



Cluster-based industrialization in China: Financing and performance

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ABSTRACT

China's rapid industrialization despite the lack of a well developed financial system seems to defy the conventional thinking on the role of finance in development. This paper tries to explain the puzzle from the clustering point of view. Based on firm-level data from two recent censuses, we find that within industrial clusters: finer division of labor lowers the capital barriers to entry; closer proximity makes the provision of trade credit among firms easier. With less reliance on external financing, more small firms emerge within clusters, leading to higher levels of export and total factor productivity thanks to the resultant more fierce competition.

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1. Introduction

Many have argued that a well-developed financial system is a key prerequisite for industrial development, as it can help pool disparate savings to finance large lump-sum investments in machinery and factory buildings (Goldsmith, 1969; McKinnon, 1973; King and Levine, 1993; Rajan and Zingales, 1998). However, China's rapid industrialization over the past three decades seems to defy the conventional wisdom. At the incipient stage of reform in the late 1970s, China's financial system was far from developed by any existing standards (Allen et al., 2005). In particular, the vast number of privately-owned small and medium enterprises (SMEs) had little access to formal credit from state-owned banks (Lin and Li, 2001). Despite the initial lack of financial development, China has achieved in three decades the same degree of industrialization that took two centuries to occur in Europe (Summers, 2007). And the rapid growth in the private sector has been a defining feature of China's growth patterns (Song et al., 2011). How was the vast number of SMEs able to emerge and quickly grow in such a credit-constrained environment?

Without denying the importance of formal financing and informal mechanisms of alternative financing (as pointed out in Allen et al., 2005; Fisman and Love, 2003) in overcoming credit constraints, we argue herein that the cost of investment in production technologies may not be as prohibitive as suggested in the literature thanks to the clustering mode of production. By dividing an integrated production process into many incremental steps, clustering can lower capital entry barriers, thereby enabling more entrepreneurs to participate in nonfarm production. The closer proximity of firms in a cluster also allows more inter-firm trade credit and thus reduces the need for working capital.

As has been reported in the media, China's rapid industrialization in the past several decades has been accompanied by the emergence of numerous "specialty cities" of a particular kind, where thousands of firms, large and small, each specializing in a finely defined production step, are lumped together in a densely populated region to churn out some particular manufactured consumer good by the millions (if not billions) annually.¹

Despite the numerous popular media reports of this phenomenon, few studies have been performed to rigorously establish patterns using

¹ For example, see <http://www.nytimes.com/2004/12/24/business/worldbusiness/24china.html> for a *New York Times* report. Many formerly rural towns in the coastal areas have become so specialized that they boast of themselves as the world's Socks City, Sweater City, Kid's Clothing City, Footwear Capital, and so on.

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data covering a large sample and a long time period.² Toward this end, we use complete firm-level data from the China Industrial Census 1995 (China, National Bureau of Statistics, 1995) and the China Economic Census 2004 (China, National Bureau of Statistics, 2004) to compute measures of clustering. We use industry proximity measure to explore how firms interact with one another, which is a key feature of clustering as highlighted by Porter (1998, 2000). Our results suggest that China's rapid industrialization during this time period was marked by increased clustering – closer interactions among firms within the same region.

We then examine the role of clustering on firm financing. At the county level, we calculate both clustering measures and the minimum asset level among all firms and find that clustering is associated with lower minimum capital requirements for industrial investment. Next, based on a panel dataset at the firm level from the two censuses in 1995 and 2004, we document that clustering is accompanied by a more prevalent use of trade credit among firms, thus reducing their reliance on external financing for working capital.

We further show that that clustering would help create more new establishments and result in extensive industrial growth. The emergence of domestic non-state establishments in a location is found to be highly associated with the degree of local industrial clustering. As a placebo test, the number of state-owned enterprises (SOEs), which are not financially constrained and thus should not be affected by clustering, is not related to the degree of clustering at all.

Finally, we find that clustering also boosts intensive growth – improving firm productivity through increased competition among similar firms. Domestic non-state firms in more clustered regions have higher export and total factor productivity (TFP) levels, while clustering has little to do with the performance of SOEs.

The study of China's industrialization may also be useful for the research on industrialization in general. China's miraculously rapid industrialization provides a unique laboratory enabling us to observe and understand the process of industrialization. While industrialization in Western Europe and North America at the early stages of the Industrial Revolution can now be studied only through the relatively dim mirror of history, industrialization can be viewed directly in the ongoing economic revolution in China. China's experience may be relevant to other developing countries characterized by a high population density and a low capital-to-labor ratio. A clearer understanding of the industrialization processes in China will be of great value in helping propagate these processes to the world's less fortunate regions.

