Entrepreneurship development in China : a multilevel approach

ENTREPRENEURSHIP DEVELOPMENT IN CHINA: A MULTILEVEL APPROACH

Ying Zhang

A catalogue record is available from the Eindhoven University of Technology Library
ISBN: 978-90-386-3326-8

Zhang, Ying

Entrepreneurship Development in China: A Multilevel Approach
Eindhoven: Eindhoven University of Technology, 2013

Keywords: Entrepreneurship, Economic Transition, Networking, Catching-up, Social Capital, Entrepreneurship Education, Entrepreneurial Intention

Eindhoven University of Technology
Department of Industrial Engineering and Innovation Sciences
www.tue.nl

Cover design: Proefschriftmaken.nl || BOXPress BV
Printed by: Proefschriftmaken.nl || BOXPress BV

ENTREPRENEURSHIP DEVELOPMENT IN CHINA: A MULTILEVEL APPROACH

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de
Technische Universiteit Eindhoven, op gezag van de
rector magnificus, prof.dr.ir. C.J. van Duijn, voor een
commissie aangewezen door het College voor
Promoties in het openbaar te verdedigen
op donderdag 14 maart 2013 om 14.00 uur

door

Ying Zhang

geboren te Shaanxi, China

Dit proefschrift is goedgekeurd door de promotoren:

prof.dr. G.M. Duysters
en
prof.dr. X. Liu

Copromotor:
dr. M. Cloodt

For my parents and my daughter

ACKNOWLEDGEMENTS

I have witnessed Ph.D. graduation defenses of many friends. Every time, when I received a hard copy of a Ph.D. thesis book, the part I would like to read first is the "Acknowledgement", because this part does reflect joys, frustrations, ups and downs in the process of PhD. Similarly, I want to use this page to briefly record what I have gained in the past four years. There are so many things I want to share and write, as my Ph.D. life is not only an academic training period that made an independent researcher out of me, but also a progress that let me really grow up.

To start this page, I would say I am a quite lucky person. Comparing to most of the Chinese people, I was quite lucky to have a chance studying in a prosperous university in China, to have a chance to study in a master program in Eindhoven University of Technology in the Netherlands, and honorable to have a chance to pursue my research in the Ph.D. program at the United Nations University (UNU-MERIT) and Eindhoven University of Technology. Most importantly, I am extremely lucky to have the chance to get insights from various people, who gave me supportive help or who made me much stronger. Still, even now, when I recall everything occurring in the past few years, I believe it is always people, people, and people who are around you to shape who you are.

There are many people whom I want to mention in this page and express my sincere appreciation. Firstly, I want to give the priority to the most important person in my Ph.D. life: my first promoter, Prof. Geert Duysters. Geert, I am so lucky to have you as my supervisor. In Chinese saying, you are my 贵人(gui ren). I looked into many dictionaries but can hardly find a suitable English or Dutch word that would do justice to the translation of this Chinese word. No choice! I have to leave this translation "assignment" to you. But to elaborate in a short sentence: you are very important for me! You have been supervising me for six years (including my master program). I don't know if I am your first Chinese Ph.D. student, but for me, your importance lies in many aspects that it is you leading me to the academic ivory tower and stimulating my research interests and ambition. It is you who always gave me hope about my future, even in the time when I was really frustrated. It is you who always diffused a magical power to make me and your other students more enthusiastic about life. It is you who echoed such a nice side of Dutch culture that made me fall in love with this special country. I really appreciate you were generous to tolerate my mistakes and help me to solve the problems and difficulties in my research and personal life in Holland. I am very much appreciative of each of your words that gave me lots of courage when I faced the serious family circumstance. Even now, when I recall what I have experienced in that period, I feel so lucky that I have you as my mentor not only for my academic work but also for my life. We have a saying in Chinese that "一日为师，终身为父" (once be my supervisor, always be my supervisor in my life) Yes! Together with what you have taught to me:

knowledge, skills, and capacity, this saying does really reflect all my appreciation to you.

Second, I want to express my gratitude to my second promoter Prof. Liu Xielin, the leading scholar in the field of innovation and entrepreneurship in China. 柳老师 (Prof. Liu), I have to say it is really my pleasure to know you and work with you. Your research on Chinese firms' catching-up does really inspire me. Each of your sincere help did offer me advantages to finish this dissertation. I am very much appreciative of your strong support in helping me with data collection. I thank you very much for helping me contact senior managers from Chery Auto (Chinese company). I appreciated you offered me so many chance to join the research seminars in Chinese Academy of Sciences and Tsinghua University. Thank you for allowing me to join your company interview. Thank you very much for providing me with many chances to discuss research with other leading scholars in China.

Third, I would like to thank my daily supervisor Dr. Myriam Cloodt! Myriam, it is really my honor to have you in my Ph.D. supervision board. Actually you are not only my daily supervisor in my Ph.D. research, but also my *first* teacher in my *first* lecture on very *first* academic day in Holland (when I started my master program of Innovation Management in TU Eindhoven). Your lecture with Prof. Ard-Pieter De Man did really impress me. I still remember what you two taught us in the first lecture on the topic of strategic alliances. I can reflect very well how charm that course influenced my study and the choice of research topic in the following years. When you joined as my supervisor in the last phases of my Ph.D., I was surprised to see how you caught up with my research topic. You were so sharp to find out all the problems in my work (even the subtle spelling mistakes). I am appreciative! I thank you very much for providing me with tremendous helpful comments and suggestions. Without any doubt, you are absolutely a diligent and precious supervisor!

In addition, I would like to thank a number of professors who are also sitting in my Ph.D. dissertation committee: Prof. Ajan van Weele, Prof. Ard-Pieter De Man, and Prof. Wilfred Dolfsma, for their valuable comments and confirmative encouragement. Nevertheless, with a full acknowledgment, I would like to thank my Ph.D. home institute, UNU-MERIT and professors, researchers, and supportive staff there who provided me with valuable academic comments and administrative support. Particularly my thanks are given to Prof. Luc Soete, Prof. Robin Cowan, Prof. Bart Verspagen, Prof. Adam Szirmai, dr. Lili Wang, dr. Can Huang, Marc Vleugels, and Eveline in de Braek.

Next, my sincere appreciation must be given to my dearest friend colleagues at UNU-MERIT and ITEM group at TU/e. Without their support, especially emotional support, I would not finish this research in a happy mood. Particularly, I would like to send my millions of thanks to my closest friends Asel, Nico, Iman (jan), Shuan (jan), and Tina (jan). Thank you very much for

bringing me so much joy and support without any condition. I really feel lucky to have you around. And no matter what happens, I know you guys are always there supporting me. This, from any perspective, is my fortune treasure. My appreciation also goes to my former colleague Sergey Filippov. Sergey, it was really my pleasure working with you on "Chery paper". Your productivity and punctured time-management skills were absolutely essential for our teamwork. I enjoyed working with you! I hope we would have more chance to work together.

Then, I would like to thank my dear Ph.D. office-mates (Connector 0.12): Lydie, Sharon, Regien, Katrin, Gielis, Tim, Bob, and my dear academic sister Jing. Dear people, I enjoyed very much colleaguing with you in the same office in the past two years. Lydie, I want to tell you I am a very responsible person. I have successfully disseminated your Flemish "Dutch" accent of "Goede Morgen" to everywhere, now even in RSM. Sharon, you are such a nice and intelligent lady. Having your sudden "intelligent jokes" in the office is kind of rewarding bonus for everyone. Having you around, the daily work became very cheerful. Regien, although you are the youngest in our office, your in-depth understanding on life and your ambitiousness is very mature. I cherish the moments we chat together, routinely after 6.30pm every day. Katrin, you are indeed special, with one of the reasons that both of us are mothers in this office and my daughter has the same birthday as you. The moments when we felt your unborn boy's movements, the "research atmosphere" in our office changed to be very "alive". Tim and Gielis: two handsome Tilburg Alumni guys(!)great experience having you as colleague. Tim's mixed cold-warm-humor, together with unnecessary "translation assistance" from Gielis who always presents sporty and psychologist' mentality bring happiness to everyone. For sure, our office Connector 0.12 couldn't be so dynamic without you two BOYS. Bob, that was really great to be your master fellow as well as Ph.D. fellow. I appreciated you would like to share your knowledge on diabetes with me. I believe your excellent achievement impresses and stimulates everyone. Also, my special acknowledgement is for my dearest academic sister, Jing Li. Jing: that is our destiny to meet and sit next to each other in the office. Your patience in listening to my boring stories and your provision of cute suggestions (with your cute voice) provides me with a lot of happiness. I remember the moments we planned activity together, lunched together, and gossiped together. Being with you makes me feel younger. You are indeed my lovely sister! Nevertheless, my greatest appreciation must be given to Marion and Bianca whom I have known for more than six years. Marion, you are undoubtedly "our great mother" at ITEM. Your unconditional help and emotional support does encourage me at every moment. Each time when you gave me a hug (which was actually very magic in comforting me) and when told me "everything will be getting better", I was really comforted and feel at home. Thank you so much! Bianca, it was my luck to know you. To large extent, I already consider you as my good friend rather than a mere colleague. It was very enjoyable talking to you and sharing many stories with you. I still remember we did sports (Pilate) together and actively

preparing Chinese Entrepreneurship Seminar together. Thank you for everything you gave. Your support does drive me to be stronger and happier.

Last but not least, I would like to thank my parents and my lovely and sensible daughter Xiao-Xiao. Without their endless and unconditional support, I wouldn't definitely finish this work. To Xiao-Xiao: Xiao-Xiao, mama is so proud that we managed to finish this Ph.D. thesis together. Mama would like to thank you for your company. You understand people. You know how to take care of people. Although currently you are just two years old, mama is so touched that every day you told mama "I love you and I care about you". You are mama's proud all the time! Without any doubt, you are mama's co-author for this doctoral book.

To my parents: 爸爸妈妈，对你们的感谢是我最不知道该怎么表达的。相比其他人来说，我真的很幸运有你们在我身边。你们从来都是以朋友的身份跟我交流，尊重我的想法，支持我的选择。对你们的感激，是没有办法用一个谢谢来表达的。你们对我和笑笑的照顾和教育，是很多爸爸妈妈和爷爷奶奶都无法做到的。无论我遇到什么，最安全的避风港总在你们那里。我很惭愧我没法像其他孩子一样呆在你们身边照顾你们，可是我又很开心不论在什么情况下，我们都可以天天交流。在这个世界上，还有什么能比得上我们这么一家子之间的爱呢？爸爸妈妈，我爱你们！

Ying Zhang 张颖

Rotterdam, the Netherlands, 2012

TABLE OF CONTENTS

Chapter 1 Introduction

Entrepreneurship concerns opportunity identification and exploitation (Shane & Venkataraman, 2000), corporate renewal (Guth & Ginsberg, 1990), and the creation of firms (Alvarez, 2003; Vesper, 1982). It encompasses acts of organizational creation, renewal, or innovation that occur within or outside an existing organization (Sharma & Chrisman, 1999, p. 17). Entrepreneurship is an emerging, adolescent (Low, 2001; Cooper, 2003; Busenitz et al., 2003), and attractive topic for researchers, policy-makers, and practitioners (Chandler & Lyon, 2001; Low & MacMillan, 1988). This field is characterized by low paradigmatic development (Ireland, Webb, & Coombs, 2005). Scholars are still searching for a distinct theory (Phan, 2004) to enhance its status as an independent field of study (Davidsson, 2003; Sarasvathy, 2004; Smith, Gannon, & Sapienza, 1989).

Because of the multifaceted nature of entrepreneurship, there are several levels of analysis, each of which has the potential to yield a new understanding of the field (Ireland, Reutzel, & Webb, 2005). According to a research survey by AMJ in 2005 (Ireland, Reutzel, & Webb, 2005), entrepreneurship studies have predominantly focused on the individual, corporate, and national levels of analysis (other levels are the group and industry levels). They focus on the antecedents, processes, and consequences of entrepreneurship.

