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Beyond Conventional Perceptions: The Power of Rising SMEs in China's Innovative Transformation

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After the exploration of advantages and disadvantages of innovation in SMEs from the literature which is mainly conducted in developed countries, the status of SMEs innovation in China is discussed. Based on the dynamics of political structure and market environment in China, SMEs in China is argued to perceive both opportunities and challenges in term of innovation development. As public policy is proposed as a critical dimension of innovation in China besides market and technology, how innovation in SMEs relates to firm strategies and firm performance is discussed in the transitional Chinese context. Particularly, high-growth SMEs are highlighted to be influential to regional innovative transition and the development of innovative culture. Perspectives for future research and policy implications are discussed at the end of the research.

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Key words: innovation, SMEs, China, Policy

1. Introduction

As the largest developing country in the world, China has achieved over 30 years significant economic growth since the reform and opening-up program in 1978. With its low-cost labor

and natural resources, China has become the world factory by manufacturing products designed by foreign companies. However, as China's economy continues growing, the old "world factory" model creates serious problems, including the heavy pollution, the exhausting of natural resources, as well as the path-dependency of low-tech manufacturing (Cao et al., 2013, Breznitz and Murphree, 2010). Having served as low-tech manufactures for decades, Chinese firms are considered to be lack of innovation capabilities and global competitiveness (Breznitz and Murphree, 2010). Though the catching-up of economic scale can be achieved by low-tech manufacturing of imported technologies (Wilsdon, 2007), the catching-up process of innovation capacity and global competitiveness represents a big challenge to China.

China has been making efforts to develop national innovation capacity since the very early foundation of the P.R.China. 4,707 central government documents regarding to science and technology policy were released from 1949 to 2010, including laws, regulations, measures, etc (Huang et al., 2014). During the catching up period, tremendous changes have happened to the Chinese economy and society, as well as the innovation systems. The economic structure and market conditions in China have experienced a transition from government-central to market-oriented. As it is known generally, research institutions (e.g. China's Academy of Science/CAS) and universities are the main driving force of science and technological research, attracting a majority of government investment on science and technology development (Liu et al., 2011, Xue, 1997). As the reform and opening up program goes deeper, Business sectors, especially state-owned enterprises (SOEs), become active and gradually get involved in research and development activities (Bound, 2013, Sun, 2002). Along with the continuous open-up of Chinese market and increasingly supportive government policies, increasing opportunities can be perceived by small and private business owners. Take Huawei and Chery as examples, the two companies represent the first batch of SMEs in China which achieve very fast growth rate and turn into large leading firms in both domestic and global market in the past few decades.

Innovation development in China has become a hot topic in recent years since Chinese government strongly emphasized the importance of innovation in the progress of economic transition and technological catching-up which leads to the increasing number of publications and patents from China. The majority of the research claims that China's innovation development is led by research institutions/universities and SOEs which are the main sources of academic publications and key targets of government support (Sun, 2002, Wilsdon, 2007). However, given the large amount of investment and political support on science and technology development, a report by NESTA identified that rather than an innovative state, China is still an absorptive state (Bound, 2013). As Hu and Mathews (2008) argued, the innovation capacity of China is still much lower than the US, Japan and some developed European countries even though the number of publications and patents of China is huge.

Problems and challenges in current China's economic transition have been studied, including the uncertainty of political structure, the inefficiency of knowledge and technology diffusion, and the unbalanced resource allocation (Breznitz and Murphree, 2010, Ernst, 2011, Zhang, 2009). While the Chinese government has been making great investment on research sectors and SOEs in order to improve the national innovation capacity, the majority of Chinese enterprises are small and medium-sized enterprises (SMEs), representing over 99% of all enterprises and contributing over 60% of GDP and over 80% of employment of China, many of which are low-tech manufacturing and lack competitiveness in global market (Liu, 2007).

In recent years, while the problems of pursuing a central planning system are pointed out, the Chinese government has slightly shifted its attitude and has gradually begun to provide more support and incentives to encourage innovative activities in SMEs. In 2003, the central government of China launched the "Small Enterprises Promotion Law" to encourage local governments to deliver SMEs promotional projects from various aspects. SMEs clusters and incubators are established by local governments, in order to attract innovative SMEs, such as university spin-offs and oversea returnees. Most SMEs selected into these local programs are identified as high-tech, innovative and of great potential of future development.

Encouraging innovation in SMEs is another exploratory approach of the Chinese government besides fostering innovation in large leading firms and research sectors. Under the circumstances of fast industrial dynamics and high competition in global market, the market will never again get dominated by one or a few large companies. SMEs from various areas, which are flexible, adaptable and proactive, are highly promising to lead the market in the future (Jarillo, 1989). However, with various programs being initiated by local governments, some practical questions need to be answered, such as whether SMEs are actual innovators or not, what types of SMEs are more innovative than others, what are the effective ways to support innovation in SMEs, and how can innovation in SMEs drive the local innovative development.

This paper addresses the issues related to innovation policy targeting SMEs, primarily in China. Similar issues are faced governments in other emerging and transitional economies. An analytical framework is developed to analyse innovation in SMEs in these context, which integrate innovation activities and strategies at firm level and its spill-over effects at regional level by combining both top-down and bottom-up perspectives. Five major issues, which are critical in China but not well explained in current literature are discussed in order to illustrate the analytical framework and point out potential perspectives for further research. The extraordinary role of policy in the Chinese context is identified as a significant driver of innovation in SMEs. How SMEs perceive the public policies and how the perception relates to their innovation and firm strategies is discussed as a promising perspective of research on SMEs innovation in China. Different trajectories of SMEs innovation development and how they interact with external environment including policy and market

will be discussed. In addition, the role high-growth SMEs are highlighted in terms of spill-over effects of innovation at firm level to regional level.

