

3 Integrating small and medium-sized enterprises into global trade flows: the case of China

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3.1 Introduction

In China, the term “small and medium-sized enterprises (SMEs)” refers to “different forms of enterprises under different ownerships that are established within the territory of the People’s Republic of China that meet the social needs and create more job opportunities, and comply with the industrial policies of the State”.¹ This definition is rather more complex than that in other countries, where the definition of SMEs tends to be based purely on their size.² It is nevertheless the case that, in China also, SMEs tend to be enterprises which have fewer employees, lower sales volume and lower gross assets. Most Chinese enterprises are SMEs. Indeed, they account for more than 98 per cent of industry and contribute to 60 per cent of China’s GDP, 75 per cent of its industrial value-added output and 50 per cent of its revenue (as of June, 2012).³ Chinese SMEs also provide for 75 per cent of China’s urban employment opportunities and absorb more than 50 per cent of the workers laid off from the state-owned enterprises. They employ more than 70 per cent of the new entrants to the labour market (Jianjun, 2006). Hence, Chinese SMEs play an important role in China’s economic development, due to their contribution to GDP and the employment they create, as well as their vigorous creative ability.

The diversified, networked and clustered division of the globe has greatly promoted the development of SMEs globally, and the internationalization of SMEs has been in the spotlight overall in the world economy. However, there is considerable room for Chinese SMEs to more fully exploit the economic opportunities provided through international trade. This will be illustrated by examining more closely the performance of SMEs established in Shanghai. Table 1 describes the new products developed by Shanghai’s large, medium-sized and small enterprises in 2011. In SMEs, the output

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Table 1 New products output by size of enterprise in Shanghai, 2011

Unit: 100 million RMB Yuan

Size of enterprise	New products output	New products sales revenue	New products export
Large	5,400.08	6,018.75	878.63
Medium	1,166.18	1,164.24	109.89
Small	575.40	588.75	44.12

Source: *Shanghai Statistical Yearbook 2012*, Shanghai Bureau of Statistics (<http://www.stats-sh.gov.cn/tjnj/tjnj2012.htm>).

of sales revenue generated by new products is lower when compared to large enterprises. The difference is particularly large when focusing on exports of new products. This suggests that Chinese SMEs are not well integrated into the dynamic segments of global trade flows.

Table 1 illustrates that most Chinese SMEs are not fully integrated into global and regional value chains, and their lack of innovative capacity may be one reason for this. Evidence suggests that multinational enterprises (MNEs) expect SME suppliers to be adaptable, agile and flexible. Notably, they expect SMEs to be able to develop new product lines and change product specifications (Krywulak and Kukushkin, 2009). Lack of innovative capacity may, therefore, make it difficult for SMEs to connect to global value chains. It may also imply that Chinese SMEs are trapped in “captured growth status” (Yongchun et al., 2013), which means that the main profits are captured by foreign enterprises. The discussion in the following sections will examine the possible reasons behind the relative lack of dynamism in Chinese SMEs and will discuss what can be done from an economic perspective to raise innovative capacity within the context of global competition.

3.2 Factors constraining innovative capacity in Chinese SMEs

According to available data from the Chinese Industrial Enterprises' Innovation Survey undertaken by the National Bureau of Statistics of China and published in 2006,⁴ the innovation performance of Chinese SMEs was not as good as the performance of large enterprises, across all aspects, including patent application, trademark registration, copyright registration, formation of national or industrial standards, internal protection of know-how and ownership of proprietary brands. Especially with regard to patent application, the percentage of SMEs which had ever applied for one or more patents is significantly lower than the percentage of large enterprises which had done so.

In China, patents are differentiated into patents referring to inventions, utility models⁵ and designs. Invention patents represented only 15.8 per cent of all patent applications by Chinese SMEs. In comparison, data on patent applications by foreign companies in China indicate that invention patents represent a large proportion (USITC, 2010). Chinese SMEs' innovation ability and core intellectual property (IP) thus appear to be limited, which is a disadvantage in international trade.