At the national level, entrepreneurship is claimed to be the engine of national growth and poverty reduction (Parker, 2004; Parker & Robson, 2004; Lazear, 2004, 2005; Wagner, 2003) and the consequence of factors such as culture, access to finance, R&D, and technologies (Schramm, 2006; European Commission, 2003; Lee et al., 2000). At the corporate level, entrepreneurship involves searching for strategies to build up a firm's *capacity* to identify new ways of doing business, develop new technologies and products, and enter new

markets in new organizational forms (Covin & Slevin, 1991). It is also considered as a *process* through which firms innovate, form new ways of doing business, and transform themselves by changing the business domain or processes (Guth & Ginsberg, 1990). At the individual level, entrepreneurship research tends to focus on entrepreneurial orientation, its antecedents, and its consequences (such as entrepreneurial behavior[1]). The antecedents include traits and personalities (e.g., the big five (Ciavarella et al., 2004), risk-taking propensity, and self-efficacy (Zhao, Siebert, & Hills, 2005)), prior experience (e.g., Krueger 1993; Matthews et al., 1996), gender (e.g., Eccles, 1994; Wilson, Kickul, & Marlino, 2007; Marlow & McAdam, 2012) and other endogenous and exogenous factors.

Although interactions across the three levels exist, little integrative research has been undertaken, because of the heterogeneity of the study targets and contexts that limit integration.

I have mapped the structure of entrepreneurship studies at the three main levels in Fig. 1.1 (it is also the research map of this dissertation). The solid lines indicate the domains of existing studies and the dashed lines indicate areas that have received less attention (a detailed summary of the literature can be found in each chapter). I took China as the study context because of China's unprecedented development in the last three decades[2], Chinese firms' rapid catching-up, and Chinese individuals' high aspirations for entrepreneurial activities. I was also motivated by the theoretical challenge of explaining the rewards of economic transition in emerging economies (Sarasvathy & Venkataraman, 2011).

[1]Recent studies have started to view entrepreneurial orientation at the collective level, considering the impact of orientation on corporate performance individually and collectively (Fini et al., 2010; Wales, Monsen, & McKelvie, 2011).

[2]The latest projection by BNP Paribas shows that in 2020, China's economy is projected to be larger than that of the USA (presented by Martin Jacques at TED Salon London, Oct. 2010).

The Chinese case might provide interesting insights for international business theory (Child & Rodrigues, 2005), catching-up theory (Abramovitz, 1986), and institutional theory (North, 1990) in the fields of economics, entrepreneurship, and management. Hence, I aim to develop a relatively complete picture of *entrepreneurship development in China at the national, corporate, and individual levels, economically, managerially, and entrepreneurially.* The fundamental research question is therefore: *How does entrepreneurship develop in China at the national, corporate, and individual levels?*[3] The issues of "what" and "when" are not included in the research question because I focus on entrepreneurship development after China's economic open-door reform (since 1978). In a top-down approach, I first discuss the national level (Chapter 2), then the corporate level (Chapter 3), and finally the individual level (Chapter 4). These three levels of analysis seem to be independent but do interact over time. They will be constructed as a system (as shown in Fig. 1.1) from a process perspective (Shane & Venkataraman, 2000).

Since entrepreneurship is considered to be the driving force of economic development, it has an indirect impact on national catching-up. However, in an economic transitional country such as China where a proactive government is leading the transition, the role of the transitional environment and its impact on entrepreneurship development cannot be disregarded. Therefore, national-level entrepreneurship development is fueled by millions of indigenous firms at the start-up, organizational renewal, growth, and innovation stages (Chapter 3). It is also dependent on the economic transition in different transitional dimensions (Chapter 2). The components of entrepreneurship development at the corporate level are individuals' entrepreneurial activities, so it is important to analyze individual entrepreneurial behavior and its antecedents (e.g.,

3 I admit that the research question of this dissertation looks abstract. However, as this dissertation aims to reflect numerous angles of entrepreneurship development (including their antecedents, process, and consequences) at the national, corporate, and individual level in different chapters (with a series of heritage interaction in between, shown in figure 1.1), addressing a very specific research question for the whole dissertation is not reasonable. By showing the research map in figure 1.1, three sub-research questions are present afterwards to help specify.

entrepreneurial intentions) (Krueger, 1993). By considering all these issues together, I have connected the three levels of analysis (as shown in Fig. 1.1). At the national level the focus is the impact of China's economic transition on entrepreneurship development. At the corporate level the focus is the role of corporate entrepreneurship (CE) strategies in the catching-up of Chinese firms. At the individual level the focus is the impact of entrepreneurship education on individual entrepreneurial intentions (EI). In the following sections, I will explain in detail the motivation and contributions of each chapter.

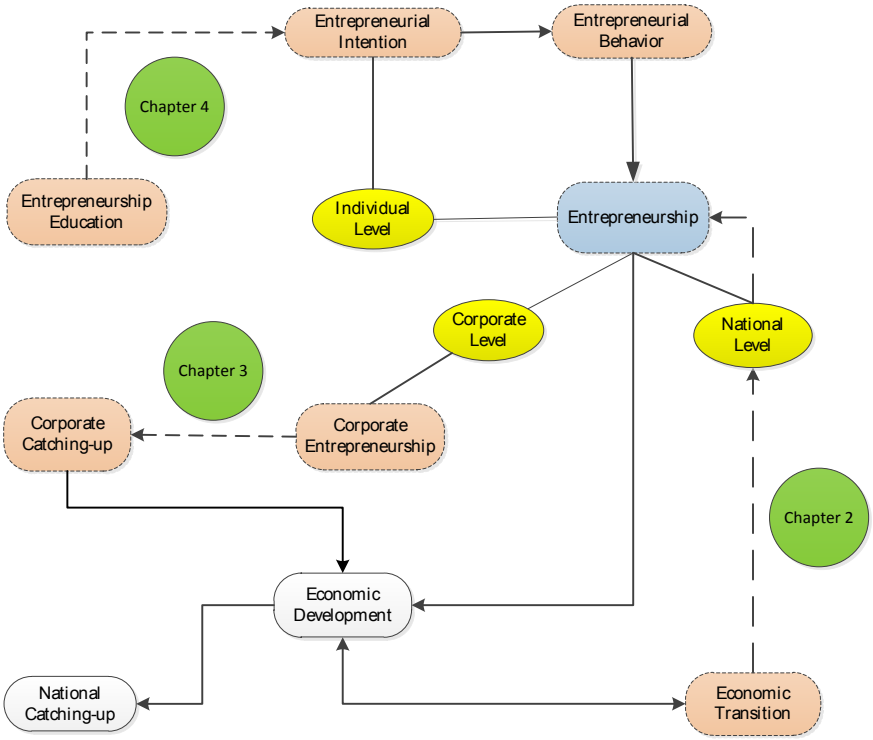


Figure 1.1 Structural map of this dissertation

1.1 Economic Transition and Entrepreneurship: The Case of China

China has developed on an economic-transitional track. This began in the 1990s, when China moved from being centrally planned to being semi-centrally

planned. It continued as the government aimed to develop China into an entrepreneurial economy. China's economic growth experience has been much debated. The debate focuses on whether this growth is driven by the Beijing consensus or the Washington census. Comparing to Washington Consensus, Beijing Consensus was just developed recently, specifically for the Chinese case. It was identified by Joshua Cooper Romo[4] in 2004 as a system committed to experimentation and innovation on the basis of existing conditions. Although Beijing Consensus is ideologically neutral and flexible (Huang, 2010), which is in contrast to the doctrinal rigidity of the Washington Consensus (named to underscore its American origin) that espouses private property rights, economic openness, financial reforms, macroeconomic stability, and political liberalization to promote economic growth (Huang, 2010), the central idea of Beijing Consensus is to reflect that China's economic growth challenges every single principle in the Washington Consensus. To sum up, if applying these two consensuses to China's growth, Beijing Consensus interprets China's economic growth as a function of innovations in the state sector, including close financial controls, state ownership of firms, and political controls in favor of economic growth, while the Washington Consensus views China's experience much the same as growth experience elsewhere as a result of financial liberalization, private entrepreneurship, and political opening (Huang, 2008, 2010).

Huang (2008, 2010) argues that both consensuses exist in China, varying in importance in different periods. He claims that the 1980s was the era of *rural China*: Chinese entrepreneurial activities mostly occurred in rural regions (represented by TVEs). The 1990s was the era of *urban China*: the government focused on infrastructure investment and urban development. It is clear that China's development has been government-led and owes much to the government's proactive policies.

4 He is a policy analyst from Britain. He published an influential position paper titled "the Beijing Consensus".

Researchers, especially those who support the Washington consensus, believe that it is a universal principle that entrepreneurship drives economic development and reduces poverty. However, to understand the role of entrepreneurship in China's growth, we must identify the impact of the antecedents of entrepreneurship from an economic-transition perspective. The literature on entrepreneurship development indicates that lower-income countries have more necessity-based entrepreneurial activities, while higher-income countries have more opportunity-based activities (Acs, 2006; Acs & Varga, 2005). Therefore, the entrepreneurship-development stage and the antecedents of entrepreneurship development in transitional China are interesting. Thus, in the first empirical study (Chapter 2), I explore the research question: *To what extent has economic transition promoted entrepreneurship development in China?*

Chapter 2 supports the cause-effect relationship between entrepreneurship and economic growth, by explaining that the different dimensions of economic transition have a significant positive impact on entrepreneurship development. Combined with previous studies on entrepreneurship's indispensable role in economic development, this chapter provides evidence for the antecedents of entrepreneurship from an economic-transition perspective. To investigate overall Chinese entrepreneurship (based on cross-regional time-series data), the analysis in this study uses data from the National Bureau of Chinese Statistics (NBCS) rather than the GEM database. This provides a relatively complete picture of entrepreneurship development, because NBSC has census data for all regions while GEM provides data for a selection of cities. Although the data sources are different, the conclusions are similar, with the difference that Chinese entrepreneurial activities are *becoming* opportunity-based rather than already having that status (as concluded by the GEM report of 2008).

1.2 Catching-Up Of Chinese Firms Via Networking Strategies

Chapter 2 elaborates China's entrepreneurship development and the antecedents of this development from a national economic-transition perspective. China's catching-up was fueled by a proactive government carrying out an economic transition to an entrepreneur-friendly country, so a large body of literature favors the Beijing consensus. In practice, political forces have facilitated the growth of thousands of indigenous companies, particularly encouraging state-owned enterprises (SOEs) to become the first generation of international companies. Of the sixty-one Chinese firms in the Fortune 500 in 2011, sixty are partially or fully state-owned. The contribution of SOEs to the Chinese economy is significant, but more than 60% of the economic growth arises from private firms. Such firms have undergone more and more successful development. In my opinion, they are more representative than SOEs and deserve further study. Therefore, Chapter 3 aims *to identify the specific catching-up mechanisms that private companies have applied and to identify the role of CE strategies in these mechanisms.*

This chapter makes several contributions. First, it contributes to the literature on the catching-up of firms from emerging economies, which is based on an open catching-up framework composed of the firms' motivations, options, modes, processes, and consequences. Secondly, by presenting a longitudinal catching-up study, this chapter contributes to the debate on the role of the government versus that of markets (Amsden, 1989; World Bank, 1993; Chang, 1994) and the discussion of the significance of the Beijing consensus and the Washington consensus for China's growth (Huang, 2010). Third, this chapter contributes to network theory, enriching the network literature by showing that network closure is a precondition for the structural holes (Burt, 2005) that lead to catching-up. It also shows that network evolution is a consequence of CE development. Lastly, this study contributes to the open-innovation paradigm by providing cases from an emerging country's multinational companies,

indicating that social networks need more attention as an aggregate form of open-innovation strategy.