The paper is structured as following. The first section introduces the research background and context of the paper, with emphasis of the importance of the research on SMEs innovation in China. Section 2 discusses existing knowledge from literature and research gaps. Section 3 introduces the analytical framework focusing on SMEs innovation in China and its role in economic and innovative transition. Five major issues regarding to the innovative status and transition in China are discussed in depth according to the analytical framework. Section 4 sums up the discussion of the paper and provides policy implications and perspectives for future research on China's innovative catching-up.

2. Theoretical Background

In order to provide a theoretical background to analyze SMEs innovation in the period of China's transition towards a more innovative economy, three streams of literature is discussed in this section, respectively innovation and technological catching-up, innovation in SMEs and Innovation in high-growth firms.

2.1 Innovation and the Technological Catching-up

It has been generally considered that innovation is a critical approach for late-comer economies to catch up with frontier countries (Fagerberg and Verspagen, 2002). From the perspective of technological catching-up of a country, the national innovation system has been identified as a systematic approach to analyse the complicated issues in the catching-up process (Nelson, 1993, Lundvall, 1992, Fagerberg and Verspagen, 2002), but the processes differ in different countries and the reason why different economies grow through distinct pathways is largely debatable.

Government, research sectors and business sectors are recognized as three main actors in the national systems of innovation (Etzkowitz and Leydesdorff, 2000). Previous research indicates that the connection between different actors is one of the most important reasons for the development of innovation. The rapid development of Japan after the Second World War was largely dependent on the role of the government in stimulating innovation at enterprise level and strengthening linkage between business sectors and research sectors, which was called "developmental state" (Johnson, 1982). More recently, Mazzucato argued the role of American government in the developmental process of innovation was an "entrepreneurial state". Instead of stimulating demand or picking winners, the American

state was able to take risks and create a highly networked system, which can harness the best of private sector over a medium to long-term horizon (Mazzucato, 2011).

While the connection of production and research is identified as the key driver of innovation development in various countries, they do not follow the same catching-up process, due to various economic structures, innovation policies, market conditions and the national culture. However, successful catching-up always integrates both innovation and the adoption of existing techniques (Fagerberg and Godinho, 2005, Cohen and Levinthal, 1990). Lee and Lim (2001) studied selected industries in Korea. Using a technological and market catching-up model, they found different pathways in Korean catching-up process, including path-creating catching-up, path-skipping catching-up and path-following catching-up (Lee and Lim, 2001). Castellacci and Natera (2012) claimed that the dynamics of national innovation systems is driven by the co-evolution of both innovative capability and absorptive capacity (Castellacci and Natera, 2012).

As the largest developing country in the world, China has its specific characteristics, in terms of the domestic economy, institutional structures and the market environment. The development of national innovation system in China has also followed a unique pathway, from central-planning to market-oriented (Zhang, 2009). However, when the large amount of innovation-oriented investment does not pay back in terms of national innovative capacity development (Bound, 2013), the problems within the catching-up process in China have to be explored in depth.

2.2 Innovation in SMEs

While innovation has widely accepted as commercialization of new knowledge (Fagerberg, 2004), it is not just about the new ideas, but including the actions to make new products or improve producing process. Therefore, the processes and outcomes of innovation are not only limited within the firm but also involves market and other external conditions.

The differences of innovation in SMEs from large firms stem from the specific characteristics of SMEs. On one side, innovative activities in SMEs are constrained by their limited resources and relatively low innovative capacities (Kanamori et al., 2006, Zhu et al., 2012). As the process of innovation is the creation of new knowledge, innovation in SMEs is therefore located in a disadvantaged position compared with their large rivals who have much bigger knowledge base and human capital resources. On the other side, as innovation in nature is risky and uncertain (Fagerberg, 2004), SMEs, from this perspective, are flexible and active while dealing with market dynamics.

Advantages and disadvantages of SMEs to innovate have been discussed in previous literature (Caloghirou et al., 2004b, Martínez-Román et al., 2011). Typical disadvantages of

SMEs include limitations in resources, informal structures, managerial capacities and financial capabilities. However, SMEs are considered as reactive and flexible in structure changes and market dynamics. Main advantages of SMEs refer to more flexibility and adaptability than larger organizations. Flexibility and absorptive capacity are critical for firm development (Eriksson et al., 2014). Due to disadvantages in terms of smaller size and less resources, small firms usually rely on flexibility and timely responsiveness to market dynamics to create and serve profitable market niches (Caloghirou et al., 2004a).

Adopting a theoretical perspective of resource-based view, Terziovski (2010) analyzed SMEs in manufacturing sectors in Australia and found that innovation strategies, formal structures, customer and supplier relationships, innovation culture and technological capabilities are positively associated with SMEs performance (Terziovski, 2010). However, while innovation is argued as a significant approach to improve SMEs technological position and performance, the approach of how innovation in SMEs facilitate firm development has to be examined in various contexts.

