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Credit Constraints, Organizational Choice, and Returns to Capital

Evidence from a Rural Industrial Cluster in China

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INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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ABSTRACT

Traditional economic theory posits that a well-functioning capital market is a necessary condition for industrialization and economic growth. In reality, micro and small enterprises are ubiquitous because entrepreneurs can undertake low-return activities with minimal barriers to entry. Using a cashmere sweater cluster in China as an example, this paper shows that organizational choice can overcome the prohibitive cost of investment. When facing credit constraints, firms are more likely to concentrate in divisible production technologies in the form of industrial clusters. Within clusters, a vertically-integrated production process can be decomposed into many small incremental stages that are more accessible for the small entrepreneurs widely available in rural China, thereby supporting industrialization even in the absence of a well-functioning capital market. The observed rate of returns to capital is closely related to the organizational choice under credit constraints.

Keywords: cluster; putting-out; subcontract; industrialization; entrepreneurship; China

1. INTRODUCTION

Over the past three decades, China has experienced the same degree of industrialization that took two centuries to occur in Europe (Summers, 2007). When China started its reforms in the early 1980s, rural areas and farmers lacked financial services, meaning that most small and medium enterprises (SMEs) lacked access to formal credit (Lin and Li, 2001). Traditional economic theory posits that a well-functioning capital market is a necessary condition for industrialization and economic growth (Goldsmith, 1969; McKinnon, 1973; Banerjee and Newman, 1993; King and Levine, 1993; Rajan and Zingales, 1998, Ayyagari, Demirgüç-Kunt, and Maksimovic, 2006). In theory, China's lack of financial development during the initial stage of industrialization should have prevented investments in machinery and other assets required for nonfarm production. However, vast rural areas in coastal China became industrialized at an unprecedented speed and now produce a wide range of manufactured goods. This begs the question: How did SMEs in China get around the credit constraints and launch their businesses?

Empirical studies suggest that entrepreneurs in emerging markets can start out with little capital and invest their profits for further growth (Mead and Liedholm, 1998; McKenzie and Woodruff, 2006). The studies find that micro and small enterprises are ubiquitous because entrepreneurs can undertake low-return activities with minimum barriers to entry. These studies also identify a large variation in capital entry barriers across sectors. For example, there is a hurdle in the range of $1,000 to $2,000 in the manufacturing sector in Mexico, whereas the barriers to entry in the service and trade sectors of this country are much lower (McKenzie and Woodruff, 2006). Based on manufacturing surveys in several African countries, Bergsten *et al.* (2000) also find that African firms face high capital costs in the manufacturing sector. Although these studies show that entrepreneurs can start small in activities requiring small investments, they cannot rule out the possibility that high start-up costs may prevent small firms from growing in the manufacturing sector. Since the development of a manufacturing sector is crucial to the process of industrialization, more in-depth case studies are needed to examine whether or not capital barriers to entry have a threshold effect (McKenzie and Woodruff, 2006).

China's rapid industrialization provides an unparalleled opportunity to examine this issue. One key feature of China's industrialization is that it is cluster-based, and has been driven by a large number of SMEs (Long and Zhang, 2008). Contrary to traditional theory, this suggests that capital barriers might have not prevented entrepreneurs from setting up businesses in the manufacturing sector. Without denying the importance of financial development, this paper uses a cashmere sweater cluster in China as an example, and argues that organizational choice can largely overcome the prohibitive cost of investment. Facing credit constraints, firms are more likely to concentrate in divisible production technologies and form industrial clusters. Within clusters, a vertically-integrated production process can be decomposed into many small incremental stages that are more accessible to the small entrepreneurs widely available in rural China, thereby supporting industrialization even in the absence of a well-functioning capital market.

This paper first posits the theoretical model that credit constraints influence entrepreneurs' technological choices. In the absence of outside credit, entrepreneurs must rely on their own savings. As their savings increase, they choose increasingly capital-intensive, more profitable production technologies. Because potential entrepreneurs with more financial resources always have the option to invest in less-expensive technologies, it is expected that the rate of returns to capital will be positively correlated to the minimum level of investment of a chosen production technology, as predicted by the Baumol hypothesis (Baumol, 1959). In reality, once a business reaches a certain size, banks grow willing to provide outside capital based on the enterprise's available collateral. With more capital available from this point forward, larger firms expand with diminishing returns to capital. This model suggests that there is an inverted-U-shaped relationship between rate of returns to capital and capital stock.

In the cashmere sweater cluster, there are two different production technologies. Larger firms with access to outside credit are more likely to choose the more capital-intensive, vertically-integrated factory system, where most stages of production are managed within one organization. Most entrepreneurs with limited savings, in contrast, lean toward independent workshops or small enterprises that are part of a merchant-coordinated putting-out system. The capital requirement for most of the divisible production technologies in a putting-out system is significantly lower than that for an integrated factory system. In terms of performance, empirical results based on primary surveys in the cashmere sweater cluster show that as the average capital stock employed increases, profitability increases up to a maximum, and then declines progressively thereafter.

This paper is arranged as follows. Section 2 reviews the available literature and puts forward a theoretical model on credit constraints, organizational choice and returns to capital. Section 3 presents a narrative of the Puyuan cluster and the major modes of production. Section 4 describes the data and provides summary statistics. Section 5 estimates the relationship between rate of returns to capital and assets, and tests the hypotheses. The paper concludes in Section 6.

2. CONCEPTUAL FRAMEWORK

Recent studies find that financial development is related to the organizational choice of production. Acemoglu, Johnson, and Mitton (2007) argue that when the capital market is well developed, firms are more likely to be vertically integrated, in order to take advantage of economies of scale. In countries where the financial market is well developed, population density is low, and labor cost is high, entrepreneurs tend to invest in larger, more profitable factory systems that are normally capital intensive. This is why vertically-integrated firms are more popular in the US than elsewhere. However, in some countries where population density is much higher and the capital market is well functioning (such as Japan and Italy), the clustering (or subcontracting) mode of production is seen alongside the integrated factory system (Piore and Sabel, 1984).

This paper focuses on the initial stage of industrialization, when credit constraints are a major concern (Freedman and Click, 2006). The prior findings on the relationship between financial development and organizational production choices are mixed. On one hand, some studies argue that large, integrated firms are more likely to be observed because small enterprises cannot be launched in the absence of credit (Rajan and Zingales, 1998). On the other hand, McKenze and Woodruff (2006) posit that entrepreneurs facing credit constraints tend to choose activities that require minimal capital, favoring the establishment of micro and small enterprises.

The development of financial systems capable of extending credit to SMEs has been widely called for in both theory and policy (Murdoch, 1999). However, despite noted successes, such as the microfinance programs in some developing countries, SMEs in these countries generally still have more difficulty obtaining low-interest loans compared to large firms, for several reasons. First, because the cost of managing a bank account is largely fixed, a small loan commands relatively higher transaction costs than a large loan. This reduces the incentives of formal banks to provide small loans to SMEs. Second, information asymmetries may discourage banks from extending credit to SMEs. These information problems are typically associated with inconsistencies in the financial statements of SMEs and the lack of third party credit information providers in the marketplace. Finally, the inability of SMEs to provide collateral and build borrowing relationships with banks exacerbates the information problem and the resulting credit rationing. In short, the path to industrialization via financial development seems like a daunting task.

Here, we argue that there could be an alternative path through organizational choices of production. If a production technology can be broken into many small steps through organizational innovations, such as the putting-out system or subcontracting, it should be possible for many entrepreneurs with limited capital and minimal access to credit to participate in the production process. This approach has been largely neglected in the literature, with a few exceptions (Leff, 1978; Hayami, 1998).

To illustrate this point, we next develop a theoretical model. Following the classical model of Evans and Jovanovic (1989) (called the 'EJ model' hereafter), we assume an entrepreneur's revenue as：

$$y = \theta\, k^{\alpha} \varepsilon \tag{1}$$

where θ is a technology parameter, k is capital investment for a project, α is capital-output elasticity, and ε is a random term. Unlike the EJ model, we do not consider entrepreneurial talents in our model.