2. Literature review on clustering, finance, and industrial development

Our study is closely related to two threads of literature. The first relevant body of literature is on finance and industrial growth. Because of the high cost to build up a factory and purchase machinery, in the absence of a well developed capital market, it would be hard for many potential entrepreneurs with limited financial resources to start their own businesses (Banerjee and Newman, 1993). Therefore, financial development is regarded as having first-order importance in promoting economic growth (King and Levine, 1993).

In an influential empirical paper, Rajan and Zingales (1998) show that firms in industrial sectors relying heavily on external finance grow faster in countries with more developed financial markets, suggesting that financial development can help reduce firms' costs of external finance. However, the lack of a well-functioning capital market is common in developing countries.

In the case of China, Allen et al. (2005) has suggested the reliance on informal financing – such as borrowing from family members, relatives, and friends – as the main solution. However, considering that at the

onset of China's reform a large proportion of rural people were poor (Ravallion and Chen, 2007), the amount of local savings available for informal financing would have been rather limited. Another alternative is for firms to rely on suppliers in the form of trade credit as an alternative source of funds (Fisman and Love, 2003). Yet despite the positive role of trade credit in easing working capital constraints, it alone does not explain how capital entry barriers can be overcome because many entrepreneurs also lack starting capital to set up their businesses.

Our study is also related to the literature on industrial clustering. Industrialization is often accompanied by clustering (or spatial agglomeration) of industrial activities.³ Italy, Japan, and other East Asian countries and regions have all experienced a path of spatial clustering during the course of industrialization, which was led by small and medium enterprises (SMEs). One noted example is the popular putting-out system in the U.K. prior to its Industrial Revolution, in which a merchant obtained market orders and subcontracted the production to nearby farmers or skilled workers, who usually finished the work in their homes or family workshops (Hounshell, 1984). Outsourcing (or subcontracting), the modern variant of the traditional putting-out system, remains a major feature of industrial production organization in contemporary Japan and Taiwan (Sonobe and Otsuka, 2006). Industrial districts in which different workshops and factories clustered together were ubiquitous in France and Italy until the mid-twentieth century and are still viable in some regions of Italy (Piore and Sabel, 1984; Porter, 1998).

The literature on clustering has highlighted at least three key positive externalities of industrial clusters: better access to the market and suppliers, labor pooling, and easy flow of technology know-how (Marshall, 1920). Glaeser and Gottlieb (2009) emphasize the role of agglomeration in speeding the flow of ideas. With these positive externalities, Porter (1998) argues that clustering is an important way for firms to fulfill their competitive advantage. Ciccone and Hall (1996) and Ciccone (2002) have empirically shown that agglomeration is positively associated with productivity at the local geographical level in the US and Europe.

We argue in this paper that another main advantage of clustering in developing countries with limited financial development is in helping firms alleviate financial constraints, a point that has not been previously discussed except in several case studies. One key feature of industrial clustering observed in China is that an integrated production process is disaggregated into many small steps that are performed by a large number of small firms. By dividing a production process into incremental stages, a large lump-sum investment can be transformed into many small steps (Schmitz, 1995). Based on a case study on cashmere sweater cluster, Ruan and Zhang (2009) empirically show that clustering enables many farmers with entrepreneurial talents to move into industrial production by lowering capital entry barriers. Furthermore, as an integrated production is split up among many firms in a narrow geographic area, these firms have to interact repeatedly on a regular basis. Over time, firms build up trust with their customers and suppliers within the cluster, which in turn lowers transaction costs of extending and receiving trade credit among firms, easing their burden of financing for working capital. Huang et al. (2008) and Ruan and Zhang (2009) provide supporting evidence that trade credit is indeed prevalent in footwear and cashmere clusters in China.

To test whether the financing effects of clustering described in these case studies still hold up in a broader context, we will resort to a more rigorous analysis using a large sample in this paper. By linking the literature on finance and growth and on clustering, our paper also attempts to offer an explanation to China's growth puzzle.

² Lu and Tao (2009) found a clear trend of industrial agglomeration during the period of 1998–2005. But their sample includes only large firms and does not capture the large number of small and medium firms prevalent in these “specialty cities”.

³ In the literature, various terms for the phenomenon of clustering abound, including *spatial agglomeration*, *industrial district*, *cluster*, *industrial concentration*, and so on. In this paper, we prefer to use *cluster*, as it better captures the interconnectedness among firms in a narrowly concentrated location.

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