2.2.1 Patterns of Innovation

Given the research context of China in transition, innovation in SMEs has to be examined from various levels according to the innovative activities taken place in firms. Five categories of innovation are identified by Schumpeter, respectively *“new products, new methods of production, new sources of supply, the exploitation of new markets, and new ways to organize business”* (Fagerberg, 2004). Basically, the five types of innovation can be categorized *“technological innovation”* and *“organizational innovation”* (Edquist et al., 2001). Organizational innovation mainly refers to changes in organizations, such as business structure and administrative approaches, which is not limited to technological change (Damanpour and Evan, 1984). In order to emphasize the research focus and narrow down the research scope, changes in organizational structures and managerial approaches will not be targeted in this research. Instead, technology innovation will be main research target, which refers to improvement in either the process of product manufacturing or the product itself. This means that, within the boundary of technological innovation, both product innovation and process innovation are considered in this research for the scope of innovation.

In addition to innovation in various aspects, firms pursue different levels of innovation relating to their strategies. Radical innovation and incremental innovation are two typical types of innovation which are discussed most frequently in previous literature (Ettlie et al., 1984, Dewar and Dutton, 1986), from both technological and market dimensions (Garcia and Calantone, 2002, Popadiuk and Choo, 2006).

Radical innovation refers to brand new products in the market which contains a high degree of new knowledge which is mainly carried out by large firms (Chandy and Tellis, 2000, Sood and Tellis, 2009). McDermott and O' Connor (2001) claimed that radical innovation is critical for firm long-term success and identified three levels of strategic themes in the process of radical innovation, respectively market scope, competency management and people issue (O'Connor and McDermott, 2004). While incumbents do have more capacity and power to bring out radical ideas and take them into practice, they suffer from the risks and uncertainties along with radical innovation (Dougherty and Hardy, 1996).

Incremental innovation refers to new products with improved functionality or figures based on existing products in the market, which contains a low degree of new knowledge (O'Reilly III and Tushman, 2008). Ali (1994) analyzed previous research and claimed that the adoption of particular innovation strategies should take both firm and project characteristics and market conditions into account (Ali, 1994). Another strategy to introduce new products, which is also discussed by researchers, is imitation. By adopting imitation, products introduced are new within the imitating firm, but not new to the market. Differentiated from innovators, imitative firms are always market followers by adopting existing knowledge (Hegarty and Hoffman, 1990). Carcia and Calantone (2002) analyzed technological innovation typology and innovativeness terminology from previous research and claimed that imitative innovation and incremental innovation are most likely to be same type of innovative activities (Garcia and Calantone, 2002).

Therefore, radical innovation and incremental innovation will be adopted in this paper when analyzing SMEs innovation in China. While innovation is emphasized by the Chinese government, the effects of SMEs adopting different innovation patterns in China are worth investigating.

2.2.2 Innovation and Firm Strategies

Innovation is not the guarantor of firm competitiveness and performance. However, it affects firm behaviors in other aspects. For instance, Wakelin (1998) found that the more innovative the firm is, the more possibilities the firm tends to export by investigating a sample of UK firms in terms of exporting behaviors (Wakelin, 1998). As innovation is a process of knowledge creation which involves both internal and external resources (Kanamori et al., 2006), firm strategies on knowledge sourcing, networking and marketing are significantly related with its innovation patterns.

Knowledge sourcing strategy of a firm is critical to affect their innovative capacity, especially in SMEs which are more likely to be restricted by limited resources and human capitals. Knowledge sourcing from other organizations, including large firms and research institutions, are therefore critical for SMEs innovation. As far as innovation is considered as an

interactive process, the notion of systems of innovation emerged, which emphasizes interactive learning and knowledge and technology diffusion.

Firm networking strategy is another significant strategy related to its innovation strategy and innovation performance, such as university-industry link (Brehm and Lundin, 2012, Lundvall, 1992). While RBV emphasizes resources, rather than production, of firms and their capabilities to achieve competitiveness (Wernerfelt, 1984). Innovation as a strategic approach of firm to improve performance is then influenced by both internal (such as firm size, assets, technological and financial capabilities) and external resources (such as market dynamics, customer demands, competitor strategies and public and institutional influence). For SMEs, certain disadvantages, such as limited technological and financial capacities, as well as specific advantages, such as flexible structure and efficient response to market dynamics, make innovation in SMEs distinct and unpredictable in different environment. Rothwell et al. (1991) analyzed SMEs in manufacturing sectors in Europe and found that innovative SMEs have intensive external networks with other firms and institutions including research sectors and government (Rothwell, 1991).

Finally, marketing strategy is also an important strategy that will directly influence on firm competitiveness besides innovation. As it is argued that innovative firms with active marketing strategies always outperform the other firms (Manu and Sriram, 1996). While the objective of SMEs innovation is to build up competitiveness in market place, the correct selection of marketing strategies can support and facilitate the improvement of firm competitive advantages among competitors.

Therefore, firm innovative activities have significant impacts on firm strategies, including knowledge sourcing, networking and marketing strategies. However, the relationships between innovation and these strategies have to be analysed in different contexts. Given the complicated market conditions during China's innovative transition, the interactive relationship between innovation and firm strategies has to be explored.