Suppose that that an entrepreneur's initial wealth is z. If the required investment, k, is greater than z, then the entrepreneur needs to borrow from outside with an interest rate of r. If we ignore the random term ε, then the entrepreneur's profit equation can be written as:

$$\pi = y - r(k - z) = \theta\, k^{\alpha} - r(k - z) \tag{2}$$

Under the risk-natural assumption, the entrepreneur will make an investment to maximize his profit as shown in (2). The interior solution, if it exists, will satisfy the following first-order condition:

$$K^* = (\frac{r}{\theta\alpha})^{1/\alpha - 1} \tag{3}$$

Similar to the EJ model, we also write the maximum amount of investment an entrepreneur can mobilize as λz, where λ measures the degree of capital market development. The more developed the capital market, the larger λ. We then introduce the minimal capital investment, K_b, for the production technology. For an investment to be viable, the optimal investment must meet the following condition:

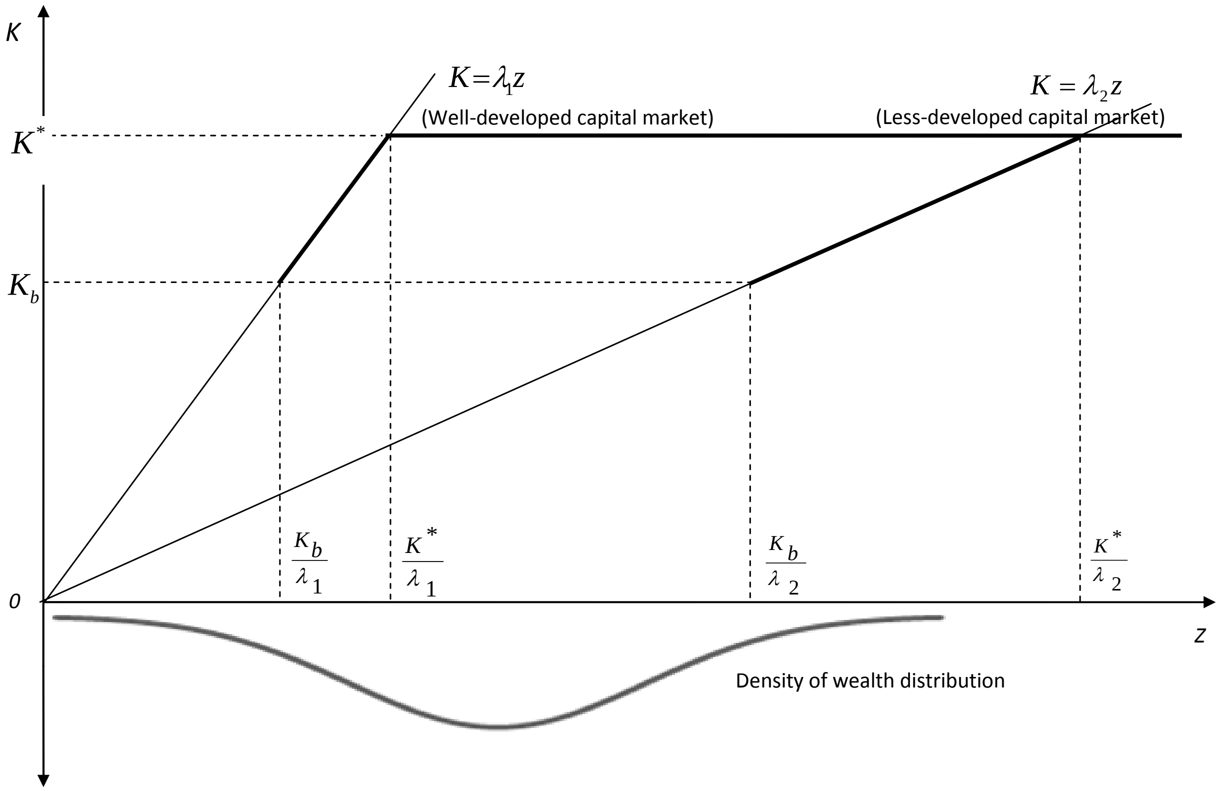
$$K^* \in [K_b, \lambda z] \tag{4}$$

A potential entrepreneur with initial wealth *z* may face three choices depending upon his wealth level: (1) If his total available capital is lower than the entry barrier ($\lambda z < K_b$), he will not be able to enter the business. (2) If his mobilized capital is larger than the minimal required investment, but below the optimal point ($K_b \le \lambda z < K^*$), he will make an investment but not at the optimal amount he wishes. (3) If his available capital exceeds the optimal investment point ($\lambda z \ge K^*$), he will choose K^*.

Now we consider how capital market development influences entrepreneurs' investment choice. Let us use λ_1 and λ_2 to represent the cases of well-developed and less-developed capital markets. The horizontal axis lists the potential entrepreneurs' levels of initial assets. The bottom part of the figure represents the density distribution of entrepreneurs with different amounts of capital. The actual investment amounts can be seen on the vertical axis above the horizontal axis.

As shown in Figure 1, when the capital market is well developed (λ_1), the potential entrepreneurs shown on the right hand side of K_b/λ_1 can overcome the minimal capital requirement, K_b. Entrepreneurs with wealth is equal to or greater than K^*/λ_1 choose the optimal level of investment, K^*. However, when the capital market is less developed (λ_2), only individuals whose assets are no less than K_b/λ_2 will become entrepreneurs, and only those few people having wealth above a very high level of K^*/λ_2 will be able to make the optimal investment. Fewer entrepreneurs will be able to invest in this case compared to the first case, and most entrepreneurs are credit constrained. According to this model, an improvement in the financial market (change from λ_2 to λ_1) will enable many potential entrepreneurs with assets between K_b/λ_2 and K_b/λ_1 to become entrepreneurs.

Figure 1. Entry barriers, capital market development, and entrepreneurial choice



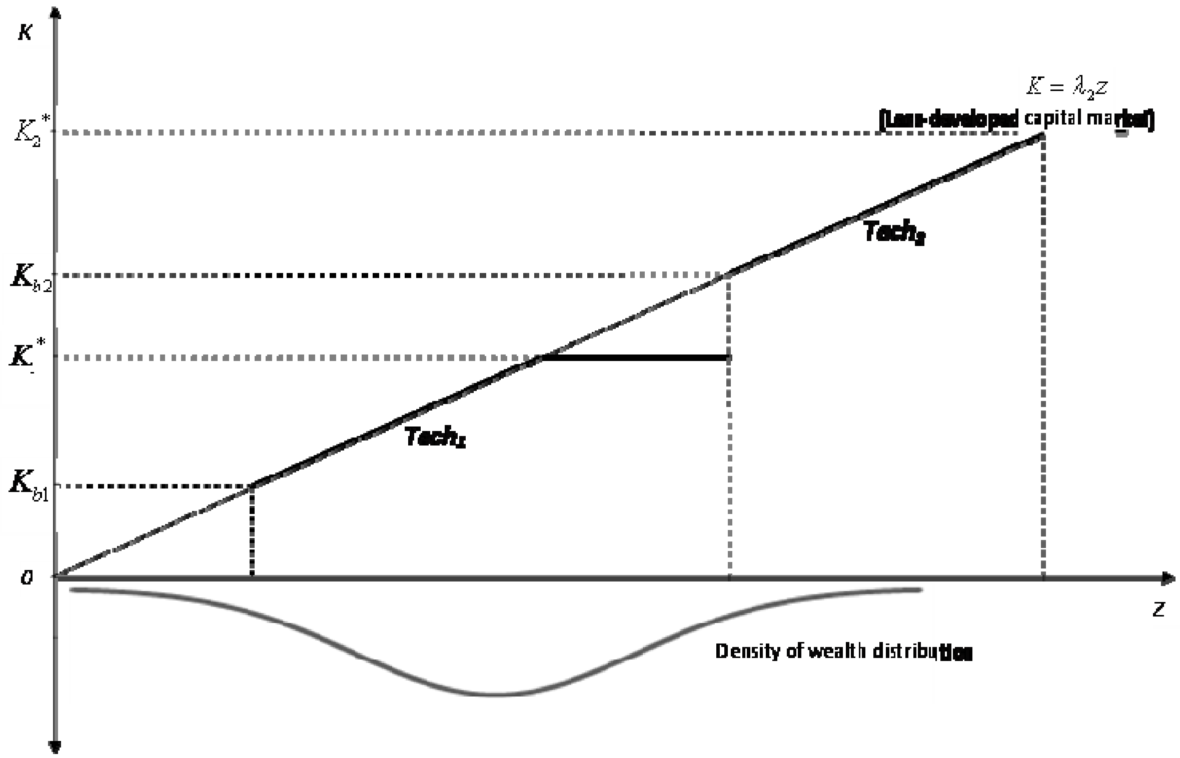
In reality, when facing the prohibitively high entry barrier of a production process, entrepreneurs may choose an alternative path by decomposing the process into many small incremental steps, through organizational innovations such as clustering, thereby lowering the minimum capital requirement. Recent case studies in China provide strong evidence for the role of clustering in overcoming capital barriers to entry (Huang *et al*., 2008; Ruan and Zhang, 2009). Let us use Figure 2 to illustrate this point. Suppose an integrated production technology $Tech_2$ can be decomposed into many incremental steps, one of which is $Tech_1$. Because of the rather low entry barrier for $Tech_1$, even in the presence of a less-developed financial market (λ_2), many people can still become entrepreneurs by investing in $Tech_1$.