1.3 Role Of Entrepreneurship Education In EI

The third empirical study in this dissertation is of individual EI. I focus on the individual level because of the implications of Chapters 2 and 3. In these chapters, I show the important role of political stimulation at the national level and CE development at the corporate level. However, entrepreneurial activity cannot be initiated without individual EI. Chapter 2 shows that educational resources contribute positively to entrepreneurship at a macro level. Chapter 3 shows that Chinese firms are keen on CE strategies. Thus, it is essential to investigate the EI-formation process via the embedded cognitive elements. Using Ajzen's theory of planned behavior and Shapero's entrepreneurial event model as well as entrepreneurial cognition theory, I have adapted an EI model (Fig. 4.1). Arguing that entrepreneurs can be made rather than being born, I claim that entrepreneurship education is the trigger that enhances knowledge and stimulates EI. The research question in this chapter is: *To what extent have endogenous and exogenous factors affected EI, and in particular what is the impact of entrepreneurship education?*

This chapter also contributes to the understanding of entrepreneurial education. I incorporate entrepreneurship knowledge and education into the EI-based model, thus adapting the model. Baron (2004) lists three questions that are central to entrepreneurship research: Why do some people choose to become entrepreneurs? Why do some people recognize opportunities for new products or services that can be profitably exploited? Why are some entrepreneurs so much more successful than others? This study helps to answer the first question by arguing that entrepreneurship education plays an important role in the formation of entrepreneurs and of individual entrepreneurial cognition.

1.4 Overall Contribution

This dissertation contributes to the existing literature in a number of ways. First, it is one of the first studies to investigate all three levels of entrepreneurship development: national, corporate, and individual. Previous psychological and sociological approaches focus on the individual or the team as the unit of analysis (Packalen, 2007; Ruef, 2003). Economic approaches focus on the country or industry as the unit of analysis (Acs, 2006; Audretsch & Thurik, 2004). Managerial approaches focus on the organization as the unit of analysis (Teng, 2007; Zahra, 1995, 1996). It is rare for a single study to integrate different approaches. This dissertation contributes by investigating the relationships between the different levels of entrepreneurship (see Fig. 1.1) in the Chinese context.

Regarding the empirical contributions, this dissertation reveals that China's national entrepreneurship is still lagging behind, with a mixture of necessity-based and opportunity-based entrepreneurship. This indicates that entrepreneurship at the corporate and individual levels is highly heterogeneous: there are rapidly growing companies that are opportunity-based while other firms still stagnate in the necessity-based category. Chapter 2 proves this, and Chapter 3 investigates opportunity-based entrepreneurship at the corporate level. This provides many lessons for the catching-up of firms from emerging countries. For example, individuals should actively gain technology and entrepreneurship knowledge by collaborating with universities. Chapter 4 indicates that entrepreneurship can be taught. It is a necessary and useful skill, not only for entrepreneurs, and an important way of understanding the world (Sarasvathy & Venkataraman, 2011). This dissertation as a whole provides evidence for the proposition (Sarasvathy & Venkataraman, 2011) that entrepreneurship is not merely a fallback position in the event of employer downsizing or economic downturns. It is instead a widespread driver of social

change (Weber, Heinze, & DeSoucey, 2008) at the national, corporate, and individual levels.

The second contribution of this dissertation is theoretical. It builds an eclectic framework drawing on several research fields: economics, management, and sociology. Relevant theories include economic development theory, national catching-up theory, social network theory, CE theory, open-innovation theory, and planned behavior theory. These theories interact and have a "bridge-in and bridge-out" effect on each other, indicating that entrepreneurship is a distinct field of research that is *of relevance*, and stakeholders outside the "club" can find this research useful (Wiklund et al., 2011). For example, (1) the national government, the largest stakeholder at the national level, may find from Chapter 2 that entrepreneurial policies do impact entrepreneurial activities and therefore influence economic growth. (2) The main stakeholders at the corporate level may learn from Chapter 3 that CE strategies, especially collaboration-based networking, facilitate corporate catching-up. (3) Educators, potential entrepreneurs, and politicians may learn from Chapter 4 that entrepreneurship education has a significantly positive influence on EI, particularly for males and people with a technological background. Thus, by diffusing information to as many stakeholders as possible (Sarasvathy & Venkataraman, 2011), we can combine the emerging strands of research on social entrepreneurship (Austin, Stevenson, & Wei-Skillern, 2006; Mair & Marti, 2006) and institutional entrepreneurship (Greenwood & Suddaby, 2006; Maguire, Hardy, & Lawrence, 2004).

Thirdly, this dissertation contributes by proving that entrepreneurship is a field that should be approached both theoretically and empirically (Wiklund et al., 2011). The three core chapters are more phenomenon-driven than theory-driven. (1) Chinese entrepreneurship is driven by economic and institutional transition but there is no strong theoretical basis for this. (2) Chinese CE is developing for the purpose of catching-up, but corporate catching-up theory is

limited. (3) Entrepreneurship knowledge influences EI, but the associated theory is limited. The focus of this dissertation is the entrepreneurial phenomenon in China, but it does not conflict with theory-driven research (see Wiklund et al., 2011). For each subtopic I considered the *context*, e.g., Chinese entrepreneurship development at a particular stage of economic transition (Chapter 2), the catching-up of Huawei (Chapter 3), and EI formation in a particular group of Chinese people (Chapter 4). I also clarified what each topic is about and why it is interesting (the *phenomenon).* Therefore, this work responds to the suggestion that future entrepreneurship research provide more insights from the real world (Wiklund et al., 2011), thus helping to create "a better world" (Shepherd & Patzelt, 2011, Sarasvathy & Venkataraman, 2011; McMullan, 2011).

To emphasize my point, I state again that this dissertation contributes more to phenomenon-driven than to theory-driven entrepreneurship studies. This is because of the transitional situation of China. The primary contribution of this dissertation, in my opinion, is the experimentation based on theoretical insights and hindsight from reflections about the phenomenon. Catching-up and entrepreneurship theories have not been adapted for emerging and economic-transition nations. Therefore, this dissertation paves the way for future studies that will develop a theoretical grounding for entrepreneurship development in emerging and transitional countries. I argue that Chinese economic development is driven by both the Beijing consensus and the Washington consensus (see Chapter 5). Thus, the dissertation considers both the phenomenon-driven (Beijing consensus) and the theory-driven (Washington consensus) perspectives.

1.5 Outline

This dissertation analyzes China's entrepreneurship development at multiple levels. The remainder of this dissertation is organized as follows (Fig. 1.1). Chapter 2 takes a macro view and investigates the extent to which economic

transition in China has impacted entrepreneurship development. Chapter 3 focuses on the corporate level and attempts to explain the relationship between the catching-up mechanism and CE strategies via a case study. Chapter 4 focuses on the individual level and explores the role of education in the EI-formation process. Chapter 5 presents the conclusions. It discusses the contributions and limitations of this dissertation, and considers future research topics.

Chapter 2 Economic Transition and Entrepreneurship: The Case of China*

Economic transition is claimed to be the original antecedent of all economic activities in China. Accordingly, this study investigates the reverse impact of economic transition on entrepreneurship development. We describe the evolution of the entrepreneurial environment and entrepreneurial activities over the last thirty years. We then study the impact of economic transition from four perspectives: GDP per capita, unemployment rate, educational resources, and economic openness. The results show that China's standard of living and economic growth (GDP per capita) have a significant inverted-U-shaped impact on entrepreneurship. Educational resources and economic openness contribute positively to entrepreneurship. There is a significant unemployment-push effect and a negative interactive effect with GDP per capita. The results indicate that China's entrepreneurship has developed into a transitional phase between necessity-based and opportunity-based (and is closer to the opportunity-based end of the spectrum). This corresponds to China's progress to an efficiency-driven stage.

*This chapter was accepted for presentation at the 2012 European Academy of Management Conference (EURAM'12), Rotterdam, June 6–8, 2012, and the 3rd Workshop on Asian Management and Entrepreneurship (EIASM), Brussels, May 23–24, 2011.

2.1 **Introduction**

Entrepreneurship is a multifaceted concept. Entrepreneurs seek to generate value by identifying and exploiting new products, processes, and markets, and creating or expanding economic activities (OECD, 2007). Since entrepreneurship was identified in 1732 by the Irish economist Richard Cantillon many scholars such as Knight (1921), Schumpeter (1934), Kirzner (1973, 1997), and Baumol (1990) have contributed to the formalization of the entrepreneurship process and to the study of entrepreneurial behavior. This topic has experienced an evolutionary path from Homo Economicus to more open interdisciplinary work. Entrepreneurship has multiple levels: national, corporate, and individual.

Minniti and Lévesque (2008) argue that five heterodox streams (based on the five leading characteristics of the emerging new orthodoxy identified by Koppl (2006)) form the basis of most recent work on entrepreneurship: bounded rationality[5], rule following, institutions, cognition, and evolution. These streams are often termed BRICE economics. At the macro level, studies consider either the consequences of entrepreneurship for job creation, economic growth, poverty reduction (Parker, 2004; Parker & Robson, 2004; Lazear, 2004, 2005; Wagner, 2003), and entrepreneurial performance (Audretsch & Thurik, 2001; Brandt, 2004), or the determinants of entrepreneurship such as culture, access to finance, and R&D and technology (Schramm, 2006; European Commission, 2003; Lee et al., 2000). Macro-level studies mostly draw data from the World Bank, Eurostat, and GEM databases. They usually focus on entrepreneurship development in OECD countries or comparisons between high-income and low-income economies.

[5]Bounded rationality was initially defined by Herbert Simon based on the idea of the limitation of individual rationality resulting from limited information, cognitive limitations, and limited time for decision-making. Today, most economists agree that agents should be considered to have bounded rationality (Koppl, 2006).

National economic transition as a predictor of entrepreneurship development has not been investigated. Consensus has been reached that entrepreneurship contributes to economic development by introducing innovation, enhancing rivalry, and creating competition (Wong, Ho, & Autio, 2005). Moreover, low-income countries have higher levels of necessity-based entrepreneurship (starting a business because there is no alternative) while high-income countries have higher levels of opportunity-based entrepreneurship (starting a business to exploit a perceived opportunity); see Acs (2006) and Acs and Varga (2005). However, the determinative antecedents of entrepreneurship development in transitional countries such as China are not yet clear. The success or failure of a transitional economy is due in large part to the performance of its entrepreneurs (McMillan & Woodruff, 2002). However, the reverse role of economic transition in entrepreneurship development in transitional economies has not been clarified. China is a politics-driven country where the government has worked to build an entrepreneur-friendly environment. Therefore, there is a great interest in the impact of the transition on entrepreneurship development. A few studies have investigated the institutional environment of entrepreneurship and its cultural dimensions (Li & Materlay, 2006), but there has been little investigation of the impact of economic transition on entrepreneurship development.

We address this issue by asking: *To what extent has economic transition promoted the development of entrepreneurship in China?*

To answer this question, we analyze the economic-transition environment and its impact on entrepreneurship. After reviewing the institutional changes of the last thirty years, we discuss the evolution of entrepreneurial activities. Different attitudes and policies exist at different transitional stages, so we focus on the most recent stage. We study the impact of economic transition on entrepreneurship development using a panel dataset for thirty regions over four years. We consider four aspects of the transition: GDP per capita,

educational resources, economic openness, and the unemployment rate. The reasons to incorporate these four dimensions in China's transitional stages will be elaborated afterwards.