Internal constraints on small and medium-sized enterprises

Shortage of qualified staff

An important aspect determining innovative capacity is the availability of qualified personnel. SMEs tend to employ fewer scientific and technological personnel, and research and development (R&D) personnel,⁶ than do large enterprises, although SMEs active in technology-intensive sectors may be an exception to this rule. Table 2 shows the number of personnel involved in scientific and technological and R&D activities in different-sized enterprises in Shanghai in 2011.

One notable phenomenon is that the number of R&D personnel active in the private sector has increased since the structural reform of China's scientific and technological institutions, as many of those institutions have been transformed into small enterprises. It is nevertheless the case that Chinese SMEs employ only limited numbers of staff involved in scientific and technological activities and, among them, there are insufficient numbers with R&D talent and personnel with senior or medium technical titles.

Limited financial strength

SMEs own less capital than do large enterprises, and funding has become a serious bottleneck for the survival and development of Chinese SMEs. Commercial banks are reluctant to provide credits to SMEs due to the higher risk involved. Risks are

Table 2 Number of personnel involved in scientific and technological and R&D activities by size of enterprise in Shanghai, 2011

Unit: ten thousand

Size of enterprise	Personnel involved in scientific and technological activities	R&D personnel	
		Total	With senior or medium technical titles
Large	9.15	4.92	2.77
Medium	5.56	2.96	1.29
Small	4.08	2.15	1.11

Source: Shanghai Statistical Yearbook 2012, Shanghai Bureau of Statistics.

considered to be particularly high for SMEs active in technology-intensive sectors and it is therefore very difficult for SMEs to obtain funding for technological innovation from commercial banks.

Table 3 illustrates that, in 2011, SMEs were characterized by significantly lower expenditure on scientific and technological activities than in large enterprises, in particular in the area of new product exploration. SMEs' spending in this area represents only around 15 per cent of total spending on new product exploration, which is contradictory compared with the weight SMEs have in China's GDP.⁷

Table 4 illustrates that SMEs' expenditure for technical transformation, imports of technology and purchases of domestic technology is also markedly lower than that of large enterprises.

Innovation requires significant amounts of capital investment. However, Table 5 indicates that the Chinese Government offers less R&D funding to SMEs than to large enterprises.

Table 3 Scientific and technological expenditure by size of enterprise in Shanghai, 2011

Unit: 100 million RMB Yuan

Size of enterprise	Expenditure	
	Scientific and technological	New product exploration
Large	333.37	284.51
Medium	118.19	94.96
Small	88.45	68.04

Source: *Shanghai Statistical Yearbook 2012*, Shanghai Bureau of Statistics.

Table 4 Other technical expenditures by size of enterprise in Shanghai, 2011

Unit: 100 million RMB Yuan

Size of enterprise	Expenditure		
	Technical transformation	Technology import	Domestic technology purchase
Large	108.51	54.48	20.87
Medium	17.24	8.52	0.86
Small	12.73	2.27	0.18

Source: *Shanghai Statistical Yearbook 2012*, Shanghai Bureau of Statistics.

Table 5 Source of R&D expenditure by size of enterprise in Shanghai, 2011

Unit: 100 million RMB Yuan

Size of enterprise	Total R&D expenditure	Government funds	Equity funds	Foreign funds
Large	217.68	14.06	201.76	0.73
Medium	74.71	1.92	71.75	0.84
Small	51.32	2.21	47.87	0.58

Source: *Shanghai Statistical Yearbook 2012*, Shanghai Bureau of Statistics.

Intensity of research and development

In addition to referring to the absolute values of R&D budgets, it is useful to examine R&D intensity, as this makes it possible to evaluate the role of R&D taking into account a company's scale.⁸ Data on R&D intensity can, therefore, be used to measure an enterprise's technological innovation ability. A common measure for R&D intensity is the share of R&D spending in total sales. This measure can be considered to be a reflection of an enterprise's innovation consciousness, determination and economic capabilities. The measure also gives an indication as to how inputs (R&D budgets) evolve compared with outputs (sales).

