may require a greater amount of start-up capital. The wealth indicator—owning a nonresidential building—has the expected negative sign, although not significant.

Male entrepreneurs in general are less likely to be financially constrained when starting a business than female entrepreneurs. Studies have shown that female entrepreneurs in developing countries generally lack economic resources that can be used as collateral to access credit (FAO 1984; McKee 1989; Otero and Downing 1989; Buvinic and Marguerite 1990). Culture, social norms, and the type of activities women invest in have also been mentioned as possible factors contributing to their limited access to both formal and informal finances (McKee 1989).

Those entrepreneurs with more years of schooling are less likely to be financially constrained when starting a business. This could be because more educated entrepreneurs might be more informed about different ways of gaining access to credit than their less educated counterparts. In addition, educated entrepreneurs might appear creditworthy in the eyes of lenders because of their relative credibility in taking calculated risks and their bookkeeping ability that could help facilitate the monitoring process.

Table 3. Clustering, financial constraints, and entry barrier

	I	II	III	IV
Clustering (location quotient)	-0.28***	-0.13**	-0.17**	-0.28***
	(0.03)	(0.05)	(0.09)	(0.06)
Financial market inefficiency (log)	0.09***	-0.19***	—	—
	(0.02)	(0.06)		
Distance to all-weather road (log)	-0.03***	-0.07**	-0.27***	0.07*
	(0.01)	(0.03)	(0.05)	(0.04)
Own building (dummy)	-0.03	0.43***	0.76***	0.08
	(0.03)	(0.09)	(0.11)	(0.14)
Male (dummy)	-0.19***	2.20***	2.07***	2.14***
	(0.03)	(0.08)	(0.12)	(0.13)
Years of schooling	-0.01**	0.04***	0.02	0.04***
	(0.01)	(0.01)	(0.02)	(0.02)
Age	-0.00	-0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Addis Ababa (dummy)	-0.11**	0.72***	0.28	1.13***
	(0.06)	(0.12)	(0.21)	(0.17)
Amhara (dummy)	0.05	0.14	0.15	-0.04
	(0.04)	(0.11)	(0.14)	(0.16)
Tigray (dummy)	-0.03	0.63***	0.42***	0.71***
	(0.05)	(0.12)	(0.14)	(0.24)
Urban (dummy)	-0.04	-0.35***	-0.39	-0.53
	(0.05)	(0.13)	(0.18)**	(0.21)**
Constant	—	2.09***	2.01***	2.68***
		(0.16)	(0.19)	(0.27)
R^2	0.127	0.478	0.470	0.510
N	1,325	1,325	636	689

Source: Authors' estimation based on the 2002–2003 Cottage/Handicrafts Manufacturing Survey, the 2002–2003 Large and Medium Scale Manufacturing Survey and the 2002–2003 Welfare Monitoring Survey.

Notes: Column I reports the marginal effects of a probit regression for the probability of being financially constrained when starting a business. Columns II, III, and IV report the results of an ordinary least squares regression where the dependent variable is the logarithm of starting capital. Robust standard errors corrected for any form of arbitrary heteroskedasticity are reported in parentheses. Significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

Clustering and the Capital Barrier to Entry

Taking the logarithm of start-up capital as the dependent variable, column II of Table 3 shows that clustering reduces start-up capital. Similarly, the greater the financial market inefficiency of a certain district, the lower the start-up capital is, implying the existence of limited access to both formal and informal finances in such locations. These results indicate that, even after controlling for financial market inefficiency, clustering, through specialization and division of labor, could lower the entry barrier for potential entrepreneurs.

Entrepreneurs in accessible locations, as captured by distance to the nearest all-weather road, invest a relatively larger amount of capital than do those in remote areas. On the other hand, entrepreneurs in urban areas invest relatively less capital than do those in rural areas. Whereas the first result may capture the higher valuation of accessible locations that could increase the capital entry barrier, the urban dummy variable, on the other hand, may have wider implications in terms of capturing the externalities from the existence of large firms and other complementary services in urban areas that may actually reduce the transaction costs of operating a business (Krugman 1991; Fujita, Krugman, and Venables 1999). Large urban areas are also more diverse, supporting a wide range of industrial activities in close proximity (Fujita, Krugman, and Venables 1999), which may help facilitate specialization and the division of labor. Interestingly, the coefficient of the urban dummy variable is much higher than that of

clustering, which indicates that the externalities and multiple specializations in urban centers have a greater impact on helping to reduce entry barriers.

Entrepreneurs who own nonresidential buildings invest a relatively larger amount of capital than do those who do not own such buildings. This shows that more wealth leads to higher savings, which one can either invest in a business or use to gain relatively better access to capital due to availability of collateral.

Male entrepreneurs are found to invest relatively larger amounts of capital than their female counterparts. The relatively limited savings (McKee 1989; Otero and Downing 1989) and lack of access to both formal and informal sources of finance among women entrepreneurs (FAO 1984) may lead them to invest in activities that have a lower entry barrier. Similarly, more educated and young entrepreneurs are found to make larger investments compared with less educated and older entrepreneurs. This could be due to better information-processing ability and search techniques regarding markets in general and credits in particular among more educated and young entrepreneurs (Wheeler 2006; Freedman 2008), which may result in them taking calculated risks to invest in activities that require larger investments with higher returns.