We now more rigorously formalize the idea behind Figure 2 to examine the relationship between technology choice and profitability in the presence of credit constraints. We write the profit of the two production technologies as:

$$\pi_i = \theta_i \, k_i^{\alpha} - r(k_i - z) \tag{5}$$

where i=1 and 2 stand for *Tech1* and *Tech2*, respectively, and $\theta_2 \geq \theta_1; k_i \geq K_{bi}$.

Figure 2. Entry barriers and entrepreneurial choice of production types



In many developing countries, the micro and small enterprises are often credit constrained. Because of their limited capital availability, most of them fail to achieve the optimal level of investment. Their investment level is in proportion to their wealth level, as shown by the line of $K = \lambda_2 z$ in Figure 2. For technology *i*, the rate of returns to capital equals:

$$r_i = {[\theta_i\, k_i^{\alpha} - r(k_i - z)]} \Big/ {k_i} \qquad (6)$$

where $z = k_i / \lambda$. Under the assumption of $\alpha \in (0,1)$, the following holds:

$$\partial r_i \big/ \partial k_i = \theta_i (\alpha - 1) k_i^{(\alpha-2)} < 0 \qquad (7)$$

Equation （7） shows that under imperfect capital markets, for a given technology, the rate of returns to capital declines with capital investment.

Baumol put forward a famous hypothesis (1959) predicting higher rates of return in enterprises requiring higher capital investment when barriers to entry are associated with capital availability. If the Baumol hypothesis holds, then we would expect to observe a positive relationship between the capital barriers to entry and the corresponding rate of returns to capital. For the Baumol hypothesis to hold, the underlying production technologies must meet certain conditions.

According to equation (6), at the level of capital entry barrier, the rate of returns to capital is:

$$r_i = {[\theta_i\, k_{bi}^{\ \alpha} - r(k_{bi} - z)]} \Big/ {k_{bi}} = \theta_i k_{bi}^{\ \alpha-1} - r + \frac{rz}{k_{bi}} \qquad （8）$$

If r_2>r_1， then:

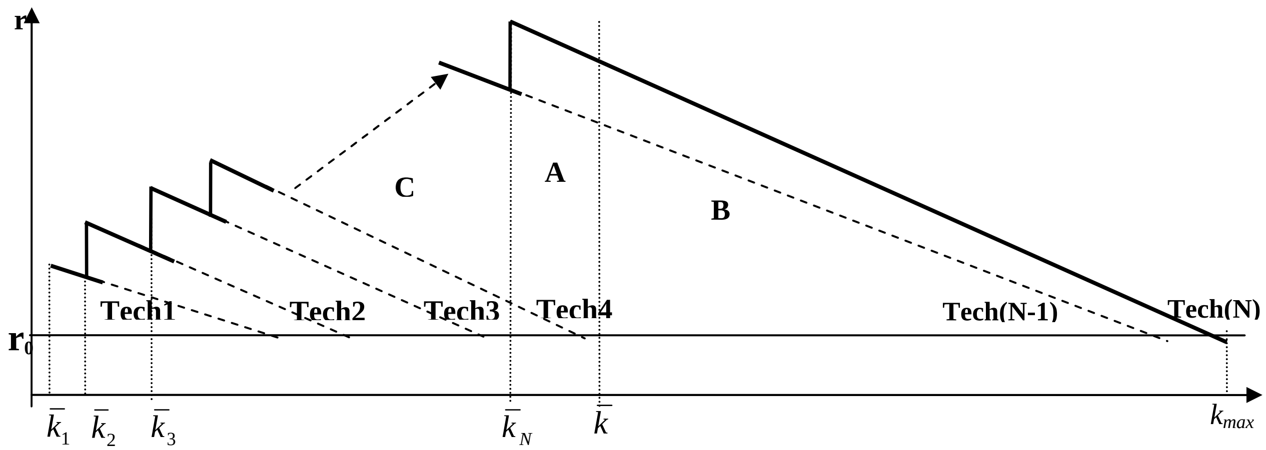
$$r_2 - r_1 = \theta_2 k_{b2}^{\alpha-1} - \theta_1 k_{b1}^{\alpha-1} + \frac{rz}{k_{b2}} - \frac{rz}{k_{b1}} > 0 \qquad (9)$$

For the above to hold, θ_2 must be significantly higher than θ_1 as shown below:

$$\theta_2 > \theta_1 \left(\frac{k_{b2}}{k_{b1}}\right)^{1-\alpha} + rz \frac{k_{b2} - k_{b1}}{k_{b2}^{\alpha} k_{b1}} \qquad (10)$$

Figure 3 demonstrates the relationship between technological choice and rate of returns to capital for a more general case of *N* different types of technology, if both equation (7) and the Baumol hypothesis (equation 9) hold. The zigzag lines show the rates of returns to capital for *N* types of production technologies. Suppose there is an integrated process to manufacture product $Tech_N$, which requires a high level of minimum investment, $\bar{k}_N$.

Figure 3. Credit constraints, technology choice, and returns to capital



Note: The horizontal axis stands for a firm's assets in logarithmic form, the vertical axis represents the rate of returns to capital, and r_0 is the low interest rate provided to larger firms.

Without a capital market, only investors with more than $\bar{k}_N$ capital can afford to enter the business. In this case, only firms will have this kind of integrated production technology. The total profit is the area *A* below line $Tech_N$ and between $\bar{k}_N$ and $\bar{k}$ (the maximal available capital).

Under a more realistic scenario, let us suppose that large firms can obtain credit from banks through collateral. Because their internal rates of returns to scale are higher than the borrowing cost, the large firms will expand their production with the potential to reach a point where the rate of returns to scale is equal to the interest rate, r_0. With access to credit, these large firms will generate more profit, as shown in area *B* of the figure. Production is dominated by a few large firms and SMEs are largely suppressed.

In the third case, suppose that the vertically-integrated production process, *N*, can be divided into *N-1* small steps through organizational innovations, such as the putting-out system or subcontracting. The capital barriers for these incremental steps range from a low $\bar{k}_1$ to $\bar{k}_{N-1}$, all of which are lower than those for the integrated production process as a whole. Any entrepreneurs with financial resources greater than $\bar{k}_1$ can invest in $Tech_1$. Individuals with resources exceeding the minimum capital requirement of $Tech_2$

are more likely to choose $Tech_2$ instead of $Tech_1$, although they have the option to invest in $Tech_1$, because the lower entry barriers inherent in $Tech_1$ intensify competition and lower the profit rate of $Tech_1$. Following the same logic, investors with resources from $\bar{k}_3$ to $\bar{k}_{N-1}$ will tend to select production types from $Tech_3$ to $Tech_{N-1}$, respectively. In summary, if a production technology is divisible and credit constraints are present, entrepreneurs are more likely to select vertically-divisible production technologies. The traditional putting-out system, subcontracting and clustering are several examples that make the vertical division of labor possible. The finer division of labor enables more entrepreneurs to participate in the production process, thereby generating more profit, as marked by area *C* in the figure.

In reality, credit constraints for SMEs and credit support to large firms may go hand in hand. The formal banking sector is generally willing to extend credit to large firms (Freedman and Click, 2006). In this case, the profit curve will extend all the way down to point k_{max}, where the rate of returns to scale equals the borrowing cost. In such a case, we should observe an inverted-U-shaped relationship for data encompassing both small and large firms.

Our theoretical model therefore yields two testable hypotheses:

Hypothesis 1: There is likely to be a positive correlation between capital barriers to entry and returns to capital when financial markets are less developed (Baumol hypothesis). If banks provide loans only to large firms with certain asset levels, the above relationship may exhibit an inverted-U shape.

Hypothesis 2: After controlling for differences in entry barriers among different types of production technologies, the marginal rate of returns to capital declines with capital investment.