Based on experience in developed and newly industrialized countries, R&D spending needs to represent a threshold share of 5 per cent of total sales in order for an enterprise to be a successful innovator in technology-intensive sectors. As far as R&D budgets of SMEs based in Shanghai are concerned, most scientific and technology-oriented SMEs spend less than 3 per cent of their budget on R&D. There is a group of only around 2,000 SMEs⁹ whose R&D spending represents 5 per cent or more of total spending (Shanghai Economic Committee, 2008). This suggests that most SMEs active in Shanghai can only carry out low- or medium-level innovation activities.

Weaknesses in the ability to utilize intellectual property rights

IP protection is intended to protect and encourage innovation. Yet it could be argued that, in China, the IP regulatory framework is designed for the benefit of large and financially strong enterprises rather than to benefit innovation activities in SMEs. This is a matter of concern given that SMEs need to be innovative and flexible in order to be active participants in the global value chain. As they are small players in a field dominated by large, mostly multinational, firms, it is important for their IP rights (IPRs) to be protected. Contractors often require suppliers to be fully transparent about the design and original plans of products (OECD, 2007). Without strong IP protection, SMEs run the risk of losing control over the plans and designs which they developed. The United Nations Conference on Trade and Development (UNCTAD, 2010) confirms that IP protection is a concern for SMEs in the creative industries of

cinema and software above all. In order for SMEs to be active players in a global environment of increasingly fierce competition, they therefore need to be able to acquire, master and skilfully use IP. Therefore, rather than giving preference to enterprises according to their scale, IP law and IP authorities should assist enterprises on the basis of their ability to innovate and effectively use IP.

IP can provide for exclusive rights, which can not only prevent others from using the fruits of innovation commercially without permission but can also be used by rights holders to fulfil their commercial goals, such as to enter new markets, become market leaders, promote the enterprise's reputation and image or start new market segments by targeting different consumer groups. IPRs can also be useful for enterprises which want to set up strategic cooperation with others, establish a franchising system, increase their market value in mergers and acquisitions, or simply obtain additional revenue by IP licensing and sales. Last but not least, IPRs can facilitate fundraising. They could also help to avoid wasting R&D investment by analysing the patent database as well as reviewing the latest technological developments.

Data on the number of patents held by SMEs, the respective share of patents for invention, utility models and designs, and both the patent grant rate and the implementation rate, all indicate that SMEs – in particular, science and technology SMEs – are aware of the importance of patents, and have often successfully applied for patents. Nevertheless, SMEs still have some disadvantages, such as the low quality of their patents, the relatively low patent grant rate and the very low patent commercialization rate. Indeed, the commercialization rate of outcomes of scientific activities was merely around 5 per cent (Zhongfa, 2013).

Traditionally, scientific and technology-oriented SMEs in Shanghai have had strong IP consciousness and shown a special interest in patents. Some of them possess their own patents and are in the process of applying for new patents. However, their view of the role of patents may be rather too simple, as they merely focus on obtaining IP protection by means of patent applications. They have not mastered the capacity of using and managing IP, and do not know how to defend and explore markets by means of IP. Those SMEs which have never experienced an IP dispute (which is a common situation among Shanghai's SMEs) are not really conscious of the potential of IP risk, and they do not know how to prevent and respond to it. Only if the patent is actually implemented can innovation lead to commercial success. The rate of patent implementation¹⁰ is, therefore, an important reflection of the use of IP. The specific investigation conducted by the Shanghai Bureau of Intellectual Property on Enterprises' Patent Implementation Status in 2006 indicates that the patent implementation rate of Shanghai's enterprises is relatively high, but the invention implementation rate is low. The implementation of technology is highest among

large enterprises (up to 87.9 per cent). The implementation rate is, however, lower for SMEs, at 81.2 per cent.¹¹

Overcoming internal constraints

SMEs can be roughly segmented into three groups:

- technology developers, which represent only between 1 and 3 per cent of all SMEs
- leading technology users, which represent 10 to 15 per cent of SMEs
- technology followers, representing between 80 per cent and 85 per cent of all SMEs (OECD, 2000b).