2.2.3 Innovation and Firm Competitiveness

Besides the impact of innovation on firm strategies, this session will discuss the direct link between innovation and firm competitiveness. From the perspective of resource-based view (RBV), firms achieve competitive advantage by reaching and leveraging resources that are rare, imitable, valuable and sustainable (Wernerfelt, 1984, Barney, 1991, Peteraf, 1993). Given the reality that firms are heterogeneous, innovating firms can reach more external resource by distinguishing themselves with superior products or producing processes, which makes a foundation for their competitive advantage. Meanwhile, innovating firms are more likely to build up internal capabilities than their rivals, which ensures their sustainable competitiveness and firm growth.

While innovators can achieve a first-mover/second-mover advantage and build up their competitiveness (Dosi and Teece, 1998, Lieberman and Montgomery, 1988, Geroski and Machin, 1992), they are generally more attractive to market resources in terms of customer preference, government incentives and financial investment. As pointed out by Kim and Mauborgne (2005), innovation is the only approach to ensure firm's survival in the highly competitive market (Kim and Mauborgne, 2005). Geroski and Machin (1992) investigated 539 UK manufacturing firms from 1972 to 1983 and found that innovating firms have better performance than non-innovating firms in terms of both profit and growth rate, especially during the recessions (Geroski and Machin, 1992).

In addition, during the process of carrying out innovative activities, innovating firms establish their capacity to absorb, utilize and generate new knowledge (Cohen and Levinthal, 1990). With better absorptive capacity and intelligence level, firms which are highly engaged in R&D and innovative activities are more adaptable and flexible to market dynamic and environmental change (Teece et al., 1997). Innovation has been approved to be positively related with firm performance in some contexts (Schmookler, 1966, Geroski and Toker, 1996). Wakelin (1999) analysed 170 UK firms and found a significantly positive relationship between firms' own R&D expenditure and its productivity growth (Wakelin, 1998).

Even though theoretical studies try to claim and empirical research has provided some findings of the positive relationship between innovation and firm performance. Yet, there is still insignificant or even unsupportive evidence in some other empirical studies. By analyzing data on US manufacturing industries over the period of 1921 to 1946, Mowery (1983) found that firm R&D employment only has positive relationship with its sales growth from 1933 to 1946, rather than through the whole period (Mowery, 1983). Bottazzi et al. (2001) claimed that no significant contribution of a firm's innovation level to its sales growth was identified in pharmaceutical sectors (Bottazzi et al., 2001).

The controversial findings of research on innovation and firm performance show that innovation is not guaranteed, but risky and uncertain in nature (Coad and Rao, 2008). Therefore, the relationship between innovation and firm performance is contingent in terms of firm sizes, sectors, market conditions, public policies and even economic structures. Coad and Rao (2008) studied on high-growth incumbents in high tech sectors and found that innovation is of much greater significance for high-growth firms than for average firms by adopting quantile regression methods (Coad and Rao, 2008). Rosenbusch et al. (2011) demonstrated that innovation-performance relationship is context dependent through a meta-analysis (Rosenbusch et al., 2011). Factors including firm age, innovation type and cultural context all considerably affect the influence of innovation on firm performance.

Particularly in SMEs, innovative activities and behaviors also have different effects on firm performance. Freels (2000) studies 228 small manufacturing firms and identified that innovating firms outperform non-innovating firms in terms of sales and employment growth (Freel, 2000). Taking Scotland and Northern England SMEs as research sample, Freel and

Robson (2004) found that product innovation in these SMEs is negatively related with firm growth in terms of both sales and productivity (Freel and Robson, 2004).

The discontinuous findings of relationship between innovation and firm competitiveness shows the importance of in-depth research on SMEs innovation in China. While innovation is considered as a key strategy to improve national technological position, policy makers have to select the right targets to support and invest on their innovation development.

2.3 Innovation in High-growth SMEs

High-growth firms, as called gazelles by Birch (1979), refer to a small subset of enterprises which have been generally considered as major job creators in regional development (Birch, 1987, Brown, 1990, Storey, 1994, Shane, 2009). It has been argued that public policies should focus on high-growth firms instead of generally supporting start-ups in order to improve employment and enhance economic growth (Mason and Brown, 2013). This has demonstrated the significant role of high growth firms in driving regional economic development.

Even though the Gibrat's law argues that growth rate is random beyond firm size, research has generally considered that small and young firms are most likely to grow rapidly (Sutton, 1997). Henrekson and Johansson (2010) argued that the rapid growth of firm benefits from its young age rather than small size (Henrekson and Johansson, 2010). However, Acs et al. (2011) studied on so called "high-impact" firms in the US and found that rather than the young age, it is the small size that categorizes these firms (Acs, 2011). While Burns (1989) argued that small businesses stabilize after growing in the first a few years of start-up (Burns, 1987), Smallbone et al. (1995) claimed that mature SMEs also have potential to grow by analyzing small business in the UK (Smallbone et al., 1995).

Regarding to industry affiliation, most researchers fail to discover any relationship between high-growth firms and their industry affiliation, which means high-growth firms are located in various industries and not necessarily in high-tech sectors (Acs, 2011). However, firms in technology-intensive sectors and high-tech sectors are found to have greater growth potential and survival rates than other average firms (Audretsch, 1995). Firms in high-tech sectors are generally more dynamic and innovative, which creates more opportunities for these firms to introduce new products or reduce manufacturing costs and achieve competitive advantages among their rivals.