The contribution of this study is an analysis of the effect of economic transition on entrepreneurship development, especially in emerging countries such as China. Existing studies have highlighted the role of entrepreneurship in national economic development. We instead provide insights into the *antecedent impact* of economic transition on entrepreneurship, which might be odd due to the opposite study angles. But because transitional country like China was developed based on integration of Beijing Consensus and Washington Consensus, meaning that in the beginning of each transitional stage, entrepreneurship was initiated and promoted by the transitional policy in an experimental and innovation manner (Beijing Consensus) (which will be explained in the table 2.1) and entrepreneurship does contribute to the economic growth (Washington Consensus), studying the impact of economic transitions on entrepreneurship development appears rather necessary (the studies from this angle is rarely constructed, especially the empirical investigation). Through this study, we provide a better understanding of the factors of economic transition (which is reflected by four dimensions improved living standard, one pillar of institutional change: education reform, forced entrepreneurial mindset change, and regional economic openness) and its consequences on entrepreneurship development. This may help policy-makers to formulate effective entrepreneurship-development policies for different stages of economic development. Moreover, this study complements other empirical studies for transitional economies, particular for the identification of inverted-U-shaped causal-effect relationship between improved living standard (also reflecting the economic growth) and entrepreneurship. This conclusion looks contradictory but actually consistent with the U-shaped relationship between economic development and entrepreneurial activities which were found by looking at cross-country data (i.e. Acs, Audretsch, & Evans, 1994;

Carree, van Stel, & Wennekers, 2002; Wennekers et al., 2005). To briefly introduce, the reverted U shape is a type of relationship embedded in the U shape that has been found before. From this perspective, this study used a zoom-in approach to provide an in-depth explanation on the effect of economic transition on entrepreneurship for the particular group of countries, especially those which transit from factor-driven to an efficiency-driven stage like China. The detailed argumentation will be provided in the upcoming sections.

This chapter is structured as follows. In Section 2.2 we discuss the evolution of entrepreneurship development and the corresponding policies in China since 1978. We aim to provide a better understanding of the institutional environment for entrepreneurship development. In Sections 2.3 and 2.4 we present the theoretical background and the hypotheses. Section 2.5 explains the methodology; Section 2.6 presents the results; and Section 2.7 presents the conclusions and the limitations of our study.

2.2 Chinese Entrepreneurship development in times of transition

Policy-makers, analysts, and economic theorists are interested in entrepreneurship in emerging countries, especially those countries that have been experiencing a high degree of transition (such as Russia, Poland, China, and Vietnam). These transition economies are "qualitatively different" (Newman, 2000) in their transition approaches. Poland and Russia dropped central planning via shock therapy (Peng, 2003), whereas China and Vietnam gradually grew out of it via changing policies. However, common elements include the emergence of a large body of entrepreneurial start-ups and adjustment to the "new rules of the game" (North, 1990, p. 3) via "three pillars"[6] (Scott, 1995).

[6]Scott (1995) suggested that at the most fundamental level, institutions have three pillars: the *regulative* pillar focuses on formal rule systems and enforcement mechanisms (North, 1990); the *normative* pillar defines legitimate means to pursue a valued end; and the *cognitive* pillar refers to taken-for-granted beliefs and values that are imposed on or internalized by social actors (DiMaggio & Powell, 1983).

Estrin, Meyer, and Bytchkova (2006) claimed that a successful entrepreneurial economy depends not only on the initial conditions in the transition economy but also on the speed and consistency with which the reform process is applied. In the last three decades, China has attempted to establish an entrepreneurial economy in the transition from a central-planning system to a market-based economy.

China's entrepreneurship development since 1978 can be divided into three phases. Each phase has a corresponding generation of entrepreneurs, a corresponding institutional environment, and corresponding government policies. The *first generation* of Chinese entrepreneurs emerged during the "four modernizations" reform program, established by Deng Xiaoping in the early 1980s to encourage entrepreneurial activities. This program aimed to deal with the economic crisis that occurred during China's Cultural Revolution (1966 to 1976). Introduced at the Third Plenum of the Chinese Communist Party's 11th Central Committee, Deng Xiaoping's policy in the 1980s was to allow commune and brigade enterprises to enter nonagricultural industries (Gregory, Tenev, & Wagle, 2000). As a result, light industry grew extremely rapidly from 1979 to 1984 (Wong, 1988).

After the mid-1980s, private entrepreneurial activities started to evolve to the *second phase*, characterized by the organization of township and village enterprises (TVEs). These enterprises were mostly privately owned or owned collectively by local governments. New private enterprises were formed, and the commune and brigade enterprises from the first phase were restructured into TVEs. According to Liao and Sohmen (2001), in the late 1980s TVEs accounted for 20% of China's gross output.

The evolution to the *third phase* was stimulated by the entry of foreign investment in the late 1980s. For many years the central government focused on attracting foreign investment and subjected domestic private enterprises to unfair treatment, discrimination, and ideological biases. Private enterprises

were therefore largely restricted to rural areas. *Getihu* (in Chinese) organizations emerged in a bid to enter urban markets and other sectors. *Getihu* organizations are individual entrepreneurs and private businesses that are registered in the enterprise category at the Industry and Commerce Office and may not hire more than seven[7] employees.

After the *Getihu* era, the third phase continued with the emergence of the private sector and the *Si ying qiye* organizational mode. On April 12, 1988, the private sector was permitted to develop within the limits prescribed by law (the First Plenary of the Seventh People's Congress approved Article 11 of the 1988 amendment to the constitution of the People's Republic of China). In June 1988, the Chinese central government issued the tentative stipulations on private enterprise (TSPE), stipulating that a unit with privately owned assets and more than eight employees could be registered as a private enterprise (*si ying qiye* in Chinese). This was a landmark in China's market-oriented reform and also a landmark for entrepreneurship development because for the first time private enterprises were allowed to coexist with SOEs. However, this reform did not have the expected results: the GDP growth rate slowed to 4.4% and 3.9% in 1989 and 1990 respectively, and the total employment in TVEs was reduced by three million between 1988 and 1990 (People's Daily, March 23, 1990), because this political adjustment occurred at a time of conflicting views on the role of the private sector in China's economy. Therefore, according to Huang (2010), during the 1980s the Washington consensus dominated and rural entrepreneurship (in particular TVEs) played an important role.

To address these conflicting views, in early 1992 Deng Xiaoping made the South Touring Talk. Deng's encouragement to "*Try to get rich quickly through entrepreneurial activities*" ended the ongoing debate. Soon afterward, at the Fourteenth Party Congress in September 1992, the goal of economic reform became the building of a *socialist market economy*. This expression sounds

[7]This policy was based on Marx's theory that if a business is allowed more than seven employees, the result could be the exploitation of labor (from "Das Kapital," Karl Marx, 1867).

strange to western economists, but this economic philosophy, introduced during an economic-transition stage, considerably reduced the prejudice toward entrepreneurship and blurred the boundary between SOEs and private businesses. Following this important decision, a series of reforms was executed. Large SOEs were turned into independently run companies. Smaller ones were sold off (*zhuada fangxiao* in Chinese) (Young, 1995). New policies were introduced for foreign exchange, taxes, the monetary system, and the financial system. Government bureaucracy was streamlined (Qian, 2000). By 1996, these reforms had triggered a second boom in entrepreneurial activities; this occurred mainly in state sectors, because 50% to 70% of the SOEs had been privatized.

In the late 1990s, China's entrepreneurship development entered a new era. In September 1997, the Chinese Communists' Fifteenth Party Congress confirmed private ownership as an important component of China's economy. In 1999, the Second Plenary of the Ninth People's Congress gave the private sector the same legal footing as the public sector. Meanwhile, China's central government introduced a series of incentives. For example, it provided an innovation fund for technology-related small and medium enterprises (SMEs), invested in high-tech zones, and created science parks and technology business incubators to encourage the development of technology-based entrepreneurship. Technology-oriented entrepreneurs were encouraged to invest in start-ups in science parks via incentives such as an 18% decrease in corporate income tax, exemption from income tax for the first three years, and no restrictions on local residence permits. By 2006, China had 6,000 industrial parks and 58 national-level science parks (Cai, Todo, & Zhou, 2007).

Table 2.1 summarizes the evolutionary path of entrepreneurship development. We emphasize that China's entrepreneurship development is characterized by its *relationship-based network*. In the pre-1999 era, this network included business partners such as suppliers, customers, and competitors and also

involved complicated political interactions with governments. Peng (2003) argued that institutional transition has two phases: the "relational contracting" stage (North, 1990, p. 34) and the rule-based stage. Because the pre-1999 period was characterized by uncertainties in the formal institutional constraints, entrepreneurs during that period were forced to rely heavily on informal, interpersonal relationships. They had to rapidly build professional networks with other entrepreneurs, managers, and government officials. Connections with political institutes were important because they were the basis for starting a new business in an environment of limited protection of property rights and constrained access to bank loans (Bai, Lu, & Tao, 2006). In the post-1999 period, this changed with the development of intellectual-property protection (especially after 2001 when China joined the WTO), investment in high-level education, and technology-based entrepreneurial orientation to a rule-based network.

Although economic transition supported entrepreneurial activities, the development of entrepreneurship was different in different regions. In general, the east-coast regions were better able to attract foreign investment and promote local entrepreneurial activities. Provinces such as Shandong, Jiangsu, Zhejiang, Fujian, and Guangdong had the most entrepreneurial development. These provinces either acted as a role model for other provinces or acted as testbeds for new policies. In these provinces there were many opportunity-based entrepreneurial activities. However, the western and central regions, where many SOEs were located, lagged behind. Entrepreneurial activities in these regions were mostly necessity-based, because the reform of SOEs led to millions of workers being laid off.

The imbalanced entrepreneurial development in China resulted from the imbalanced attention from both central and local governments. First, the central government prefers a gradual approach, so the east-coast regions (fewer SOEs and fewer geographical advantages for foreign investment) are

always chosen as the testbeds for new policies. This political mindset has lasted for more than thirty years. Secondly, the local governments have policies different to those of the central government; this can cause large time lags and performance variations. Since the relationship between the central and local governments is dynamic and interactive, local governments usually take one of two approaches: conservative or entrepreneurial. To avoid political risk, the local governments in the northern and western regions tend to be conservative in implementing new policies from the central government. In contrast, governments in the east-coast regions are likely to be entrepreneurial. Jiangsu province is a role model: it is dedicated to attracting FDI and to encouraging local entrepreneurs to start new businesses (particularly in green and sustainable-energy industries).

Table 2.1 Evolution of Entrepreneurship Development in China

Phase	Time Period	Transitional Environment			Entrepreneurship		Economic Consequences
		Policy	Transition	Institutional Situation	Entrepreneurs	Remarks	
1	End of 1970s to 1984	"Four modernizations" at Third Plenum of Chinese Communist Party's 11th Central Committee	Introduction of market-oriented policy	Uncertainty (such as resource-allocation disruption) because no previous market information	Commune and brigade entrepreneurs (CBEs)	Small-scale businesses; Self-employed; Low social status, low education; Networking with business partners and government	Mainly in nonagricultural industries; Light industry was developing
2	1985 to end of 1980s	TVEs		Balance of supply and demand manifested in adjustment of relative prices	Restructured CBEs and TVEs		20% of GDP in China in late 1980s
3	3.1: End of 1980s	FDI policy; Discrimination against domestic private firms	Permission for individual businesses with fewer than eight employees to enter urban areas	Indicated by macroeconomic stabilization (such as reduced inflation, resumption of economic growth, reduced uncertainty, and increased incentives for Schumpeterian entrepreneurs). This stage lasted a dozen years to end of 1990s, as price mechanism was established to convey	*Getihu,* TVEs		Economic development slowed to 4.4% and 3.9% of GDP growth rate in 1989 and 1990; Credit was sharply cut to rural enterprises and total employment in TVEs fell by three million between 1988 and 1990
	3.2: 1988–1991	Private sector was permitted in 1988 by tentative stipulations on private enterprise (TSPE)	Private enterprises were for first time permitted to coexist and develop with SOEs within limits prescribed by law		*Si ying qiye,* TVEs	Highly educated entrepreneurs: engineers and SOE managers; Mainly in restaurant, transportation, and manufacturing sectors; More attention to networking with business partners to	
	3.3: 1992–1996	Deng's South Touring Talk: Try to get rich quickly through entrepreneurship;	Turning large SOEs into independently run companies; Selling off smaller		*Si ying qiye,* TVEs		11.5 million workers laid off and 50% to 70% of SOEs privatized by end of 1996

		Fourteenth Party Congress in September 1992: "socialist market economy"	ones (*zhua da fang xiao*); Changing policies on foreign exchange, taxes, monetary system, financial system; Streamlining of government bureaucracy	market information on supply and demand.		increase competitive ability	
	3.4: 1997–2008	Fifteenth Party Congress: Second Plenary of Ninth People's Congress	Private ownership first stated as important component; Legal footing of private sector was approved; Innovation fund for technology SMEs; High-tech zones, science parks, and technology-business incubators	Offer better mechanism for resource co-ordination, information gathering, and contract enforcement	Technology-oriented entrepreneurs	Highly educated entrepreneurs including foreign-educated Chinese returning to start businesses; IT sector; More attention to networking with business partners to increase competitive ability	Private enterprises given direct support in contrast to pre-1999 support through legitimization; By 2006, 6,000 industrial parks and 58 national-level science parks

Our research question aims to determine the impact of economic transition on entrepreneurship development. Estrin, Meyer, and Bytchkova (2006) claimed that a successful entrepreneurial economy depends not only on initial conditions in the transition economy but also on the speed and consistency with which the reform process is applied. The Chinese government initiated economic transition in 1978 and continued by gradually experimenting with and introducing various transitional policies. China's transition is reflected not only in the tremendous improvement in the welfare (the standard of living) of the majority of the population but also in the policies that encouraged more entrepreneurial activities. Also, these policies evolved over time. They encouraged economic openness by attracting foreign investment. They changed entrepreneurial attitudes because the SOEs' self-responsible reform[8] led to millions of people becoming unemployed. They also reformed the national innovation system via for instance heavy investment in education. To sum up as shown in figure 2.1, four dimensions in the transitional stage will be focused in this study, which includes living standard, entrepreneurial mind-set, national innovation system, and economic openness.