Due to several domestic constraints, the innovation ability of Chinese SMEs is limited. In the field of technological innovation, therefore, SMEs would need to draw support from the scientific and technological power outside the enterprises themselves in order to overcome the constraints of a lack of R&D talent, limited R&D funds and weaknesses in their ability to use IP.

In China, universities and scientific research institutions have produced a great number of scientific and technological achievements which need to be transformed. Therefore, increased cooperation in the area of technical innovation among SMEs, on the one hand, and universities and scientific research institutions, on the other, could be mutually beneficial. SMEs have a flexible structure and more easily accept innovation than do large enterprises. If an effective industry–study–research mechanism could be set up, SMEs' innovation activities and their effectiveness would be improved.

External constraints on small and medium-sized enterprises

Support of national policies and intellectual property institutions

Technological innovation needs government support in the form of public policy. Technological innovation policy is the combination of a country's public policies that aim at changing the speed, direction and scale of technological innovation. With the enforcement of IP policies and measures, the government contributes to creating a social and cultural environment that encourages innovation and cultivates a system favourable for SMEs' innovation and IP management. The government can also set up a platform of public services targeting and supporting SMEs' innovation activities. The government can create incentives to support the innovation process in scientific and technology-oriented SMEs. Last but not least, the system of IP law is among the most important arrangements in the institutional environment, since the IP institution is the most transparent and universal, as well as being coercive.

Although China has adopted several IP policies to promote SMEs' innovation,¹² the implementation of these policies has raised some problems. Firstly, the patent sponsorship policy¹³ is not well targeted; indeed, it tends to lean towards large enterprises. In addition, it does not make a distinction between scientific and technology-oriented SMEs applying for a patent for the first time, and those enterprises which have a rich experience in patent application. Large enterprises and specifically technology-oriented SMEs which possess abundant patents do not rely too much on patent sponsorship. Under the ongoing patent sponsorship policy, government cannot encourage enterprises to apply for patents and then proceed to promote the innovation. In some cases, policies to promote innovation in SMEs do not give significant results.

Secondly, these policies show a manifest lack of systemization and coherence. Most of China's SME patent policies target only one aspect of the process of innovation. The patent sponsorship policy aims to reduce or abolish patent application fees for enterprises; the patent technology exhibition and transaction platform, and the SMEs patent technology industrialization investment and financing platform, aim to provide industrialization services for SMEs; the rights protection support aims to help SMEs to protect their patents. None of these policies is able to provide for a systematic patent service throughout the whole innovation process. The Chinese Government should consider providing a single, comprehensive patent service that is easily accessible for SMEs and makes it easy for them to master the process of innovation.

Thirdly, China's scientific and technology-oriented SMEs' innovation policies are government oriented, and the government pushes them to follow the trajectory of construction of China's innovation system. For instance, the patent technology exhibition and transaction platform and patent week policy, which are the two most important policies in terms of exploration, can offer resources to only a limited number of enterprises. In China, IP is still a relatively new phenomenon, and its utilization by enterprises (especially SMEs) is challenging.

Weak innovation and intellectual property culture

"IP culture" refers to the IP institution that results from the human historical development process related to the protection of innovation; the public perception, attitude and evaluation of innovation itself as well as of the institutions which protect IP; and the interaction between the IP institutions and IP consciousness. As a result, the interaction between IP culture and IP institutions influences the public's IP behavioural pattern as well as its normative adjustment pattern.