Entrepreneurial characteristics, strategic approaches and organizational characteristics are identified as key characteristics of high-growth firms (Storey, 1994). Gibb and Davies (1990) analyzed the growth of small business and discovered four types of growth models, including personality dominated approaches, business management approaches, market-led

approaches and organizational development approaches (Gibb and Davies, 1990). Jarillo (1989) claimed that entrepreneurial characteristics including being flexible and actively accessing to external resources are critical approaches to achieve high-growth rate (Jarillo, 1989). By analyzing over 100 gazelles in the UK, Parker et al. (2010) emphasized the importance of dynamic management strategies in the rapid growing of small businesses (Parker et al., 2010).

While Smallbone et al. (1995) found that, compared with average firms, high-growth SMEs show substantial changes in production process by introducing new technology (Smallbone et al., 1995). Therefore, integrating the discussion in previous sessions, innovation may contribute to the achievement of high-growth rate of a firm. Especially in the transitional environment of China, innovative firms can get more access to resources provided by the government and the market. Innovation in high-growth SMEs is then of great interest for further research on innovation in China.

Even though, it has been approved that innovation is the most popular strategy of firm expansion (Hay and Kamshad, 1994), research on the relationship between innovation and fast-growth of SMEs is scarce. Holzl (2009) analysed R&D behaviour of high-growth SMEs in 16 countries and identified that for SMEs in countries that are closer to technological frontier, innovative activities significantly contributes to their high growth rate, while no significant relationship was found in countries which are far from technological frontier (Hölzl, 2009). Rosenbusch et al. (2011) identified that innovative SMEs do not necessarily have better performance, but context dependent (Rosenbusch et al., 2011).

However, Mansfield (1962) identified that R&D activities and innovation are key factors of high growth rates of gazelle firms (Mansfield, 1962). It is also claimed by Birch and Medoff (1994) that great innovation is another characteristic of gazelles besides rapid job creation (Birch and Medoff, 1994). Smallbone et al. (1995) analyzed the differences of innovative behaviors in high-growth SMEs across sectors and identified that for craft-based sectors, innovation may not be the rule, but for medium and high technology sectors, products innovation is a significant way to differentiate themselves from rivals (Smallbone et al., 1995). Coad and Rao (2008) emphasized that innovativeness is more important for superstar high-growth firms than for those average firms (Coad and Rao, 2008). However, by researching on fast growing firms in New Zealand, Hinton and Hamilton (2013) claimed there is no need for high-growth firms to be the novel innovator in the market (Hinton and Hamilton, 2013).

Based on the above discussion, there is still not and will never be a general answer for the question how high-growth firms achieve the high growth rate. Both external environment and internal characteristics have a large impact on firm performance. External environment includes economic structure, political initiatives, market maturity, supply chain position, networking and relationship, etc. Internal characteristics include entrepreneur characteristics, business strategies, innovation patterns, as well as organizational structures.

In addition, previous studies on gazelle firms are mainly conducted in the US and European countries, where the economic structures and market conditions are much more mature and stable than emerging economies, where the characteristics, developmental patterns and social and economic impacts of high-growth firms are of much difference. Particularly in China currently, economic structure and market conditions are highly dynamic in the transitional process of China, which makes firms development more uncertain.

In addition, innovation behaviors and R&D activities in gazelle firms in transitional economies are still under developed, where gazelle firms may have a greater impact on innovative transformation. Research on innovation patterns in high-growth SMEs in China will contribute to the understanding of how high-growth firms success in a dynamic and immature emerging market and the impacts of different innovation patterns on its rapid growth.

3. Analytical Framework

The discussion in the previous section briefly summarizes the literature of innovation and firm growth, the relationship between the two constructs and evidence in high-growth firms. While the prominent theoretical and empirical work are mainly conducted in developed countries from the perspectives of the US or European economies, there is scant research taken place in emerging countries. Along with the increasing openness of global market, developing countries gradually take considerable roles during the integration of global productivity. After being the “world factory” for decades, the shift of China towards an “innovative society” may fundamentally change the structure of global manufacturing and the world economy. Therefore, research on innovation in China is urgently required.

When considering the Chinese development through the past over 30 years which mainly depended on low-tech manufacturing and its transitions towards innovative economy, problems of the Chinese economy cannot be well explained in previous literature, which are mainly from the perspectives of developed countries. As innovation is context dependent, in terms of drivers, barriers, outputs and spillover effects (Rosenbusch et al., 2011), an objective and critical investigation of the innovation status of China has to be taken to describe the various patterns and developmental trajectories in the field.