In the central-planning system, there were restrictions on collaborations with foreign businesses, whereas in the market-oriented economy, foreign investment became welcome. Private firms that collaborated with foreign firms were rewarded with a lower revenue tax. This economic policy accompanied tremendous changes in the job market. On the one hand, Chinese people started to open their minds to self-employment; on the other hand, the reforms in SOEs caused waves of passive layoffs. To reform the national innovation system, especially after the university reform in 1999, private universities were allowed to enroll students and public universities were given more freedom to receive investment; this was impossible under the central-planning system.

[8]This means that after the reforms the government stops taking responsibility for the operation of SOEs. It is no longer involved in the production arrangements, the manufacturing agenda, and the sales assignments. SOEs must be responsible for their profits, losses, and development plans although they are still state-owned.

Therefore, we formulate the conceptual framework in Fig. 2.1. In terms of the three institutional pillars (Scott, 1995), the four dimensions that we have identified correspond to the *normative* and *cognitive* pillars.

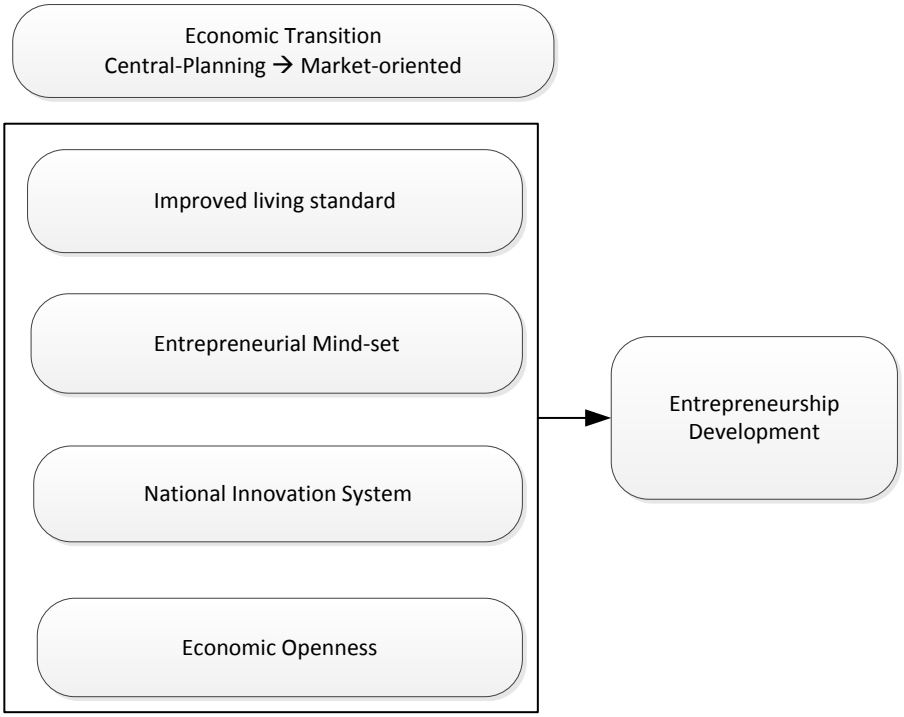


Figure 2.1 Conceptual model of impact of economic transition on entrepreneurship development in China

2.3 Theoretical Background

Entrepreneurship is an interdisciplinary research field, so the theories applied are diverse (Wennekers, 2005). From an occupational point of view, entrepreneurship refers to owning and managing a business (Hebert & Link, 1982), and the corresponding theories focus on the dynamic creation of new business. From a behavioral point of view, entrepreneurship involves identifying and exploiting economic opportunities, and the corresponding

theories focus on the stimulation of EI and the identification of economic opportunities (Shane & Venkataraman, 2000). We aim to determine in the Chinese context the self-enhanced cyclical effect between economic transition and entrepreneurship. We use the above two definitions of entrepreneurship, and below we elaborate the relevant theories corresponding to the economic-development stage and the economic function of entrepreneurship.

The milestone studies on distinguishing economic-development stages are those by Porter (1990) and Porter, Sachs, and Cornelius (2002). They argued that, based on a country's competitiveness, economic development can be classified into the factor-driven stage, the efficiency-driven stage, the innovation-driven stage, and the two transitions between these stages. At the factor-driven stage, competitiveness is correlated with low-cost efficiency in the production of commodities or low-value-added products. At the efficiency-driven stage, competitiveness requires increased production in large markets, and companies must exploit economies of scale and educate the workforce in preparation for the subsequent technological-development phase. At the innovation-driven stage, competitiveness is correlated with reaching technological frontiers and promoting innovations. This stage calls for a critical mass of knowledge, technologies, skills, and purchasing power. Therefore, an economy at this stage is equivalent to a knowledge economy, and the transition to this stage is a transition from a managed economy to an entrepreneurial economy (Audretsch & Thurik, 2001, 2004). Porter, Sachs, and Cornelius (2002) state that the key requirements for the transition from the factor-driven stage to the efficiency-driven stage are capital accumulation and technological diffusion, and the key requirement for the transition to the innovation-driven stage is the ability to generate and commercialize new knowledge.

Schumpeter (1934) concisely described the main idea of the economic function of entrepreneurship, suggesting that there are two development regimes. The Mark I regime is characterized by "creative destruction" in which new

entrepreneurs challenge incumbent firms by introducing new inventions. In the Mark II regime, "creative accumulation" dominates economic development so that the R&D activities of established corporations determine the rate of innovation. Schumpeter argued that the first regime operated from 1860 through the early 1900s, and that the second would apply from 1930 to the 1970s.

However, the recent decades of rapid technological change and economic development indicate a two-regime cycle [9]. For example, individual entrepreneurs in the ICT industry return to challenge incumbents by introducing new technologies. This was shown by a series of studies; the finding applied to both large corporations and small start-ups. Large corporations impact economic growth by creating more job opportunities and increasing productivity (through investing in new plants or replacing old factories). In small start-ups, economic development is promoted by two types of entrepreneurial activities. The first occurs when there is no other option (necessity-based), and the second is stimulated by the presence of a better option (opportunity-based).

Acs (2007) argues that although a nation's economic development depends on successful entrepreneurship combined with the power of established corporations, the beneficial value of this mechanism depends on the national income. Scholars, especially those who use GEM's database, have consistently demonstrated that self-employment is closely related to the development of national income, and the type of entrepreneurial activities depends on the role of large corporations in the market (Acs, 2006; GEM Global Report, 2008; Thurik et al., 2008). In general, necessity-based self-employment plays a major role in creating markets and providing job opportunities when a country has a low national income, whereas opportunity-based entrepreneurial activities emerge when large established corporations increase their innovative role in a

[9]Wennekers et al. (2005) refer to this as the "Schumpeter regime switch."

high-income economy. This is why the number of business start-ups decreases as more people find stable employment (Acs, 2007). However, when national income increases to a critical level, the entrepreneurial sector again controls economic growth because of its technology-based comparative advantages. This is the argument of the Schumpeter regime switch.

2.4 Hypotheses

China is now in the economic-transition stage where entrepreneurial activities are highly encouraged. According to Peng (2003), transitional economies experience two transitional stages (relationship-based and rule-based), which is much more related to the level of national income. Acs (2006) claims that the type of entrepreneurship (necessity-based or opportunity-based) corresponds to the level of national income. We therefore provide a primary statistical overview of China's entrepreneurial activities at each stage of the economic transition.

We collected data from the NBSC from 1996 to 2008[10] and calculated the ratio of the number of private enterprises to the total number of all registered enterprises (Fig. 2.2). The private enterprises include both privately owned firms and spin-offs from former SOEs and management-employee buy-outs (MEBOs). This is because at the transitional stage entrepreneurs may either establish new enterprises or take over SOEs and employ new combinations of resources (Estrin, Meler, & Bytchkova, 2006, p. 697). Figure 2.2 shows that private enterprises as a proportion of the total number of firms grew quickly, from 1.5% in 1996 to over 57% in 2008.

[10]The period 1996 to 2008 was chosen for two reasons: 1) China's transitional development started in the early 1980s, but entrepreneurship was formally acknowledged in the mid-1990s. 2) The most complete data on China's economic activities is from NBSC. However, consistent data can be tracked only since 1996.

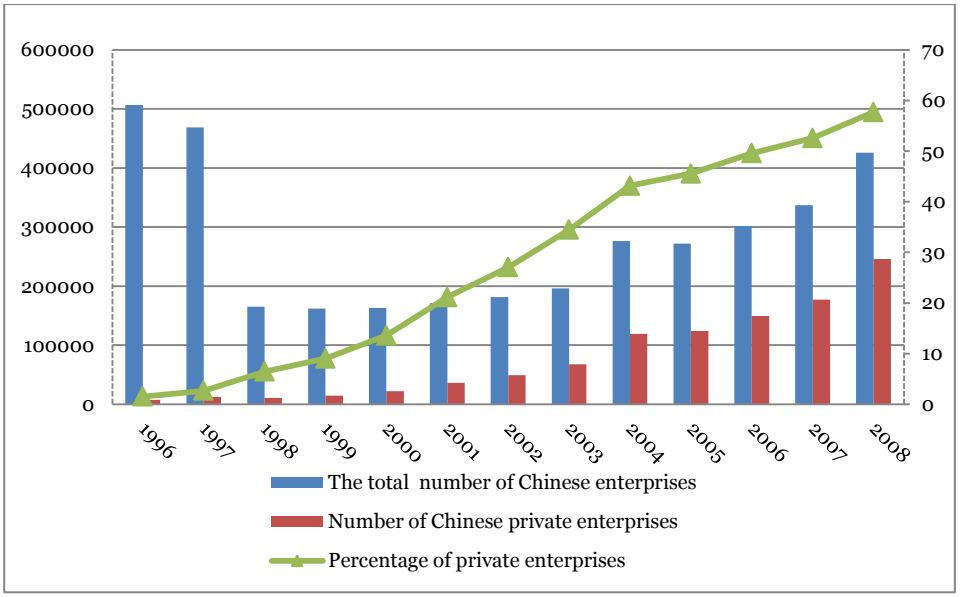


Figure 2.2 Trend in number of private enterprises
Source: NBSC (1996–2008); data collected by author

To show the general association between entrepreneurial activities and economic development, Fig. 2.3 shows the time series data of the number of registered self-employed households against the GDP per capita (1996–2008) at the national level. The scatter graph is shaped like a lower-case v. In the first stage, 1996 to 1999, the number of entrepreneurial activities increased. The second stage lasted five years from 2000 to 2004, and the increased economic development was accompanied by a decreased number of entrepreneurial activities. In the third stage, from 2005 onwards, there was a positive relationship between economic growth and entrepreneurial activities.