If financial markets are perfect, we would expect to observe equal rates of return regardless of investment level. In other words, the correlation between *r* and *k* will be close to zero. Therefore, an empirical test of the above two hypotheses will also reveal the degree of financial market development.

Finally, this paper will also contribute to the debate on firm size and returns to capital. Inspired by Baumol's seminal work, numerous studies examine this relationship. In general, the empirical findings are mixed. Using data from Fortune Magazine's "Directories of 500 largest Industrial Corporations," Hall and Weiss (1967) find large firms have higher profit rates, as Baumol proposed. Using larger samples and controlling for market share and concentration, however, Shepherd (1972) and Amato and Wilder (1985) find no relationship between firm size and profit rate. Dhawan (2001) finds that small firms are significantly more productive but also more risky than their larger counterparts in the US industrial sector. Because different industries may follow different business cycles, it is hard to test Baumol's hypotheses using aggregate data from many industries. Moreover, most of the empirical studies mentioned above exclude small firms due to lack of data. The present paper addresses this issue by using primary survey data from a single industry, covering the whole spectrum of firm sizes.

3. A NARRATIVE OF THE PUYUAN CASHMERE SWEATER CLUSTER

Brief History of the Puyuan Cluster

Puyuan Township is located in northern Zhejiang Province, between Hangzhou and Shanghai. Historically, Puyuan was an important silk production center. In 1976, a collectively owned enterprise, the Puyuan Tanhua (Weaving) Production Cooperative, purchased three hand-loom weaving machines and began to produce cashmere sweaters. The gross output value of the cooperative soared from 28,000 *yuan* to 300,000 *yuan* in just one year, prompting the group to devote all of its production capacity to cashmere sweaters by the end of 1977 (Chen, 1996).

This firm's huge success prompted farmers in nearby villages and workers from the township and village-owned enterprises to set up their own cashmere sweater production workshops. Meanwhile, market demand for clothes surged exponentially after the success of rural reform in the mid-1980s; this ever-increasing demand greatly stimulated production. Due to lack of savings, most entrepreneurs initially worked from home using a few secondhand weaving machines, and sold the sweaters along a main road linking Shanghai and Hangzhou. However, large crowds often gathered at these points of sale, blocking traffic. In April of 1988, the township government and the local administration for industry and commerce responded to this issue by raising 580,000 *yuan* from different sources and constructing a cashmere sweater marketplace. Located on the southern side of the main road, this marketplace initially comprised over 4,300 square meters of building area and more than 50 rooms. Both local merchants and those from other regions of Zhejiang Province quickly moved into the marketplace and began doing business. The openness of the marketplace deepened the division of labor, with merchants often putting-out production to different workshops in Puyuan after receiving market orders. In 1990, the township produced over 2.8 million sweaters, and approximately 90% of the households in Puyuan Township and its peripheral villages were engaged in the production of cashmere sweaters.

By 1992, the old marketplace had exceeded its capacity. Between 1992 and 1994, the local government further raised nearly 100 million *yuan* and built 11 more marketplaces with more than 3,000 rooms for intermediate inputs and cashmere sweaters. Once again, the new marketplaces were very popular and quickly became filled with merchants from all around China. The establishment of standard markets for intermediate and final goods enabled small family workshops to easily access raw materials, intermediate inputs, and national markets. Easy market access also lowered the transportation and marketing costs. As a result, the majority of entrepreneurs chose to specialize in only one stage of production. Cashmere sweater production recorded an explosive growth in this period. As of 1994, Puyuan's sweater production capacity reached as many as 10 million pieces with market sales exceeding 2 billion *yuan*, making it the largest production center of cashmere sweaters in China.

By the late 1990s, the large expansion of low-end cashmere sweaters had largely driven prices down. The profit margin for enterprises producing high-quality, brand name sweaters was much higher, but Puyuan had very few well-known local brands at that time. Thus in 2000, the local government set up an industrial park of 2,245 *mu* (1 *mu*=0.067 hectare) in an attempt to attract well-known cashmere sweater enterprises with famous brands from elsewhere in China. Due at least in part to preferable land, tax, and credit policies, the industrial park was quickly occupied to full capacity. In addition, the local government encouraged local enterprises with high growth potentials to settle in the park, expand their production, and establish their brands.

As of 2007, over 4,000 enterprises and family workshops in the Puyuan Township were engaged in the production of a variety of cashmere sweaters, and the market boasted more than 6,000 sweater shops. Over 60,000 people worked in different stages of the cashmere sweater production in this cluster. The market transaction turnover topped 10 billion *yuan* and the business volume amounted to nearly 500 million pieces.[1] Along with the rapid growth in production, the local population jumped from less than

[1] Data source: Puyuan Administrative Committee of Marketplace.

30,000 in 1992 to more than 130,000 in 2005; among the latter, over 90,000 were migrant workers (Tongxiang Statistical Bureau, 2007).

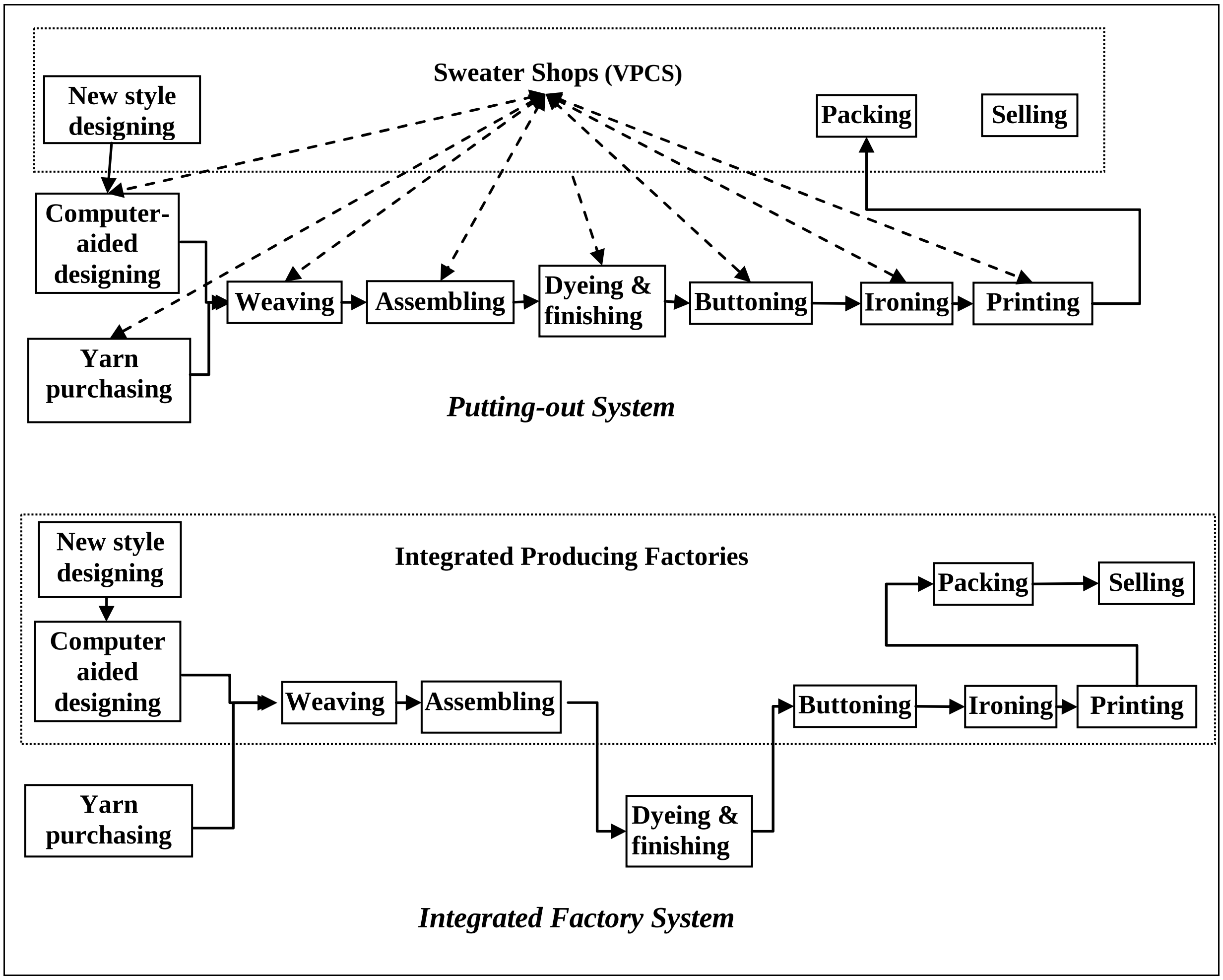
Two Modes of Production Organization

The Puyuan cashmere cluster includes two major modes of production: the putting-out system and the integrated factory system. In the following section, we briefly introduce the two systems.