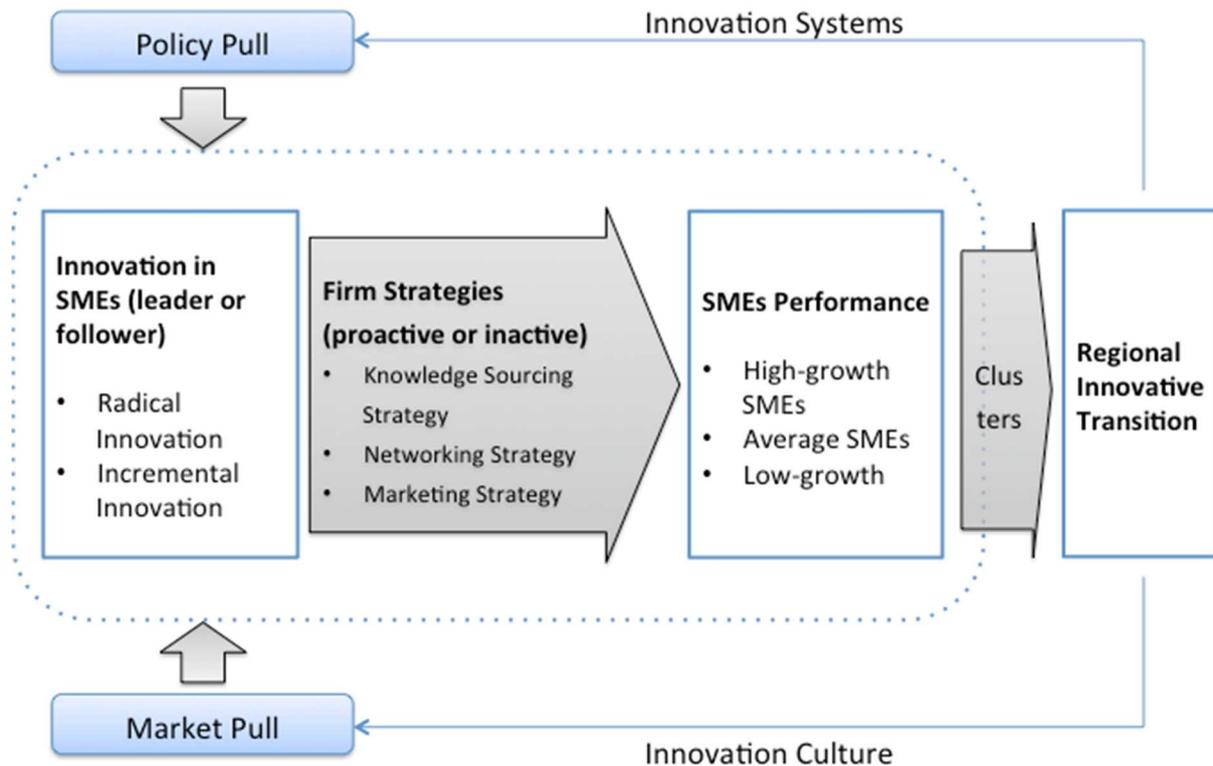


Fig. 1. Analytical framework of SMEs innovation and its role in regional innovative transition

This section will discuss the specific issues of innovation in China. By synthesizing previous literature on innovation in various contexts and case studies in China, an analytical framework is introduced (see Fig. 1.), in order to provide a systematic figure of innovation in China from the perspective of SMEs innovation. Based on the analytical framework, five major issues within the analytical framework in the specific context of China which need better answers and closer observations are discussed in the Chinese context.

3.1 Policy-pull as a Third Dimension of Innovation in China

Adopting a central planning system for the past a few decades, the Chinese economy and market conditions are still influenced a lot by government activities. This is one of the major differences of innovation development in China from the developed countries in the literature. While technology and market are two critical dimensions of innovation (Abernathy and Clark, 1985, Popadiuk and Choo, 2006), the influence of policy cannot be overlooked in SMEs innovation in China.

The motivation of a firm to take innovative activities is to survive and improve competitiveness in the increasingly competitive market. Various stakeholders are involved

in the process of carrying out the innovative activities, including customers, competitors, suppliers, and governments. As Breznitz and Murphree (2011) pointed out that the structural uncertainty and technological path-dependency are considerable barriers of innovation development in China (Breznitz and Murphree, 2010). Policy instructions have a large impact on firm innovative activities in China, especially under the unstable market condition. On one side, for specific sectors that are supported by government, firms can benefit from more opportunities and developmental space. On the other side, the shift of government orientations may lead the firm to a disadvantaged environment.

In recent years, especially after the release of MLP in 2006, the Chinese government has strongly supported the development of domestic innovation capabilities with large amount of innovation-oriented investment and political support. Increasing number of incubators and high-tech clusters are established to support innovative enterprises. The launch of the “Small and Medium-size Enterprises Promotion Law” in 2003 and the “National Medium and Long-term Plan for Science and Technology Development” in 2006 emphasized the startup of high-tech SMEs and transition of conventional SMEs towards more innovative enterprises.

The returnee incubator in Hangzhou High-tech District is one of the incubators which aim to attract returnee entrepreneurs. The local government provides not only office place, efficient administration systems for these high-tech firms, but also different levels of investment support based on the project innovativeness and feasibility. Creative financial system has also been developed to facilitate small businesses which are innovative and of great potential to grow into big firms. These firms, benefiting from government policies, are more likely to be innovative and be influential in local clusters. Hikvision, which started in 2001 as a spin-off from a research institute of China Academy of Science (CAS), is currently a public company and a world leading developer of security camera. During 13 years development and profiting from government support, Hikvision achieved a turnover of over \$1 billion when the original asset was less than \$1 million. The rapid development of Hikvision has also facilitated innovation development of other local firms and has considerable influence on local economic development.

3.2 Biased Perceptions of SMEs Innovation in China -- Are they actually Innovative or Not?

Since the problems of unbalanced innovative development in China are increasingly severe, which has hindered the sustainable development of China’s economy and transition of China’s industrial structures, slight change from the government towards enterprise-led system can be detected (Sun and Liu, 2010). Nowadays, the Chinese market provides more and more opportunities for SMEs to develop and grow into big or even strong firms (Sun and Liu, 2010).