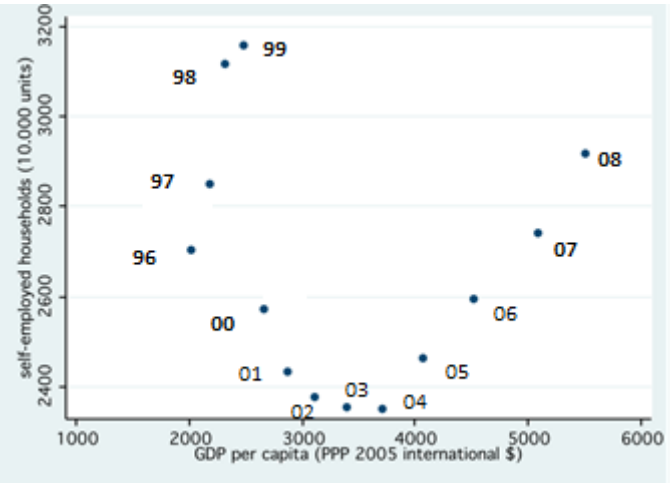


Figure 2.3. Relationship between entrepreneurial activities (measured by self-employment) and economic development (1996–2008)

Source: NBSC (1996–2008); data collected by author

Figure 2.3 is consistent with Acs, Audretsch, and Evans (1994)'s argument that entrepreneurship development is associated with national income. According to the methodology that the GEM report used to classify economies[11], China can be classified as a factor-driven economy by 1999, and a transitional economy from factor-driven to efficiency-driven from 2000 onwards (with a GDP per capita of more than USD 4000)[12]. Figure 2.3 does not conflict with GEM's conclusion that the inflection point of the U-shaped relationship between national income and entrepreneurship is around USD 3000 GDP per capita. This is because the GEM report considered all the surveyed countries at the factor-driven, efficiency-driven, and innovation-driven stages in the same year, whereas we observed the Chinese progression from the factor-driven stage to the efficiency-driven stage. Therefore, we focused on just one piece of the GEM report, studying one country developing over time through the factor-driven

[11]This is consistent with Porter (1990) and Porter, Sachs, and Cornelius (2002); see GEM Global Report (2010, p. 14).
[12]In the GEM Global Report (2008), China is categorized as efficiency-driven. In the GEM Global Report (2010), China is in the list of efficiency-driven countries.

and efficiency-driven stages. However, Fig. 2.3 indicates that there might be a mini-U-shaped relationship with an inflection point around USD 3000 per capita (for the factor- and efficiency-driven countries) embedded in GEM's large U shape that includes all economy types.

At the factor-driven stage by 1999, we argue that entrepreneurial activities were likely necessity-based because of the large number of layoffs during the SOE reforms. The layoffs together with the large inflow of FDI increased the opportunities for producing low-cost and low-value-added commodities in a household unit. There are two explanations for the decreased number of entrepreneurial activities at the transitional stage from 2000 to 2004. The first arises from the theory of capital-labor substitution. As an economy becomes wealthier, capital and labor become substitutes, the average firm size increases, and the capital stock return from working is larger than that from managing. People therefore choose to be employed rather than to be self-employed. The second explanation is the advantage of large firms over small firms: in the improved infrastructure environment, large firms are able to operate more cheaply. Small firms must shoulder higher costs because of their limited economies of scale. Figure 2.3 also shows an increased trend to self-employment from 2005 onward. This can be explained by the large supply-chain niches arising from increased industrialization and economies of scale for small and medium enterprises.

Our goal is to provide a picture of the effect of economic transition on entrepreneurship at the current transitional stage (from 2005 onward). Therefore, we focus on the exact causal effect between economic development and entrepreneurial activities at this stage. Acs (2006) introduced an index called the opportunity-to-necessity entrepreneurship ratio [13] (ONER) to compare entrepreneurial activities in different countries. According to data

[13]This index measures the relative importance of opportunity-based and necessity-based entrepreneurship. Acs (2006) argued that it is a key indicator of economic development.

from the GEM APS master dataset (2005)[14], China had an ONER of 5, which exceeded those of Italy (4), Canada (4), Brazil (4), Singapore (3), Thailand (3), Ireland (2), the USA (1.5), and Russia (1). By 2006, China had been recognized as an opportunity-based entrepreneurial country, with one opportunity-based TEA index (the prevalence of early-stage entrepreneurial activity) at 9.6, indicating that 60.4% of respondents were doing opportunity-based entrepreneurial activities (with the remaining 39.6% involved in necessity-based activities). China thus ranked tenth in the world.

The GEM Global Report (2008) shows that China's entrepreneurship has become opportunity-based. However, studies on the relationship between economic development and entrepreneurial activities (e.g., Acs, 2007) show that opportunity-based activities usually occur in high-income countries (knowledge-based or innovation-driven economies). China's GDP per capita has not however reached the level of innovation-driven economies, which implies that Chinese entrepreneurship probably not reached the opportunity-based stage. We found that GEM's conclusions were drawn from a survey carried out in a number of large Chinese cities (such as Beijing, Shanghai, and Guangzhou). Therefore, by observation and rational reckoning based on China's economic development stages, we conjecture that there must a period during which necessity-based and opportunity-based entrepreneurial activities coexist. Although entrepreneurial activities are booming in China, we predict that the rate of increase might be decreasing because necessity-based activities would decrease more quickly than opportunity-based activities increase[15]. Theoretically, this can be explained by economic development stage theory and the theory of capital-labor substitution. As an economy becomes wealthier to the stage of efficiency-driven stage, capital and labor become substitutes, the average firm size increases, and the capital stock return from working is larger than that from managing. People therefore choose to be employed rather than

[14] http://www.gemconsortium.org/about.aspx?page=gem_datasets

[15] Although there are many entrepreneurial opportunities in a transitional economy, knowledge-based opportunities may not be easy to discover and exploit, because the situation is complex.

to be self-employed. Therefore, the number of self-employment would be reduced. This is also accordance to the occupation choice theory/model (Grossman, 1984), in which individuals compare the wage they can earn as a worker with the entrepreneurial income they can obtain if they start their own business. As the large firms become the dominant actor in the industries, small firms might be crowded out due to their inefficiency and non-innovative. This is equal to the crowding out effect (Aitken and Harrison, 1999), meaning that due to the advantage of large firms over small firms (in the improved infrastructure environment, large firms are able to operate more cheaply), small firms must shoulder higher costs because of their limited economies of scale or have to be forced to leave the market. Therefore, we hypothesize:

Hypothesis 1: Economic growth (reflecting the standard of living) has an inverted-U-shaped impact on entrepreneurial activities at the transitional stage from 2005 to 2008.

Opportunity-based entrepreneurial activities are associated with entrepreneurs' backgrounds and prior experience. According to Shane (2000), the factors that impact the discovery of entrepreneurial opportunities are the possession of prior information and the cognitive ability to value existing opportunities. Gilad and Kaish (1986) state that those who are better at identifying a new opportunity have prior information complementary to the new information embedded in the opportunity, because specialized information is more useful than general information for most activities (Becker & Murphy, 1992). Since entrepreneurial opportunities are easily identified by people who embrace related knowledge, we argue that people with a higher level of specialized education are more likely to exploit such opportunities. Since 1996, Chinese government started to change national innovation system. The primary aim of this reform was to facilitate the proceeding of entrepreneurship and innovation in China, by converting from the *Former Soviet Union model* of national innovation model which emphasizes that

government is the central hub to distribute resource and manage the collaboration between different national actors, to the *enterprise-centered model* which gives much more sovereign to enterprises and universities or other national actors in the national innovation system to spontaneous collaborate. In the basic national innovation system framework suggested by Anderson and Lundvall (1997), five fundamental activities are highlighted, which are research, implementation, end-use, linkage, and education (Liu and White, 2001). To undertake these activities, universities become the primary actors in the transitional national innovation system, in which other actors such as local governments and enterprises were allowed to invest resource in the university educations so as to facilitate the speed of enlarging enrollment in the universities. This provides much more benefits back to the national innovation system, because the magnitude of education output---the number of specialist graduates and talents is increased, providing a larger pool of potential entrepreneurs who have embraced specialized skills and background, and relevant industrial experience etc. to explore entrepreneurial opportunities. Thus, we hypothesize:

> ***Hypothesis 2: Educational resources are positively related to entrepreneurial activities.***

Knight (1921) states that individuals choose between three states: unemployment, self-employment, and employment. However, the link between unemployment and self-employment has puzzled scholars (Thurik et al., 2008). Oxenfeldt (1943), who was the first to find a positive linkage, argued that individuals confronted with unemployment and low prospects for wage-employment will turn to self-employment as a viable alternative. This conclusion is supported by the theory of income choice that argues that the opportunity cost of starting a new firm decreases (Blau, 1987; Evans & Jovanovic, 1989). In the literature, this positive effect from unemployment is called the *unemployment push effect (refugee or depreciation effect*) (Thuik et al.,

2008). In contrast, the *unemployment pull effect* indicates that high unemployment implies lower levels of personal wealth, and this reduces the likelihood of self-employment (Johansson, 2000). These two effects work differently at different economic stages. According to previous studies (Thuik et al., 2008; Johansson, 2000), the push effect works well in economic-growth stages, while the pull effect works well in recession stages. With improved Chinese standards of living and the reduced opportunity cost of starting new companies (lower requirements for financial capital, fewer conditions on start-ups, etc.), we predict that there is an unemployment push effect on entrepreneurship, positively influencing entrepreneurial activities. However, according to the state-owned firms reform in the late 1990s where millions of workers were laid-off from their previous employment, it seems that there could be possible existing a negative relationship because the lower levels of personal wealth. Based on the observation in China, we propose that this relationship is positive because firstly, there is no other choice for those laid-off workers but to start own business (therefore, it was necessity-based entrepreneurship and most of them were family business in a small scale) or find an alternative job. Second, in terms of external support, government, in this situation, provided training programs for them to help them gain extra skills and advantages for an alternative job-searching or own business. Third, the reform in the state sectors not only encourages laid-off workers to start their own business, but also consequently awakes Chinese population to change their mind-set to be more entrepreneurial, due to the availability of more options to approach to towards *Xiaokang* (a western style democracy, a mature-stage socialism, or an enlightened authoritarianism---a moderate prosperity or well-off society (Lin, 2012) that Chinese development aims to reach). and more possibility to produce a large amount of well-fare for own families. Therefore, we hypothesize that

Hypothesis 3: Unemployment is positively related to entrepreneurial activities.