Putting-Out System.

The putting-out system is a merchant-led production organization form that consists of virtual production coordinators (shortened as VPCs) and many independent workshops and small enterprises. Silk production systems adopted the putting-out system as early as the Ming and Qing dynasties. According to *Puyuan Township History* (Chen, 1996), silk merchants purchased raw materials and then contracted out the production to individual workshops at the time. Because the workshops usually did not have much capital, they normally did not purchase raw materials by themselves. Instead, their major source of income was processing fees. Although silk and sweater productions differ in their technical details, their organizational modes of production are similar. Typical cashmere sweater production includes 10 main steps, as shown in the upper part of Figure 4: purchasing yarn, computer-aided design (CAD), weaving, assembling, dyeing and finishing, buttoning, ironing, printing, packing, and sale.

Figure 4. Two modes of production systems



In the putting-out system, although most of the production takes place in independent workshops, the VPCs play a key role in coordinating the production process. These VPCs either rent or own shops in the township's designated sweater marketplaces. More often than not, they imitate designs from bigger companies or fashion magazines, create sample sweaters from these designs, and display the samples in their shops. As Puyuan is the largest cashmere sweater market in China, many merchants visit the shops in the marketplaces before putting in orders. When the VPCs receive orders or believe that a certain style will sell well, they purchase raw materials from the marketplace and have them delivered to family weaving workshops further down the production chain. The generated semi-finished goods are sent to dyeing, finishing, printing, and ironing enterprises, and the VPCs (merchants) perform quality inspections and package the final products in their shops. If any quality problems are identified, the VPC will trace it through the production steps and resolve the issue with the responsible party.

The capital requirement for yarn dealers is high because they need a large amount of working capital for the yarns stocked in their shops. The Puyuan cluster comprises 250 yarn dealers, 5,700 sweater merchants, and over 4,000 production workshops. The local government has set up specific marketplaces for yarn and sweater merchants. Ironing workshops are concentrated in a designated area with access to centrally-provided gas. A few villages in the township have demolished scattered farmers' houses and rebuilt them into more compact six-story townhouses. Usually, the workshops are located on the first and second floors of the farmers' houses, the workers sleep on the third to fourth floors, and the local residents live on the top floors and collect rents from the workshops. Most workshops are within a three-kilometer radius of the sweater marketplace.

Integrated Factory System.

The lower part in Figure 4 depicts the second business model, which has integrated enterprises at its core. These businesses design their own samples, purchase yarn from the yarn dealers in the marketplace or directly from yarn factories, and complete the weaving process in-house. They then typically outsource the semi-finished goods to specialized dyeing and finishing workshops/factories. After these steps, the products are returned to the integrated enterprise, where they are buttoned, ironed, sorted, printed, and packaged before being ultimately shipped out to the national market through the logistics center in Puyuan. Some enterprises may further outsource the ironing and printing stages.[2] Most of these integrated enterprises are located in the industrial park.

It should be noted that yarn dealers and dyeing/finishing factories serve both putting-out and integrated factory systems as separate entities. Yarn dealers usually rent a shop in the yarn marketplace; the yarn shop requires only one or two people, but the business is rather capital intensive. Because its business model is similar to that of the sweater merchants, we include it as part of the putting-out system in our analysis. The dyeing and finishing factories, in contrast, usually have large buildings, employ a number of workers, and include many indivisible technical stages. Most of them are located in the industrial parks, together with the integrated factories. In the following analysis, we therefore regard them as an integrated factory.

[2] Banerjee and Munshi (2004) define a firm as integrated if it includes more than one stage of production.

4. DATA SOURCES AND DESCRIPTIVE STATISTICS

Since 2005, we have paid numerous visits to the cluster and kept in close contact with a number of key people in the industry, including officials at the Puyuan Administrative Committee of Marketplaces, as well as merchants, workshop owners and workers. Through conversation and observation, we have gained a deep understanding of both production systems. This greatly helps us obtain valuable information about various business activities when we conduct our surveys.

Data Sources

Our data come from two sources. The data on integrated firms in 2006 were obtained from the Administrative Committee of Puyuan Industrial Park (ACPIP). The enterprises in the industrial park are required to submit to the ACPIP accurate statistics on their fixed investments, numbers of workers, gross output values, profits and taxes. After we excluded seven enterprises that had just been set up in 2006 or lacked complete data, the sample comprised 118 enterprises, including 94 integrated factories and 24 dyeing/finishing factories.

In addition to this secondary data on the integrated firms in the industry park, we also conducted primary surveys in enterprises located outside the industry park in June and July of 2007. To make the sample more representative, we randomly selected the same number of VPCs from sections of marketplaces selling low-, middle- and high-end yarns and sweaters. The production of sweaters is scattered in villages surrounding the township center. Some villages have redesigned their residential and industrial areas to support the industry, while others have maintained the status quo. As a result, the rents of workshops differ between the two types of villages. We surveyed both types of villages to capture the difference. Table 1 presents the sampling framework, along with summary statistics of employment and capital stock. In total, we surveyed 200 merchants and workshop owners. After excluding 12 questionnaires with incomplete answers, we were left with a sample comprising 188 questionnaires, including 58 yarn dealers, 62 sweater merchants, and 68 production workshops. Among the production workshops, the sample included 10 computer-aided designers, 14 weavers, 12 assemblers, 10 buttoners, 11 printers, and 11 ironing workshops. We tried to survey at least 10 enterprises from each type of production.

We made a concerted effort to obtain reliable labor force, capital stock and profit information. Because firms in the industrial park have certified formal accounting systems in place, the figures they provide to the administrative committee are relatively standardized. However, unlike the large factories in the industrial park, most merchants and workshop owners do not keep standard accounting books. Moreover, many of them were cautious about revealing sensitive information related to their business during the interview. Many refused to answer questions about profit and taxes. This posed a major challenge for our survey. Therefore, we adopted following measures to address the issue.

Table 1. Comparison of workers and capital stock between two production systems

	Total	Sample	Number of workers in sample			Number of total workers	Capital stock (10,000 *yuan*)			Received bank loan (%)
			Max	Min	Mean		Max	Min	Mean	
Putting-out system										
Yarn dealers	250	58	3	1	2.14	535	176	39.6	92.23	58.62
Sweater shops (VPCs)	5,750	62	4	1	2.11	12,133	130	26	64.74	30.65
Computer-aided designers	20	10	2	1	1.8	36	18.62	8.92	12.98	10.00
Buttoning workshops	300	10	8	2.5	4.4	1,320	13.07	8.2	10.17	0.00
Ironing workshops	100	11	4	2.5	3.18	318	7.46	5.12	5.97	0.00
Assembling workshops	300	12	6.5	2	3.63	1088	11.38	4.58	6.93	8.33
Printing workshops	100	11	15	2	5	500	121.29	10.59	36.1	0.00
Weaving workshops	3,000	14	60	2	13.21	39,630	78.43	6.04	38.01	28.57
Vertically-integrated system										
Dyeing & Finishing factories	60	24	155	16	59.46	3,567	6,937	100	1,442.46	90.91
Integrated producing factories	136	94	573	10	60.69	8,254	15,353	14	1,254.01	71.43

Labor Force

We herein define labor force as the total number of employees in an enterprise. In other words, an entrepreneur is treated as the same as a hired worker; if an entrepreneur hires a single worker into the business, we count the labor force as two. In reality, entrepreneurs usually work harder than workers. We will come back to this point later on, when we analyze the reasons behind the observed performance difference between the two types of production system. Some workshops hire workers only during the peak season, and maintain these workers for five to six months. Under this circumstance, we multiply the number of seasonal workers by a factor of 0.5.