Innovative small businesses get increasing supports from local government for the sake of local economic development and prosperity. According to data from the first national economic census in China, the richest regions like Shanghai, Jiangsu, Zhejiang and Guangdong have the largest amount of SMEs. SMEs clusters play a significant role in regional economic development (Kanamori et al., 2006, Bellandi and Lombardi, 2012).

While, SOEs, with large amount of financial support from government and protection for its operation, are likely to be conservative and reluctant to take risks, which leads them to pursue short-term profits instead of radical innovation (Suttmeier et al., 2006) and failed to produce higher innovative performance than non-SOEs and SMEs (Guan et al., 2009, Du et al., 2014), SMEs are considered to be more flexible to market dynamics (Jarillo, 1989) and with more entrepreneurial characters and willingness to take risks.

SMEs in China, with constrained resources and limited ability to carry out in-house R&D activities, SMEs are always overlooked as innovators. Traditional measurements of innovation are using the indicators of the level of firm R&D expenditure, the number of patents and new products to indicate the input, output and outcome of innovative activities. As a matter of fact, SMEs in China tend to take innovative activities in terms of process improvement from the perspective of cost reduction and advanced manufacturing. Therefore, the traditional measurements of innovative capacity are likely to be biased in SMEs.

Particularly, given the label of “Shanzhai”, SMEs are treated as pure imitators with very low innovative capacity. However, SMEs which can survive and grow in the highly competitive market never just imitate (Kim and Mauborgne, 2005). While some extraordinary SMEs are developing radical innovations and leading niche markets gradually, the majority of SMEs in the lower position of innovation value chain are adopting incremental and imitative innovations, which are based on existing technologies or products, but with their own competitive advantages.

Therefore, by adopting different patterns of innovation, SMEs in China are more innovative than they are perceived. However, new methods and in-depth fieldwork have to be taken to explore the reality of innovation status in Chinese SMEs.

3.3 The Transformation of Innovative Capacity and the Development of Business Performance in SMEs

Although there is an argument on the influence of innovation on business performance, it's generally considered that in the long-term the increasingly innovative capacity can drive the growth and competitiveness of business from various contexts (Dosi and Teece, 1998, Geroski and Machin, 1992). Along with increasingly political support for SMEs development

in terms of innovative capacity, SMEs in China have gained considerable development (Chen, 2006). However, during the specific period of economic transition and innovative development in China, how do SMEs actually grow? Given the various strategies taken by SMEs, what types of firm strategy of innovation actually drive their development in the current period of innovative transition and what changes are taking place within the current mechanism?

Radical innovation and incremental innovation are discussed in the literature. In the transitional period of China's economy, the emphasis of innovation of both Chinese government and the market may have more impacts on firm choice of innovation patterns and affect its strategies and performance accordingly.

As radical innovation is one of the major approaches to achieve objective of indigenous innovation of the Chinese government, enterprises are encouraged to develop R&D activities with high-level technologies. Especially for SMEs in high-tech sectors, the number of patents and new products are important indicators to get government subsidies and financial investment. The level of firm innovative capacity is then very important for a firm to get access to external investment and build up relationships with government and other external stakeholders for the sake of its long-term development. FDJZ is a medium-sized enterprise specialized in bio-medical industry located in Shanghai. The core of the growth model of FDJZ is to pursue radical innovation in niche market. After 18 years' development from a scratch of less than 10 employees, the company has developed into a leader in the special medical market with over 400 employees. As recorded by its R&D manager, the advantage of innovative capacity within the firm is very significant to help them get access to government projects and financial supports.

Incremental innovation is the most popular strategy adopted by Chinese SMEs, both in high-tech and low-tech sectors. By adopting incremental innovation, firms take a conservative strategy, as it is low risk in terms of both technology and market but at the same time faces more competitive conditions for similar products in the market. AS is a medium-sized enterprise in food addition industry which started 13 years ago with 5 employees in a factory dumped by a SOE. Currently, AS has over 100 employees, its own office building and factory and has become a distinguished supplier among its customers including the very large SOEs. The competitiveness of AS is to provide low-cost products with equal/similar quality and customized solutions. Incremental innovation based on existing products is adopted by AS. Integrating with customized designs and re-innovation, AS stands out among various competitors and establishes its own customer base.

As the main stream literature emphasizes the importance of innovation, the Chinese government is also encouraging transition towards more innovative economy. SMEs in China is facing the dilemma of innovation, while incremental innovation and imitation can both generate profits and achieve growth in certain markets. The problem of whether

innovation or imitation boots growth in the current Chinese market needs in-depth investigation.

3.4 Innovation Orientation and Proactive Firm Strategies – a More Significant Link in China

Innovation strategy adopted by a firm relates to other strategic decisions such as marketing, networking and knowledge sourcing (Tidd and Bessant, 2011, Rothwell, 1992). The process of carrying out innovation according to a particular strategy affects firm strategies of other aspects. As literature from the western perspectives have proved that the more innovative a firm is, the more active it is in connecting with market and other external stakeholders (Rothwell, 1992). Constrained by its smaller size and limited resources, innovative SMEs tend to be more active regarding to networking strategies. Especially in China, while “guanxi”, the Chinese expression of a special type of relationship, is very influential in the Chinese society, networking is an effective strategy especially when the firm aims to build close relationship with government and other stakeholders.

Given the uncertainty of innovative products in highly competitive market in China, the marketing strategies adopted by a firm should be more effective in order to reach its customers. Manu (1996) suggested that firms with different innovation strategies have different marketing strategies and performance levels, where pioneering in the market always has better performance than the late entries (Manu and Sriram, 1996).