Economic openness is considered as one of the most important characteristics of transitional countries. Many latecomer countries have shown that economic openness can affect the economic output and eventually the rate of economic growth, either by export or FDI. In this study, we use inward FDI to look at the economic openness in different Chinese regions. One of the reason is based on the improving role of FDI in the world economy. According to OECD (2008), the total FDI stock raised from 8% to 26% of world GDP between 1990s and 2006, and FDI has become the main source of external finance for developing countries (which is more than twice as large as official development aid). For emerging countries, FDI contributes to the local economy development through financial capital and technology transfer. Thus, many countries(including China) not only liberalize their markets, but started to offer generous investment package, such as tax holidays, import duty exemptions, or preferential loans (UNCTAD, 2003). However, the effects of FDI on local economies are mixed. According to the early case studies, Caves (1974) and Blomstrom (1986) claimed that activities of MNEs in host countries generate knowledge externalities. Theory on technology diffusion supports their claimant and advocates the positive impact because MNEs confer technology spillovers to domestic firms [16]. UNO (2001) states that FDI can foster domestic entrepreneurship in host countries, because of the possible complementary effects between foreign and domestic firms (Rodriguez-Clare, 1996; Markusen and Venables, 1999), and also the demonstration, networking, and spillover effects of foreign firms in host countries may actually stimulate local entrepreneurship if the necessary stimulating conditions are created (De Backer and Sleuwaegen, 2003). However, the other voice from studies on emerging and transitional countries states that there might be no effect and negative effect were also found in the previous study. For instance, Carkovic and Levine (2005) find no evidence of a positive impact of FDI on economic growth. Haddad and Harrrison (1993) and Aitken and Harrison (1999) have

16 Findlay (1978) and Keller (2004) state that technology in this context includes products, production process, distribution networks, management, and marketing, etc.

found negative or no spillover effect. Aitken and Harrsion (1999) explain these contradictory findings as "market stealing" or the crowding-out effect[17]. Caves (1996) and Blomstrom, Kokko, and Zejen (2000) also argue that the likelihood that MNEs will crowd out local firms is larger in developing than in developed countries. They address that the reason is a higher technology gap between domestic and foreign firms, because FDI often represents a "death sentence" for local firms because they usually cannot compete with MNEs that possess technological and financial advantages. Pertaining to this study, we propose FDI, reflecting economic openness, has a positive impact on entrepreneurship, based on the time period that we studied is from 2005 to 2008 where complementary effects dominates due to reduced technological gap between MNEs and local Chinese firms and network linkage effect in between (i.e. Rodriguez-Clare, 1996; Markusen and Venables, 1999). Yang et al., (2011) stress that by the time China moves to the late stage of market transition[18] while staying in the intermediate stage of market transition, Chinese local firms have benefited from foreign firms' modern technologies through licensing, IJVs and alliances. Complementary effect and networking effects therefore in this stage appear stronger than the crowding out effect between foreign MNEs and Chinese local firms. This stimulates local entrepreneurship if the necessary stimulating conditions are created (De Backer and Sleuwaegen, 2003). Thus, we hypothesize that

> ***Hypothesis 4: Economic openness is positively related to entrepreneurial activities.***

In addition to the hypotheses above, we also investigate the interactive effects of educational resources, unemployment, and regional economic openness. Our

17 They argue that even though technology spillovers exist, more efficient foreign firms may draw demand from domestic firms, so the negative competitive effect may outweigh positive technology spillovers.
18 This stage emphasizes on (1) fair and transparent government regulations, (2) well defined and enforced laws, (3) highly developed factor markets, (4) high customer sophistication and value convergence, (5) highly developed local supporting and related industries, (6) comprehensive local competition.

work is based on the argument that economic development provides more entrepreneurial opportunities, and the argument that the level of entrepreneurial activity must increase in the economic transitions from factor-driven to efficiency-driven and innovation-driven stages (e.g., Kirzner, 1983).

We argue that the development of education and an increase in educational resources enables educational institutes to train more specialized graduates and thus provides human capital for economic development. More ideas can therefore be incubated by high-level educational institutes, and more entrepreneurial opportunities can be identified by trained specialists. We also argue that regional economic openness has a positive interactive effect, because international trade and interfirm collaborations in the period of economic transition and growth generate more opportunities. Finally, we argue that increased unemployment eliminates the positive relationship between economic growth and entrepreneurial activities because, from the perspective of the unemployment pull effect, higher unemployment rates might indicate an economic recession or economic crisis in which opportunities are likely to shrink.

Hypothesis 5a: Increased educational resources strengthen the positive relationship between economic growth and entrepreneurial activities.

Hypothesis 5b: The more open a regional economy, the stronger the positive relationship between economic growth and entrepreneurial activities.

Hypothesis 5c: Higher unemployment weakens the positive relationship between economic growth and entrepreneurial activities.

2.5 Data and Method

Sample

The data used in this study covered the most recent transitional stage (from 2005 onward, the efficiency-driven economic development stage). They were drawn from the official *China Statistic Yearbooks* in the NBSC database. This database can be accessed via the NBSC website. The NBSC database records data from 1996 onward, covering the population, economy, and society at the national and regional levels. It includes yearly, quarterly, and monthly data for thirty-one Chinese provinces in twenty-three categories (for national accounts, population, finance, industry, agriculture, trade, education, health, welfare, etc.). Although NBSC has been criticized for its data inconsistency (especially in the areas of productivity growth and industrialization from 1996 to 2002), its validity from 2002 has been verified by previous studies in the strategy and international business areas (e.g., Buckley, Clegg, & Wang, 2007; Chang & Xu, 2008; Tian, 2007).

Since the data recorded in year t relate to year t-1, the data recorded from 2006 to 2009 reflect the situation from 2005 to 2008. To form a panel dataset, we used data from thirty provinces (excluding Tibet because of its outlier impact).

Dependent variable

Because we want to predict the effect of economic transition on entrepreneurship, the dependent variable should reflect entrepreneurial activities, especially those at an early stage. Previous studies normally used the total entrepreneurial activity (TEA): the percentage of the adult population (aged 16–64) that is either actively involved in starting a new venture or is the owner/manager of a business that is less than 42 months old (GEM Global Report, 2002).

Accordingly, we first tried to calculate an index equivalent to TEA, but this was hindered by the lack of appropriate data in NBSC. Therefore, we followed

Storey (1991) and used the indicator of self-employment. In this case, self-employment refers to the number of individuals (in the regression, in units of 10,000) who hold certificates of residence in urban areas or have resided in urban areas for a long time and are registered at the department of industrial and commercial administration and are permitted to be engaged in individual industrial or commercial business. This indicator was used based on a *dynamic occupational* perspective of entrepreneurship. Before the regression, this variable was mean-centered for each year. To indicate that, self-employment only reflect private firms in China, excluding state-owned firms and other types of ownership.

Independent variables

As shown in Fig. 2.1, the independent variables have four dimensions. GDP per capita is chosen to reflect the standard of living because it is the appropriate Chinese benchmark for this (Huang, 2008) and reflects national economic development (Acs, 2006). NBSC (2009) defines GDP per capita at the regional level to be the market prices of the products produced by all the resident units during a certain period of time divided by the number of people in the region.

FDI inflow refers to investments in China by foreign enterprises and economic organizations or individuals (including overseas Chinese, compatriots from Hong Kong, Macao, and Taiwan, and Chinese enterprises registered abroad). Such investments must follow Chinese policies and laws, and they are exclusively for the establishment of ventures with foreign own investment. FDI inflow is used as the measure (in units of USD 100M) of economic openness.

The logarithm of the number of teachers and staff members at regular institutions of higher education represents the educational resources for innovation-system updates. According to NBSC (2009), regular institutions of higher education are educational establishments set up according to the government's evaluation and approval procedures that recruit graduates from senior secondary schools via the national matriculation test. They include full-

time universities, colleges, institutions of higher professional education, institutions of higher vocational education, and others (non-university tertiary, branch schools, and undergraduate classes). Universities and colleges primarily provide undergraduate courses. Institutions of higher professional education and institutions of higher vocational education primarily provide professional training. Educational establishments that are responsible for enrolling higher-education students under the State Plan but are not enumerated in the total number of schools include branch schools of universities and colleges, and universities and colleges that have been approved and are under construction. Non-university tertiary refers to regular undergraduate branch colleges that operate in new modes, excluding branch schools and similar branches of educational institutions.

The registered unemployment rate in urban areas measures both active and passive job-market changes. It is a ratio where the numerator is the number of registered unemployed individuals. The denominator is the total number of people employed in various units (minus the employed rural labor force, re-employed retirees, and Hong Kong, Macao, Taiwan, or foreign employees) plus the number of laid-off staff and workers, owners of private enterprises, self-employed individuals, employees of private enterprises or self-employed individuals, and registered unemployed individuals.

All the variables were mean-centered for each year.

The interactive variables are also involved in the analysis in terms of centered GDP per capita * centered unemployment rate, centered GDP per capita * centered number of teachers, and centered GDP per capita * centered FDI.

Time dummies were also included.

Method

Our sample is composed of entity data for thirty provinces[19] over four years (2005–2008). According to Wooldridge (2002), we first need to choose either panel data analysis or pooled ordinary least squares (OLS)[20]. The former method is used when the data consist of repeated observations on the same units over time and unobserved individual effects are associated with these units. The latter method is used when the data have both cross-section and time-series features but no within-group autocorrelation (Zhang et al., 2010). We ran the Breusch–Pagan Lagrange multiplier (LM) test[21] and the results indicate the existence of unobserved individual effects, so we use panel data analysis.

To apply panel data analysis, we need to choose between fixed- and random-effect estimations. The basis for this choice is whether or not the unobserved individual effects are correlated with the observed explanatory variables in the model (Wooldridge, 2002). If they are, then fixed effects are appropriate. We therefore ran the Hausman (1978) specification test (the Hausman test value is in Table 2.3), and the results show that the random-effect approach is appropriate.

Multicollinearity has been checked in each model, and the independent variables involved show no significant multicollinearity (the VIFs are less than 10).

2.6 Results

Table 2.2 gives the descriptive correlation between the independent variables. Table 2.3 presents the panel estimation results.

[19]We exclude Tibet because of its outlier effect.
[20]We chose a centered dependent variable that includes negative and positive values, so we preferred OLS to the negative binomial model.
[21]This test checks for the presence of unobserved individual effects; the null hypothesis is that the variance of such effects is zero. If the null hypothesis is rejected, unobserved effects exist and thus panel data analysis should be applied. Otherwise, pooled OLS is more appropriate.

Hypothesis 1 predicts that regional economic growth has an inverted-U-shaped relationship with entrepreneurial activities. Models 1, 3, 4, 5, and 6 consistently show that regional economic growth has a *significant positive effect* on entrepreneurial activities. As economic growth (measured by regional GDP per capita) increases, the marginal effect on entrepreneurship decreases. Therefore, *hypothesis 1 is supported*. This can be explained by China's *dynamic industrialization structure*. As entrepreneurial opportunities move from the manufacturing sector to the service/technology-based sectors (which have lower investment costs), the average firm size may decrease and the number of entrepreneurial activities may increase. The reducing marginal increase of the effect might be explained by the slower increase in China's standard of living and consumption in recent years. In 2007, Chinese household consumption had declined to one-third of GDP (Huang, 2010), compared to 47% in 2000. This can be further explained by an alternative theory called the "precautionary savings hypothesis." The idea is that Chinese households saved more over time and reduced their consumption (Chamon & Eswar, 2008). This low income growth must restrain the development of individual entrepreneurial activities; these are likely to initially be sponsored by relatives. This result also reflects that during the recent international economic crisis, the driver of China's economic growth has become urban-controlled and state-owned sectors. There has been intensive investment in state sectors to stimulate economic growth, and private entrepreneurial activities have been discouraged.

Also, this inverted-U shape indicates that Chinese entrepreneurial activities were in transition from necessity-based to opportunity-based, because necessity-based entrepreneurial activities play a major role in low-income countries while opportunity-based activities are often associated with high-income countries (Acs, 2007). We could argue that in China's economy the transition from the factor-driven to the efficiency-driven stage (GEM Global Report, 2005) requires capital accumulation and technological diffusion (Cornelius and McArthur, 2002). Large firms start to dominate the economy

and individuals realize that wage employment is better paid than self-employment. Therefore, necessity-based entrepreneurial activities decrease and opportunity-based activities increase as large established corporations take over the innovation role.

Hypothesis 2 predicts that educational resources have a positive impact on entrepreneurial activities. Models 1, 2, 3, and 4 *support hypothesis 2*. We conclude that China is approaching the third stage of economic development where entrepreneurship is characterized by innovations (Porter, 1990), and entrepreneurs who start high-potential ventures are relatively well educated (Autio, 2003).