Capital Stock

Because merchants do not have machinery, the calculation of their capital stock differs from that for family workshops. A merchant needs a shop and working capital to operate. We define the total capital stock as the sum of the present market value of their shop and their working capital. For family workshops, in addition to the value of shops and working capital, we also take the value of machinery into account. As merchants and workshops are clustered in designated areas, the market values of the shops and machinery are transparent and homogenous. In the survey, we asked for details on the timing and price of major machines purchases. Based on a published fixed asset price index and depreciation rate, we computed the present value of the machinery in 2006.[3]

Profit

The profit data obtained from the ACPIP refers to net profit, which excludes wages and taxes. Not surprisingly, some enterprises reported negative net profits. For enterprises outside the industrial park, we had to compute the net profit. Firms' wage costs were calculated by multiplying the total number of hired workers by the local wage level. In the cluster, the labor market is competitive and the wage range is narrow. Most workers are migrants, and they often exchange labor market information among themselves. Moreover, the marketplaces are rife with help-wanted advertisements that specify wages. If workers are underpaid in one workshop, they can switch to another, better-paying workshop at a low or negligible cost. By talking to workers and looking over the help-wanted postings in the marketplaces, we determined that a typical worker earned between 12,000 and 18,000 *yuan* per year, with 15,000 *yuan* as the median value. Accordingly, we multiplied the total number of workers by 15,000 *yuan* to obtain the total wage.

In our preliminary survey, we found that most entrepreneurs did not want to reveal their net profits and taxes. However, they did not mind talking about the sales of their product. Therefore, we adopted an indirect method for determining profit in the final survey. First, we chatted with the merchants or workshop owners about the market situation of their products, such as whether they were targeting the high end or the mass market. Then, we asked the price of their products. Next, we shifted to other aspects of the questionnaire that were seemingly unrelated to profit. After we felt that the interviewees were more at ease, we asked them their total sales in 2006. At this stage, most of the entrepreneurs gave us definite answers. For the processing workshops, where the major revenues were processing fees based on a per-piece rate, the workshop owners were general willing to tell us the piece rate and the total number of pieces finished in 2006. We could then use this information to calculate the total revenues. In addition, we also surveyed other major cost items, such as utilities, interest payments, and taxes. By deducting wages and other major costs from the calculated revenues, we were able to estimate the net profits.

[3] Following Li (2003), we set 0.04 as the discount rate.

Performance Comparison

Scale of Operation

The enterprises in the putting-out system are much smaller than the integrated firms in the industrial parks. Many of the yarn and sweater shops were run by husband and wife teams, some of whom hired one or two helpers. The raw materials and intermediate products were frequently transported from one processing point to another by a number of three-wheeler drivers. The designer shops were also small, usually comprising only one or two people, along with a computer, scanner, and printer. The weaving workshops were generally bigger than the other workshops, with an average of 13 workers. The assembling, buttoning, printing, and ironing workshops usually employed fewer than five people. In contrast, the enterprises in the industrial park were much bigger, averaging more than 60 workers. The Puyuan Administrative Committee of Marketplace provided us with the total number of enterprises by type. Based on the average sizes found in our sample, we were able to calculate the total number of workers by type in Puyuan (See Table 1 for details). In total, the putting-out system employed about 55,000 workers while the integrated enterprises employed about 12,000 people.

Profit

Table 2 reports the rate of returns to scale and capital-labor ratio. The yarn dealers and sweater merchants had the highest capital-labor ratios, followed by the integrated enterprises in the industrial park, and then the production workshops in the putting-out system. The putting-out enterprises are typically more labor intensive than their vertically-integrated counterparts. Most SMEs hire family laborers. Some family members may work longer hours than hired workers, while other family members may work shorter hours so they can take care of family chores. Because we use imputed wages to compute profit, the accuracy of the wage data will affect the net profit. To check whether the estimated rate of returns to scale is sensitive to the working hours of family members, we calculated two rate of return sets (r_1 and r_2), assuming that family members worked the same hours as and 25% longer than hired workers, respectively. When assuming longer working hours, the rate of returns to scale drops from 0.32 to 0.25 for the enterprises in the putting-out system. In particular, the two most labor-intensive workshops (those engaged in ironing and assembling) had the most dramatic decline. With rather low capital requirement and easy entry, the profit rate margin for these two types of production is thin. Entrepreneurs often rely on extended working hours to make a profit. No matter whether r_1 or r_2 is used, the putting-out system exhibits a higher rate of returns to scale compared to the vertically-integrated firms. Among the enterprises in the putting-out system, the rate of return appears to be positively related to the capital-labor ratio.

Table 2. Rate of returns to scale

	r_1	CV(r_1)	r_2	CV(r_2)	K/L
Putting-out system					
Yarn dealers	0.32	0.34	0.31	0.36	44.11
Sweater shops (VPCs)	0.38	0.54	0.36	0.57	31.18
Computer-aided designers	0.46	0.61	0.39	0.68	7.81
Buttoning workshops	0.31	0.64	0.22	0.86	2.59
Ironing workshops	0.31	0.72	0.18	1.36	1.91
Assembling workshops	0.24	1.55	0.08	6.75	2.03
Printing workshops	0.25	0.96	0.22	1.15	7.18
Weaving workshops	0.26	0.83	0.24	0.93	7.44
Average	0.32	0.64	0.25	0.76	13.03

Table 2. Continued

	r_1	CV(r_1)	r_2	CV(r_2)	K/L
Vertically-integrated system					
Dyeing & Finishing factories	0.13	1.48	0.13	1.49	25.53
Integrated producing factories	0.06	2.59	0.06	2.64	24.1
Average	0.09	2.43	0.09	2.47	24.82

Data source: Authors' survey, Puyuan Administrative Committee of Industrial Park, and the Puyuan Administrative Committee of Marketplace.
Note: *For r_1, we assume family members work as long as hired workers. For r_2, we assume that family members work 25% longer than hired workers, meaning that their imputed wage is 25% higher.*

5. HYPOTHESIS TESTING

The Existence of Credit Bias against SMEs

One key assumption underlying the two hypotheses is that SMEs have more difficulty accessing bank credit compared to their larger counterparts. Many empirical works lend support to this assumption. For example, Yang (2002) finds that the rejection rate of loan applications for firms with less than 51 employees is as high as 78.92%, while it is only 24.34% for firms with more than 500 employees. A study undertaken by the Township and the Village Enterprise Bureau of Ministry of Agriculture (2002) revealed that 86.5% of firms with fixed assets less than five million *yuan* reported having difficulty acquiring loans. A report by the Township and Village Enterprise Bureau of Ankang City (2006) indicates that China Bank of Industry and Commerce (CBIC) requires a firm to have a minimum asset level of 10 million *yuan* to qualify for credit, and loans of less than 1 million *yuan* to new customers are not considered. In general, the CBIC classifies SMEs into three types: medium, small and micro firms. Firms with assets of less than 2 million *yuan* are defined as micro firms. In principle, the bank discourages extending loans to the micro firms.[4] In its lending guidelines, the Bank of China (1998) has explicit regulations that limit credit to SMEs. The China Agricultural Bank requires that firms provide at least three years of financial reports when applying for a loan.[5] Because many SMEs are relatively new and do not have a formal financial reporting system, they are naturally excluded by this requirement.

Prior to 2004, Puyuan had branches of only the abovementioned state banks. In March of 2004, Jiaxing Commercial Bank, a locally-owned shareholding company, set up a branch office in Tongxiang City, about 20 kilometers from Puyuan Township. In 2005, the first pawnshop opened in Puyuan Township. The last column in Table 1 shows the proportion of enterprises that have received bank loans. It is apparent from the table that production types requiring a higher level of investment are more likely to receive bank credit compared to those with lower entry costs. For example, none of the buttoning and ironing workshops had acquired bank loans, which could be interpreted in two ways: either they did not have access to credit, or they did not need outside credit. In contrast, most firms in the Puyuan industrial park, which were bigger and owned factory buildings and other assets, had access to formal credit.

This finding is consistent with prior reports in the academic literature (Lin and Li, 2001). The lending guidelines mean that in the absence of fixed assets as collateral, SMEs receive limited credit support from state banks in China. This obviously favors the extension of credit to large firms. However, the lack of credit to SMEs in the cluster may also suggest that these workshops do not need external credit due to their low entry costs. Unfortunately, our data cannot distinguish between these two possibilities. Nonetheless, the table suggests that there is a positive correlation between access to credit and the level of capital investment.

Testing the Two Hypotheses

Having documented the existence of credit constraints for SMEs and more favorable lending policies for large firms, we next use both parametric and non-parametric methods to test the two hypotheses put forward in the second section. Figure 5 plots the rate of returns to scale (r_1) against assets in logarithmic form (k) with a 95% confidence interval. The band in the segment of higher returns does not appear to be wider than that of lower returns, suggesting that higher rates of returns are not necessarily associated with higher risks. Also, as shown in Table 2, the coefficient of variation (CV) among the enterprises in the putting-out system is generally smaller than that for the vertically-integrated factories. In general, the smaller firms are not necessarily more risky than their larger counterparts.