Columns III and IV of Table 3 show the comparison of the impact of clustering on start-up capital between enterprises investing in districts with low and high financial market inefficiency, respectively. The distinction between districts with low and high financial market inefficiency is made on the basis of the median value.[6] As expected, the impact of clustering on reducing start-up capital is higher for enterprises investing in districts with high financial market inefficiency, which illustrates the importance of industrial clusters as an alternative to propagate industrialization when the local conditions do not allow easy access to credit.

Robustness Check Using a Different Measure of Clustering

In this section, we check the robustness of the preceding results by using a different measure for clustering. Following the works of Adelman (1955), Levy (1991), Holmes (1999), and Sonobe and Otsuka (2006b), we use the average sales-to-value-added ratio of enterprises at the district level as a measure of clustering. This ratio tends to increase as the number of enterprises involved in the production process increases. The ratio therefore captures the concentration of specialized firms in a given district. The sales-to-value-added ratio, however, might be affected over time through a change in the prices of outputs and inputs, and it may not really capture the concentration of specialized firms (Sonobe and Otsuka 2006b). Having that shortcoming in mind, we checked the correlation between the location quotient and the sales-to-value-added ratio for the newly established enterprises at the district level, and we find that the two measures of clustering are positively correlated.

The marginal effects of the probit regression in column I of Table 4 show that the sales-to-valued-added ratio of clustering measure gives a similar significant negative effect on the probability of being financially constrained as the location quotient. Similar significant effects are also found where an increase in the average sales-to-value-added ratio at the district level reduces the amount of start-up capital, even after controlling for financial market inefficiency (Table 4, column II). Columns III and IV of Table 4 show the comparison of the impact of clustering on start-up capital between enterprises investing in districts with low and high financial market inefficiency, respectively. This effect is found to be higher for microenterprises investing in districts marked by high financial market inefficiency than for those investing in districts marked by low financial market inefficiency.

[6] A Chow test between the whole sample of enterprises and those investing in districts with high financial inefficiency shows a significant difference in coefficients across the two, justifying the need to have separate regressions for enterprises in low and high financially inefficient districts.

Table 4. Clustering, financial constraints, and entry barrier (alternative cluster measure)

	I	II	III	IV
Clustering (sales-to-value-added ratio)	-0.02***	-0.04**	-0.05**	-0.11***
	(0.01)	(0.02)	(0.03)	(0.04)
Financial market inefficiency (log)	0.04**	-0.21***	—	—
	(0.02)	(0.06)		
Distance to all-weather road (log)	-0.02**	-0.07**	-0.27***	0.09**
	(0.01)	(0.03)	(0.05)	(0.04)
Own building (dummy)	-0.02	0.43***	0.69***	0.15
	(0.03)	(0.09)	(0.11)	(0.14)
Male (dummy)	-0.21***	2.19***	2.06***	2.14***
	(0.03)	(0.08)	(0.12)	(0.13)
Years of schooling	-0.01**	0.04***	0.02	0.04***
	(0.01)	(0.01)	(0.02)	(0.02)
Age	-0.00	0.00	0.01	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Addis Ababa (dummy)	-0.23***	0.67***	0.27	1.20***
	(0.05)	(0.12)	(0.22)	(0.18)
Amhara (dummy)	0.07	0.14	0 .11	0.17
	(0.04)	(0.11)	(0.14)	(0.18)
Tigray (dummy)	-0.15***	0.55***	0.27*	0.64**
	(0.05)	(0.12)	(0.14)	(0.25)
Urban (dummy)	-0.01	-0.33**	-0.39**	-0.47**
	(0.05)	(0.13)	(0.18)	(0.20)
Constant	—	2.12***	2.10***	2.75***
		(0.17)	(0.21)	(0.29)
R^2	0.089	0.478	0.469	0.511
N	1,325	1,325	636	689

Source: Authors' estimation based on the 2002–2003 Cottage/Handicrafts Manufacturing Survey, the 2002–2003 Large and Medium Scale Manufacturing Survey and the 2002–2003 Welfare Monitoring Survey.

Notes: Column I reports the marginal effects of a probit regression for the probability of being financially constrained when starting a business. Columns II, III, and IV report the results of an ordinary least squares regression where the dependent variable is the logarithm of starting capital. Robust standard errors corrected for any form of arbitrary heteroskedasticity are reported in parentheses. Significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

Addressing the Issue of Causality

Although the preceding results show the relationship between clustering and capital entry barriers, the issue of causality could be a concern if there are any unobservable factors correlated with clustering that can have an effect on start-up capital. We try to address this issue by taking large firms that have better access to credit as a control group and analyzing the relationship between clustering and start-up capital in their respective situations. This can be seen as a "placebo" test, allowing us to show that clustering reduces start-up capital only when there is a lack of access to external financing and not because unobservable factors not captured by the model are at work.