IP consciousness, as an expression of IP culture, refers to a society's consistent perception, respect for and understanding of the essence of IP and its effects, as well as its support for IP protection. The social perception, attitude and evaluation of IP are important criteria for evaluating a country's IP culture. Respecting the

non-public property attribute of innovation, abiding by IPRs, and taking advantage of IPRs to spread information and encourage innovation, are essential conditions for constructing an invention-, creation- and innovation-friendly society within the context of a knowledge-based economy.

There are many factors within the external environment which affect innovation activities, such as the legislative environment, the level of competition in markets, the social service environment and the social innovation culture. Because of the particular characteristics of SMEs, the ability of SMEs to innovate suffers most from the absence of a supportive external environment. The support of relevant legislative institutions, especially the IP institution, can act as a powerful guarantee to enable SMEs to promote technical innovation extensively.

3.3 Policy recommendations and conclusions

R&D funding, the availability of R&D talent, technological ability, R&D intensity and the IP index all result from long-term investment and cannot easily and rapidly be addressed. All are typical factors constraining SMEs' involvement in international trade and their innovation activities, and these problems are widespread in SMEs all over the world.

Although Chinese SMEs face many similar constraints to those faced by SMEs elsewhere, they do tend to have strong foundations for innovation and are relatively well integrated into global trade flows. SMEs are flexible, and if the government can offer effective incentives, and provide for a better institutional environment, Chinese SMEs have strong potential for innovation.

Creating a single, comprehensive patent service for SMEs

When a policy is designed, it typically only targets one specific aspect of SMEs' innovation activities. Innovation-related government services therefore tend to be scattered and costly, which increases operational difficulties for SMEs which want to take advantage of the government's policy. As a result, application of these policies by SMEs is not efficient. The government should focus on providing a single, comprehensive patent service for the scientific and technology-oriented SMEs in order to help them master the establishment of patents in the innovation process.

Avoiding focusing only on quantity of patents

Because of China's ambition to be a strong innovator, patent quantity has become an important index to assessing innovation and IP abilities. Many local governments, for instance, pursue patent quantities as an important goal. However, SMEs are a

highly diversified group. Differences in industry, scale and commercial environment account for differences in SMEs' innovative abilities and lead to different innovation models. The government should take these differences into account and consider applying different IP policies to different types of SMEs.

Revising the patent sponsorship policy

Local governments in China have set up sponsorship institutions for patent applications. Unfortunately, the specific conditions and methods of sponsorship have not been clarified. As a consequence, the policy has so far had little effect on SMEs' patent applications. The government should strengthen its encouragement for and introduction to patent fees sponsorship by focusing on SMEs applying for a patent for the first time. The government could require other SMEs to pay only part of the fees and thereby encourage them to apply for a patent. Apart from sponsorship, the government could also offer specific patent guidance, including basic knowledge on patent application and commercial strategy in respect of patents.

Strengthening the ability of SMEs to use and manage intellectual property rights

The government should consider providing public services to improve the ability of SMEs to utilize and manage IP, and this should be a prime policy objective in supporting technological innovation by SMEs. This is in line with the approach taken elsewhere, as governments in different countries provide significant support to SMEs, mainly focusing on providing public services for SMEs and helping them improve their competitive abilities (notably by utilizing IP to increase their market share). SMEs based in Shanghai, in particular scientific and technology-oriented enterprises, have a certain level of IP consciousness, and they have recognized the importance of patents for their activities. However, Shanghai's SMEs still have a rather simple understanding of IP, and they do not have the ability to fully take advantage of and manage it. The creation, utilization, management and protection of IP are essential indicators when it comes to evaluating the ability of SMEs to take advantage of the IP institution to protect their innovation activities.

Strengthening support for fund-raising for innovation activities

The government could consider setting up innovation networks within which SMEs could identify suitable partners for cooperation. Such networks should also provide information services regarding new products and new policy measures. They could help inventors, invention sponsors and SMEs to advertise at a favourable price, or even at no cost, so that technological achievement could be transformed into productivity.