Figure 5 shows that there is an inverted-U-shaped relationship between the two variables. For the first segment of the curve, the rate of return is positively associated with the asset level. The relationship

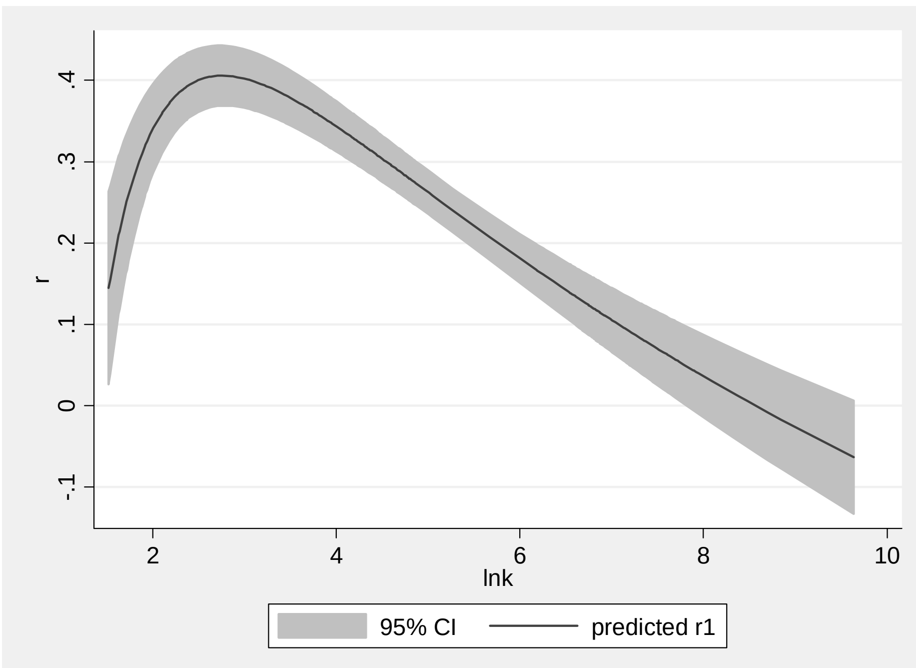
[4] "The CBIB Lending Guidelines to SMEs" is from http://www.zhangye.gov.cn/qybszn/rdzcjd/200709/50628.html.
[5] "The Agricultural Bank Lending Guidelines" can be found at http://www.smeyndl.gov.cn/readnews.asp?newsid=212.

becomes negative after the firm's assets reach a certain size. This nonparametric graph seems to support our first hypothesis. To more rigorously test the two hypotheses further, we use the following econometric specifications:

$$r = c + \alpha k + \beta k^2 + \lambda X + \varepsilon \tag{11}$$

where *r* stands for the rate of returns to scale, *c* is an intercept, *k* is firm's asset level in logarithmic form, k^2 is a quadratic term of *k*, *X* is a set of control variables for different types of production, and *ε* is an error term. We use either the minimum capital requirement in each type of production or a set of dummy variables for production types as control variables, and *α*, *β*, and *γ* are the corresponding coefficients for *k*, k^2 and *X*, respectively.

Figure 5. Returns to capital for all firms



For the first hypothesis to hold, we expect *β* to be significant and negative when *X* is excluded. The second hypothesis indicates that *α* should be significantly negative and *β* to be insignificant if *X* is included. Table 3 reports the estimation results under various specifications when the dependent variable is r_1. For the first six regressions, R1-R6, we use our survey sample without taking sampling weights into account. The second set of six regressions, R7-R12, uses the inverse probability of sample selection as weights. In regressions R1 and R7, only the capital variable is included as an independent variable. The coefficient for this variable is negative in both regressions, and it is significant in R1 but not in R7. When the quadratic term is added, the coefficient for k^2 become significantly negative in R2, strongly supporting the first hypothesis of an inverted-U-shaped relationship between the capital entry barrier and the rate of returns to capital. Although the coefficient for the quadratic term is negative, it is insignificant in R8 when weights are considered, lending only weak support to the first hypothesis.

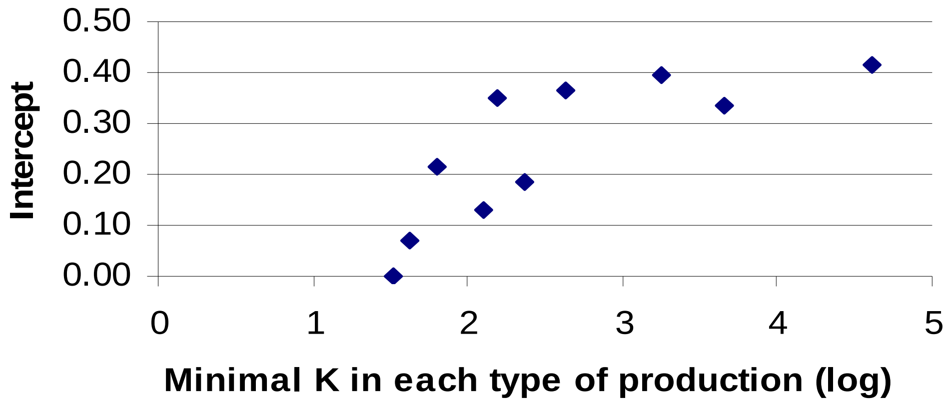
Table 3. Regression results with dependent variable r_1

	Without weights						With weights					
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12
k	-0.061	0.052	-0.027	-0.073	-0.210	-0.095	-0.023	0.089	-0.029	-0.076	-0.126	-0.093
	(3.18)**	(1.29)	(0.34)	(7.33)***	(2.00)*	(6.56)***	(1.20)	(0.78)	(0.33)	(5.64)***	(1.24)	(14.87)***
k^2		-0.011	-0.004		0.011			-0.015	-0.006		0.005	
		(3.01)***	(0.62)		(1.28)			(1.30)	(0.57)		(0.31)	
Minimum k			0.060	0.072					0.118	0.122		
			(2.33)**	(2.63)**					(11.66)***	(7.81)***		
Yarn dealers					0.456	0.335					0.341	0.330
					(3.44)***	(9.05)***					(14.76)***	(20.64)***
Sweater shops (VPCs)					0.507	0.397					0.406	0.393
					(4.29)***	(12.71)***					(13.85)***	(29.14)***
Computer-aided designers					0.39	0.349					0.355	0.347
					(9.33)***	(39.05)***					(15.97)***	(90.17)***
Buttoning workshops					0.160	0.131					0.137	0.131
					(5.61)***	(22.47)***					(8.22)***	(51.74)***
Ironing workshops					0.061	0.071					0.069	0.071
					(6.53)***	(37.52)***					(12.20)***	(87.28)***
Printing workshops					0.260	0.186					0.194	0.183
					(3.35)***	(9.75)***					(7.15)***	(22.26)***
Weaving workshops					0.293	0.216					0.223	0.213
					(3.60)***	(10.50)***					(8.89)***	(24.00)***
Dyeing & Finishing factories					0.516	0.416					0.37	0.406
					(3.35)***	(5.81)***					(2.47)**	(13.13)***
Integrated producing factories					0.459	0.367					0.33	0.358
					(3.34)***	(5.93)***					(2.73)**	(13.42)***
Constant	0.559	0.317	0.335	0.405	0.575	0.394	0.441	0.244	0.233	0.308	0.437	0.39
	(5.55)***	(3.09)***	(1.85)*	(4.34)***	(3.39)***	(14.27)***	(5.76)***	(0.93)	(1.25)	(4.44)***	(3.14)**	(32.75)***
Observations	306	306	306	306	306	306	306	306	306	306	306	306
Adjusted R-squared	0.120	0.132	0.142	0.144	0.170	0.167	0.005	0.015	0.098	0.099	0.103	0.105
AIC	132.972	129.495	126.936	125.532	104.857	104.787	-8.094	-10.208	-36.02	-37.326	-49.99	-51.806
Omitted variable test	0.001	0.007	0.268	0.119	0.255	0.183	0.044	0.082	0.02	0.147	0.008	0.055

Note: *k is capital stock in logarithmic form. Clustered robust t-statistics are in parentheses. The symbols *, ** and *** represent significance at 10%, 5%, and 1%, respectively.*

In regressions R3 and R9, we further add the minimum capital requirement at each stage of production in logarithmic form, as taken from Table 1. The new variable has a significantly positive coefficient, suggesting that rates of return are positively associated with the capital barriers to entry. The coefficient for the quadratic term of *k* is insignificant. In regressions R4 and R10, in which the quadratic term of *k* is dropped, the coefficient for *k* becomes significant and negative, showing that after we control for the minimum capital requirement of entry, capital has a diminishing margin. This result is consistent with the second hypothesis. In regressions R5 and R6 (R11 and R12), we replace the minimum capital requirement with a set of dummy variables for production types, in order to capture the potential difference in technologies; from this we obtain similar results (the coefficient for *k* is negative). Figure 6 plots the coefficients for the dummy variables against the minimum capital requirement by production type. It is clear that there is a strong positive correlation, as suggested by our theoretical model. The observed initial increase in the rate of return may be mainly due to the existence of credit constraints for SMEs. In general, the regressions that include control variables have smaller Akaike information criterion(AIC) than those without controls, suggesting that the latter models provide a better description of the underlying data-generating process.