Compared to micro- and small-scale enterprises, the large firms in Ethiopia, particularly state-owned and foreign-owned firms, have much better access to credit (World Bank 2009). According to the investment climate survey conducted by the World Bank in 2001–2002 and 2006–2007, large firms and especially state-owned ones are far less likely to identify themselves as constrained by costs of financing because they tend to have collateral either through ownership of buildings or land. In addition, the concentration of the banking sector by state-owned banks (nearly two-thirds of the banking system) has resulted in preferential treatment for state-owned and large firms (World Bank 2009). Large firms with better access to credit are therefore more likely to use the integrated mode of production rather than the cluster-based production structure.

Table 5 shows the regression results of the logarithm of starting capital on the two measures of clustering,[7] financial market inefficiency, and other explanatory variables using the 2002–2003 census data of the CSAE's Large and Medium Scale Manufacturing Survey. The regression, which is performed on the firms established in the five years preceding the time of the survey, shows that the clustering variables in both columns have the expected signs but are not significant, implying that clustering is not important when there is better access to credit. Although the regression is not done based only on data from the textile industry,[8] that clustering relates differently for producers with different levels of access to credit enables us to conclude that the observed correlation in Tables 3 and 4 between clustering and finance is causal.

Table 5. Clustering and entry barrier for large firms with good access to credit

	I	II
Clustering (location quotient)	-0.11 (0.38)	—
Clustering (sales-to-value-added ratio)	—	-0.11 (0.45)
Financial market inefficiency (log)	-0.32 (1.14)	-0.51 (0.86)
Distance to all-weather road (log)	0.36 (0.36)	0.45 (0.31)
Own building (dummy)	2.16*** (0.39)	2.16*** (0.39)
Male (dummy)	1.16* (0.59)	1.14* (0.59)
Public (dummy)	3.47*** (0.58)	3.47*** (0.58)
Foreign (dummy)	1.62*** (0.56)	1.63*** (0.56)
Addis Ababa (dummy)	0.32 (0.84)	0.51 (0.97)
Amhara (dummy)	0.28 (1.01)	0.25 (0.89)
Tigray (dummy)	-0.06 (0.97)	-0.16 (1.13)
Urban (dummy)	1.18 (0.74)	1.07 (0.82)
Constant	10.93*** (1.05)	11.28*** (1.87)
R^2	0.206	0.206
N	153	153

Source: Authors' estimation based on the 2002–2003 Large and Medium Scale Manufacturing Survey and the 2002–2003 Welfare Monitoring Survey.

Notes: Demographic information other than gender is not available about the owner of the firm. Sectoral dummies for different manufacturing activities are included in the regression but not reported in the table. Robust standard errors corrected for any form of arbitrary heteroskedasticity are reported in parentheses.

Significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

[7] Clustering of large firms is calculated at the zonal level by taking regions as a reference point.

[8] Because the number of newly established manufacturing firms in the textile sector is very small (only seven firms), the regression is done for all manufacturing firms and by including sectoral dummies.

7. CONCLUSIONS AND DISCUSSION

The absence of a developed financial market has been listed as a key obstacle to industrialization in developing countries in the development literature (Bigsten et al. 2000; Hernández-Trillo, Pagán, and Paxton 2005; McKenzie and Woodruff 2006, 2008). In this paper, we show that industrial clusters, as a form of production organization, can help ease the financial constraints of microenterprises even in the absence of a well-functioning capital market. By using data on microenterprise producers in Ethiopia's handloom sector, we find that clustering reduces the probability of being financially constrained when starting a business, after controlling for financial market inefficiency. This could be because the production system followed in industrial clusters promotes specialization and division of labor, allowing small entrepreneurs to invest in and start a business by focusing on activities that best suit their capital endowments, without them necessarily being financially constrained. Similarly, we show that clustering lowers the capital entry barrier by reducing the initial investment required to start a business. This depicts the importance of industrial clusters, through specialization and division of labor, in helping promote entrepreneurship at the early stage of industrialization. The impact of clustering on reducing start-up capital is shown to be even larger for enterprises investing in districts of high financial market inefficiency, implying that industrial clusters may be an important form of organizational response to capital market inefficiency.

Even if a well-developed financial market is crucial for industrial development, these findings indicate that industrial clusters could act as an alternative way to propagate industrialization when local conditions do not allow easy access to credit. China has achieved rapid industrialization in the past three decades despite its lack of a well-functioning financial market. Clustering largely explains how Chinese micro- and small-scale enterprises were able to function in that credit-constrained environment (Huang et al. 2008; Ruan and Zhang 2009; Long and Zhang 2010). Even if the institutional contexts in which clusters operate are not the same as in China, the cluster-based industrialization model may be applied to developing countries in Africa with similar capital endowments. Promotion of clusters, especially in divisible sectors, could therefore help developing countries engage the vast number of entrepreneurs in micro- and medium-scale industries in production processes and make better use of limited capital.

A possible caveat is this study's reliance on cross-sectional data, which does not allow us to see the effects of intertemporal changes of relative input prices and their effect on initial capital investment. That we cannot directly control for possible unobservable factors that can be correlated with clustering is another limitation. However, the placebo test performed on large firms with better access to credit does allow us to infer that the relationship between clustering and finance found in this study is causal.

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