Strengthening industry–university–research institution cooperative innovation relationships

The government should strengthen cooperation among SMEs, universities and research institutions in the area of innovation. While government efforts towards transforming innovation into products with market application should focus on SMEs, the government should also find ways to strengthen cooperation among SMEs, universities and research institutions. It might consider the establishment of an R&D centre, which would benefit industry–university–research cooperation in the long run and, in turn, lay the technical foundation for the long-term development of SMEs.

Strengthening the intellectual property institution

Since its accession to the WTO, China's IP regulatory framework is deemed to be in conformity with the TRIPS standards.¹⁴ However, standards regarding international IP protection and enforcement institutions tend to increase over time. In this context, the government should consider emphasizing that China is a developing country, and reaffirm the balance between private and public rights and developed and developing countries.

Cultivating the intellectual property culture

The Bureau of Intellectual Property should consider holding seminars on IP institutions, enterprises' innovation consciousness and IP protection consciousness, especially for innovative SMEs. These seminars could be tailored to the demands of different industries. The Bureau of Intellectual Property should also offer training courses to meet the specific needs of SMEs, especially the needs of those dealing with IP in innovative enterprises. For technicians in manufacturing and high-technology SMEs, the training should focus on the institution of patents, the patent literature search and analysis of patent rights requirements. For other SMEs, training should focus on the introduction of a utility model, appearance design and trademark application. For those SMEs with concerns about the protection of business secrets, training should focus on instituting protection of business secrets.

Strengthening the ability of the innovation support institutions regarding intellectual property

The government should pay attention to cultivating and improving the ability of innovation support institutions, such as science and technology parks and incubators, to deal with IP. For instance, the government should require innovation support institutions to hire employees who know how to manage and utilize IP and provide IP services to innovative enterprises. The provision of IP services should become a hallmark of science and technology parks, incubators and other innovation support institutions.

Finally, the government should encourage science and technology parks, incubators and other innovation support institutions to take part in innovation activities directly. This implies that these bodies should collect from universities and research institutes the convertible fruits of technological innovation, identify SMEs which have the will to implement their conversion, and take part in such projects directly as fund-raisers, coordinators and managers. Science and technology parks, incubators and other innovation support institutions are different from other start-up hubs, and they should not only provide a home for innovation activities, but also become key innovation actors.

Endnotes

1. Law of the People's Republic of China on Promotion of Small and Medium-sized Enterprises, Article 2.
2. Most OECD countries consider SMEs to be firms with fewer than 250 employees. Some countries set the limit at 200 employees. The United States considers SMEs to include firms with fewer than 500 employees (OECD, 2000a).
3. See: <http://finance.sina.com.cn/hy/20120426/100211929864.shtml>.
4. See: http://www.stats.gov.cn/tjsj/qtsj/2006cxdc/t20080222_402464453.htm.
5. According to Chinese patent law, a utility model is similar to the patent, but usually has a shorter term and less stringent patentability requirements. It is usually called a "petty patent" or "small patent".
6. R&D personnel are a sub-sample of scientific and technological personnel.
7. SMEs contributed close to 60 per cent of China's GDP in 2006 (see Introduction).
8. Normally, R&D intensity means the ratio of a firm's expenditures on research and development to the firm's sales (see Cohen, Levin and Mowery, 1987). In China, the statistics are not categorized by different scales of enterprise; for the purpose of this chapter, we made some adaptation.
9. 2000 SMEs represents 5 per cent of all enterprises in Shanghai.
10. Patent implementation includes commercialization by oneself and licensing to others.
11. See: http://202.123.110.5/gzdt/2006-04/14/content_253909.htm.
12. See: <http://english.sipo.gov.cn/laws/>.
13. The patent sponsorship policy is meant to encourage enterprises to apply for patents by giving them the patent application fees.
14. The WTO's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), negotiated in the 1986–1994 Uruguay Round, introduced intellectual property rules into the multilateral trading system for the first time.

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