Figure 6. Intercepts and minimum capital by type of production



Note: *The vertical axis represents the coefficient for dummy variables in regression 5 of Table 2. The horizontal axis is the minimum capital in each stage of production, as shown in Table 1 in logarithmic form. The default dummy variable is for the assembling workshops and the corresponding coefficient is set to zero in the figure.*

To further check whether the regression results are robust to the rate of returns that are imputed based on longer working hours for family members, Table 4 repeats the regressions in Table 3, replacing the dependent variable r_1 with r_2. All the findings still hold. Once again, an inverted-U-shaped relationship is observed in the absence of control variables. After the control variables for entry barriers are included, the quadratic term becomes insignificant, and only a negative relationship between the rate of returns to scale and capital stock is observed.

Table 4. Regression results with dependent variable r_2

	Without weights						With weights					
	R1	R2	R3	R4	R5	R6	R1	R2	R3	R4	R5	R6
k	-0.044	0.140	0.057	-0.060	-0.159	-0.088	0.015	0.200	0.084	-0.040	-0.011	-0.056
	(1.80)	(3.31)***	(0.62)	(5.12)***	(1.31)	(5.30)***	(0.64)	(1.73)*	(0.93)	(2.11)*	(0.12)	(3.56)***
k^2		-0.018	-0.011		0.007			-0.025	-0.016		-0.006	
		(4.60)***	(1.37)		(0.68)			(2.11)**	(1.50)		(0.44)	
Minimum k			0.063	0.093					0.116	0.127		
			(2.21)*	(2.65)**					(10.66)***	(5.10)***		
Yarn dealers					0.542	0.468					0.372	0.387
					(3.58)***	(11.05)***					(21.58)***	(9.61)***
Sweater shops (VPCs)					0.593	0.526					0.44	0.457
					(4.39)***	(14.73)***					(20.01)***	(13.48)***
Computer-aided designers					0.459	0.433					0.402	0.413
					(9.55)***	(42.45)***					(21.05)***	(42.66)***
Buttoning workshops					0.217	0.199					0.178	0.186
					(6.61)***	(29.78)***					(12.34)***	(29.33)***
Ironing workshops					0.096	0.102					0.109	0.106
					(8.96)***	(47.56)***					(22.12)***	(52.07)***
Printing workshops					0.338	0.293					0.236	0.251
					(3.81)***	(13.45)***					(10.88)***	(12.14)***
Weaving workshops					0.367	0.32					0.261	0.275
					(3.94)***	(13.61)***					(13.27)***	(12.31)***
Dyeing & Finishing factories					0.604	0.542					0.433	0.386
					(3.48)***	(6.63)***					(2.72)**	(4.96)***
Integrated producing factories					0.55	0.494					0.396	0.359
					(3.55)***	(6.99)***					(3.05)**	(5.35)***
Constant	0.451	0.056	0.075	0.251	0.328	0.217	0.262	-0.064	-0.074	0.124	0.093	0.157
	(3.52)***	(0.52)	(0.35)	(1.96)*	(1.68)	(6.88)***	(2.63)**	(0.24)	(0.38)	(1.46)	(0.74)	(5.23)***
Observations	306	306	306	306	306	306	306	306	306	306	306	306
Adjusted R-squared	0.061	0.100	0.111	0.103	0.154	0.155	0.000	0.033	0.112	0.100	0.122	0.124
AIC	148.29	136.299	133.435	135.146	106.116	104.849	-0.699	-9.858	-34.911	-32.076	-50.788	-52.455
Omitted variable test	0	0.007	0.048	0.107	0.024	0.164	0.003	0.036	0.297	0.007	0.002	0.032

6. CONCLUSIONS

The traditional putting-out system has been generally regarded as a transitional stage during Western Europe's Industrial Revolution. Recently, however, industrial clustering has reemerged to prominence in both developed and developing countries. Strictly speaking, the subcontracting commonly seen in industrial clusters is a modern variant of the traditional putting-out system. Marshall (1920) argues that clustering helps promote industrial development in three ways: by improving the flow of market and technology information, by improving linkages between suppliers and clients, and by pooling labor. Porter (1990) goes one step further by proposing that clustering is a key way to improve competitiveness. Ruan and Zhang (2008) show that industrial clustering plays an additional role in lowering capital barriers to entry, which in turn attracts more potential entrepreneurs to industrial activities.

In terms of firm performance, we observe that for each type of production, the law of diminishing marginal returns to capital still holds. This is particularly true for the larger integrated enterprises, which have easier access to bank credit. However, the rate of returns at the point of entry to a certain production type is positively correlated with its minimum level of capital requirement. This suggests that many small enterprises in the putting-out system make technological choices based on their own available financial resources. Despite the credit constraints, many entrepreneurs can still participate in the production process, largely because clustering provides a wider menu of choices.

In this case study, we further show that the putting-out system in industrial clusters can also help tap the entrepreneurial talents that are scattered in rural areas, thus making better use of capital. As in many developing countries, at the time of economic reform in the late 1970s, China's comparative advantage was marked by abundant labor and scarce capital. Facing a less-developed financial market, entrepreneurs and local governments in many parts of coastal China chose clustering as a more favorable mode of production than the use of integrated factories. Production was organized within clusters according to the traditional putting-out system and its modern variants. As a result, both capital and entrepreneurial talents were more efficiently utilized over the course of China's rural industrialization.

Further studies are needed to examine where clustering is most likely to occur. At least from casual observation, population density seems to be a key factor in the emergence of clusters. Subcontracting and clustering are more popular in Japan and Italy than in the US, perhaps due to the high population density in the former countries. The same pattern holds true within China. Let us take two provinces in China as an example. Inner Mongolia is one of the least populated provinces in China, with only about 20 people per square kilometer. There, individuals have stayed close to the source of wool production, and a number of large, integrated cashmere sweater enterprises have emerged. In contrast, the population density in Zhejiang Province is as high as 481 people per square kilometer. Although Zhejiang does not produce wool and is located thousands of kilometers away from the major sources of input in the north, through clustering it has become one of leading production centers of cashmere sweaters. Due at least in part to deepening divisions of labor, the firm size in Puyuan (within Zhejiang Province) is much smaller than that seen in Inner Mongolia.

As shown by Long and Zhang (2008), clustering has been a major feature of China's rural industrialization over the past three decades, suggesting that the Zhejiang model may not be a unique phenomenon. This business model of separate producing units vertically linking the stages of production not only helps overcome the difficulties of capital and legal constraints, it also fits well with the comparative advantage of most developing countries- i.e. relatively abundant labor and limited capital. Despite its widespread practice in developing countries, however, there are relatively few empirical studies comparing the role of clustering with that of vertically-integrated mass production in the course of industrialization. This study on the putting-out system in industrial clusters in Zhejiang Province may shed some light on the applicability of this business model in other developing countries when credit constraints are a major problem.

It is worth emphasizing that we are not arguing that a well-functioning financial system is unimportant or that its absence will not at some point hinder economic growth. Rather, our argument is a much milder one. We find that the lack of formal, "first-best" institutions does not necessarily preclude a nation's economic development, as long as appropriate alternative mechanisms can be developed (or chosen) in response to the initial conditions of the economy. When studying the early stages of industrialization, it is important to examine organizational choices of production in addition to financial development.

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