Knowledge sourcing is important for a firm to establish its knowledge base in order to carry out innovative activities. Innovation of high creativity needs considerable amount of knowledge which is hard for SMEs to do it by themselves. Rothwell (1991) claimed that innovative SMEs are more interactive to relate to research sectors and other organizations (Rothwell, 1991). However, in the specific period of China when innovation is largely promoted but the mechanism of IPR is rather low, SMEs which are usually located in the disadvantaged position in the market, may have different reactions when considering knowledge sourcing strategies.

Therefore, SMEs in China under the specific period of innovative transition, face both opportunities and challenges. While innovation is argued to be an important approach for better firm performance, firm strategies related to innovation, such as knowledge sourcing, marketing and networking, are also critical.

3.5 Spill-over Effects of High-growth Innovative SMEs and the Reflection on Regional Innovation Systems and Innovation Culture

High-growth SMEs are believed, to a large extent, represent the most innovative and dynamic group of SMEs. First of all, in order to achieve rapid growth rate, these firms usually adopt very active strategies to firm development and high flexibility and dynamics to market competitions and involved in innovative activities following different patterns. Secondly, high-growth firms have been largely proved as an extraordinary group of firms which contributes most to economic growth and job creation with positive influence on other firms in the same region or the same industrial cluster through spill-over effects (Mason and Brown, 2013).

Research shows close relationship between highly active and competitive SMEs and the effect of SMEs clusters in driving regional economic development (Kanamori et al., 2006, Bellandi and Lombardi, 2012). Along with the rapid development, high-growth firms will not only generate more job opportunities for local community, but also develop more interactive relationships with local suppliers, competitors, customers and other organizations. During this process, the innovative behaviours of these firms will affect the other organizations involved. Especially in China, in the current legacy of central planning but local execution, the development of high-growth SMEs will easily become targets of government support and recognized by the rest of local economy.

The highlight of regional innovation system can effectively involve the innovative activities of local SMEs, which are highly active but not well linked in national innovation system. The innovative activities and performance of SMEs will then reflect on the transition of regional innovation systems. By analyzing development of Italian economy, Locke (1995) argued SMEs are crucial players and should be understood in the systems of innovation (Locke, 1995). By analyzing five empirical cases on SMEs and regional innovation systems, Asheim and Coenen argued that the regional level policy of innovation could stimulate both tacit and codified knowledge of an industry within regional networks (Asheim and Coenen, 2005).

Particularly, SMEs in China, which are highly active but not touched in national innovation systems, can be effectively engaged in regional innovative policy making and regional innovation networks. Besides, innovation in SMEs will also affect the atmosphere of local innovation by diffusions of knowledge and technology. In turn, more innovative activities will be pursued among various market players in order to build good reputation and enhance their competitive advantages.

4. Discussion and Conclusion

This paper provides a conceptual framework with a unique perspective to look into innovation in China, by synthesizing the top-down and bottom-up perspectives. Based on the analysis of research context and previous literature, discussions are generated and guided by the framework, including five major issues in China.

While China is experiencing the transitional period towards an innovative economy after being the “world factory” for over 3 decades, SMEs in China face the complicated market conditions, with both opportunities and challenges. On one side, increasing support from the government and market has been provided to SMEs for innovative development. On the other side, path-dependency of low-tech manufacturing presents a challenge for SMEs to improve their innovative capacity.

From the perspective of SMEs innovation, the role of public policy is identified as a significant dimension to pull up innovation in firms, as in China, the market conditions is still affected largely by public policies. The traditional perception of SMEs with low innovative capacity is challenged based on the analytical framework, where the transition of SMEs innovation is discussed. Especially, the transformation of SMEs from low-tech manufacturing to high-tech sectors, from imitators to innovators are discussed, which proposed that the role of SMEs in driving innovative transition cannot be overlooked. Particularly, the spill-over effects of high-growth SMEs in driving regional innovation performance and cultivating innovation culture is discussed, since these firms, to the largest extent, contribute to local economic development.

Based on the analysis, policy implications targeting SMEs innovation is discussed. First of all, high-growth SMEs can be selected as major targets of political support, instead of general entrepreneurs. Because of the significant influence of high-growth firms on economic development and innovative transition, the focus on high-growth firms will largely improve the efficiency of local policies. Particular support on innovation development in high-growth SMEs will not only improve the performance of these firms, but also generate spill-over effects in regional innovative development. Secondly, SMEs from various industries with different levels of innovation capacity should be encouraged, including both radical and incremental innovations. Even though different supportive policies should be made to encourage SMEs at different levels, the motivation of innovation in SMEs at all levels should be stimulated in order to establish an innovative society and cultivate innovative culture. Policies to support connection and knowledge diffusion in clusters will be an effective approach to create innovation culture. Finally, policies should be complementary to market functions. As market pull is an important driver for firm innovation, public policy makers should be well familiar with local market conditions and initiate policies that are

complementary and supportive to the mechanisms of market in order to provide a more stable environment and better stimulate SMEs innovation.

In conclusion, this paper develops an analytical framework to systematically discuss issues of innovation in China's transitional period and identified potential perspectives for research on innovation in China. However, empirical work has to be done to provide evidence for in-depth analysis of the innovative transition taking place in China.

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