Hypothesis 3 predicts that unemployment has a positive effect on entrepreneurial activities. All the models *support hypothesis 3*. We argue that this positive relationship is a result of the refugee (or unemployment push) effect, because the opportunity cost of starting a firm is lower (Blau, 1987). The lower cost arises from the economic transition. It not only offers a favorable political environment for start-ups (in terms of friendly regulations for private firms and capitalists) but also provides a booming outward economic environment where more entrepreneurial opportunities can be discovered. Therefore, opportunity-based entrepreneurship becomes possible. There are still many necessity-based activities resulting from passive layoffs, but the support of hypotheses 1 and 3 shows that opportunity-based activities have started to emerge[22].

Hypothesis 4 predicts that economic openness is positively related to entrepreneurship; FDI inflow is used to measure this. Models 1, 2, and 5

[22]This is *mostly* consistent with the conclusion from GEM APS master data 2005 that China has an ONER grade of 5, ranking tenth in the world. However, we draw this conclusion at the regional level using NBSC data, whereas GEM collected data at the individual level from a selection of large Chinese cities.

consistently demonstrate this effect, and it is significant. Therefore, *hypothesis 4 is supported*. An example of the effect of foreign investment is that the Chinese government will recommend that foreign investors procure necessary materials or manufacturing parts in China. This allows investors to access cheap supplies and to find manufacturing partners locally, and it also creates opportunities for entrepreneurs.

Hypotheses 5a, 5b, and 5c predict the interactive effects of educational resources, economic openness, and unemployment. Model 4 shows that educational resources have a significant positive effect on the relationship between economic growth and entrepreneurial activities, so *hypothesis 5a is strongly supported*. This result indicates that the larger the educational resources, the stronger the positive impact of economic growth on entrepreneurial activities. Model 5 shows that economic openness has a significant positive effect on the relationship between economic growth and entrepreneurial activities, so *hypothesis 5b is supported*. Model 6 shows that the interactive effect from unemployment is significantly negative, which supports hypothesis 5c.

Table 2.2 Descriptive statistics and correlation matrix

	C_GDPPC	C_GDPPC2	C_lnedu	C_FDI	C_unemployment	C_GDPPC* C_lnedu	C_GDPPC* C_FDI	C_GDPPC* C_unemployment
C_GDPPC	1.00							
C_GDPPC2	0.81***	1.00						
C_lnedu	0.35***	0.15*	1.00					
C_FDI	0.63***	0.36***	0.41***	1.00				
C_unemployment	-0.40***	-0.24***	-0.21**	-0.35***	1.00			
C_GDPPC*C_lnedu	0.43***	0.52***	-0.30***	0.30***	-0.46***	1.00		
C_GDPPC*C_FDI	0.62***	0.74***	0.18**	0.70***	-0.08	0.37***	1.00	
C_GDPPC*C_unemployment	-0.32***	-0.24***	-0.22**	-0.06	0.60***	-0.51***	0.18**	1.00

120 observations (4 years, 30 regions/excluding Tibet). Significance level: *** <1% , ** <5%, * <10%. All variables have been mean-centered for each year.

Table 2.3 Results of panel data estimation

C_Self-employment	1	2	3	4	5	6
C_GDPPC	2.64* (4.32)		12.79*** (4.36)	9.74*** (3.97)	8.44* (4.49)	15.36*** (4.57)
C_GDPPC^2	-.0004*** (.0001)		-.0003*** (.0001)	-.0003*** (.00001)	-.0006*** (.0001)	-.0004*** (.0001)
C_ln Education	38470.4*** (78917.83)	447302.2*** (94308.61)	495922.8*** (94052.55)	535900*** (91215.19)		
C_FDI	243.13*** (44.41)	181.12*** (39.23)			142.87*** (50.01)	
C_Unemployment Rate	72845.47* (38713.91)	59873.36* (39073)	68234.64* (41721.43)	69140.91* (41998.81)	94569.38*** (36587.09)	93547.79** (43586.92)
C_GDPPC*C_ln Education				8.67* (5.23)		
C_GDPPC* C_FDI					.008*** (.002)	
C_GDPPC*C_UnemploymentRate						-4.55* (2.84)
Constant	82188.25 (67074.65)	-.00029 (79015)	77424.38 (83114.53)	12259.08 (78980.69)	66032.1*** (24524.83)	73360.74 (109789.6)
R^2	0.67	0.55	0.47	0.47	0.37	0.12
Prob>Chi2	0.0000	.0000	.0000	.0000	.0000	0.0048
Hausman Test Prob>Chi2	0.1310	0.9950	0.2544	0.4798	0.0001	0.6272

Time dummies were included but are not shown here. Significance level: *** <1% , ** <5%, * <10%

2.7 Discussion and Conclusion

Our main goal is to estimate the role of economic transition in entrepreneurship development in China. In Section 2 we gave an overview of China's economic transition and entrepreneurship development since the end of the 1970s, presenting the evolutionary path of economic transition over three generations of entrepreneurial activities. We discussed the three economic transitions in China: from centrally planned to market-oriented, from relationship-based to rule-based, and from factor-driven to efficiency-driven. We also described the transition of entrepreneurship from necessity-based to opportunity-based. We explained the characteristics of entrepreneurship development at each transitional stage. In the empirical analysis, we focused on the most recent transitional period, from 2005 to 2008.

We studied six panel regression models. The results show that the GDP per capita in the recent transitional stage (2005–2008) has a significant inverted-U-shaped effect on entrepreneurship development. This result is consistent with the argument (Acs, 2006) that at low levels of national income, self-employment provides job opportunities and scope for the creation of markets, and as GDP per capita increases, the emergence of new technologies and economies of scale allows larger established firms to satisfy the increasing demand of growing markets and to increase their role in the economy. Other factors affected by economic transitions such as educational resources, regional economic openness, and unemployment have also shown significantly positive effects.

The interactive effect of FDI and educational resources is relevant to the network view of the transitional economy. In addition to the argument given in Section 2.4, the significant positive interactive effects from educational resources and economic openness can be explained by China's network-oriented entrepreneurial atmosphere. Chinese people rely on networks for opportunities and solutions to potential problems. Networks provide assistance

to entrepreneurs in the context of China's market uncertainty and immature institutional environment in a period of economic transition. Entrepreneurs can establish networks by, for example, enrolling in MBA and executive MBA programs where current and potential entrepreneurs study together and share social capital. They can also become actively involved in industry clusters where technology diffusion is enhanced through collaboration with foreign firms.

Entrepreneurs in transitional economies use many strategies to accumulate network social capital and hedge against risks. These include engagement in trade and the diversification of activities (Smallbone & Welter, 2001). In transitional economies networks are extremely important (Peng & Heath, 1996; Batjargal & Liu, 2004). The underlying argument relies on the theory of transaction costs. Swaan (1997) argued that underdeveloped formal-institution economies cause extensive market failures because of information asymmetries, lack of contract enforcement, high search and negotiation costs, and various other effects. If entrepreneurs build their own networks and relationships, the long-term benefits of collaboration might outweigh the short-term costs. This is consistent with the observation of McMillan and Woodruff (1999) in Vietnam that business networks in transitional economies are based on reputation, and cheating ruins one's reputation, which outweighs any short-term benefits of such behavior. To summarize: the Chinese reliance on informal network systems is a consequence of both the collective culture and China's underdeveloped formal-institution framework. In Russia the *blat* system has a negative effect (Ledeneva, 1998; Johnson, McMillan, & Woodruff, 2000). In contrast, China's informal *guanxi* network together with a formal-institution framework has a positive effect (Peng, 2001; Batjargal & Liu, 2004).

In our results, the interactive effect of educational resources is interesting. The recent history of China's entrepreneurship development shows that the government began to favor technology-based entrepreneurship at exactly the

time that Chinese universities started building technology-based incubators and university-based science parks. These actions were also associated with China's intellectual-property reforms. In the late 1990s, to update intellectual-property rights in preparation for joining the World Trade Organization (WTO), the Ministry of Education announced a Chinese version of the Bayh–Dole Act that allows universities to own patents for inventions supported by government funding. At this time the national innovation system was changed from a Soviet-style PRI-centered system to a firm-centered system. Universities in China attempted to become world-class by merging with other universities and expanding enrolment, privatization, decentralization, and diversification. As a result, universities began to take more responsibility for training specialists and entrepreneurs by incubating technology-based enterprises.

The negative interactive effect from unemployment implies that China is still at the efficiency-driven stage where necessity- and opportunity-based entrepreneurial activities coexist. Although China's increased industrialization and enlarged economies of scale ensure that large firms still dominate at this stage, supply-chain niches have started to open up for small and medium enterprises (GEM Global Report, 2010) and for opportunity-based entrepreneurship. If we consider this negative interactive effect together with the positive relationship between unemployment and entrepreneurship, we can conclude that unemployed individuals are likely to prefer wage employment to self-employment, which is consistent with the reality of efficiency-driven economic development.

This study contributes to the study of the virtuous development cycle between entrepreneurship and economic growth (with transition). It shows that economic-transition sourcing from the different pillars has a significant positive impact on entrepreneurship development. Combined with previous studies on entrepreneurship's indispensable role in economic development, this study provides evidence for the institutional antecedents of entrepreneurship,

particularly in transitional economies. Using data from NBCS rather than GEM allows us to generalize the conclusions, because the NBSC data cover all Chinese regions and thus offer a true picture of the segmented entrepreneurship development. Although the data sources are different, the conclusions are similar, with the difference that entrepreneurial activities are becoming opportunity-based rather than already having that status (as concluded by the GEM report of 2008).

Moreover, this study contributes to the debate on the Beijing consensus versus the Washington consensus. In terms of the former, this study indicates that entrepreneurship development in China is government-led and owes much to the governmental initiation of institutional transition. However, the results suggest that the *ex ante* dimensions of entrepreneurship development correspond to the requirements of the Washington consensus (at least in terms of economic openness). Hence, we take a middle position in this lively debate: we believe that China's development is driven by both scenarios. At the political level, which we argue is the framework level, China follows the Beijing consensus, because it has long-term political decision-making (by a single political party) and experimentation-based policy development (defined by Deng Xiaoping). At the micro level however, economic development is driven by the Washington consensus. China is trying to build up a formal institutional framework that supports private property rights, economic openness, financial reforms, macroeconomic stability, and political liberalization. There is a contradiction between the political liberalization defined by the Washington consensus and the current situation in China. However, we still argue that, as a result of the government's proactive behavior, quiet progress is being made on every disputed issue (including liberalization).

The main limitation of this study is the limited time period (2005–2008). We have given our reasons for focusing on this period, but a longer period, perhaps starting at the end of the 1970s, would lead to more interesting results. Because

China's data records are segmented into regions, we suggest that future studies choose a longer investigation period and focus on specific Chinese provinces (those with complete data). Furthermore, future studies could investigate other dimensions of transition and systematically look at both the economic transition and institutional transition over time.

Chapter 3 Catching-Up of Chinese Firms via Networking Strategies*

Catching-up is a concept originally developed at the national level. Catching-up at the corporate level, especially in emerging countries, has not been sufficiently studied. We propose a catching-up framework based on the theories of national catching-up, CE, and social networks. We tested this framework via a longitudinal case study of Huawei Technology Co., Ltd. By qualitatively and quantitatively analyzing Huawei's catching-up in the three network layers, we illustrate Huawei's three catching-up stages (pre-catching-up, catching-up, and post-catching-up) in the last twenty-three years. We argue that, as is the case nationally, corporate social capability is a necessary precondition for technological catching-up. Catching-up firms have the same characteristics as entrepreneurial firms in terms of growth- and opportunity-orientation.

We found that networking, as a CE strategy, is an important approach for catching-up firms. Structural, relational, and cognitive social capital can be gained from networking. This allows the catching-up firm to identify and address resource gaps and to create and respond to new opportunities. We further found that Huawei's network evolution (in terms of composition and structure) has a positive impact on Huawei's catching-up, especially in building an open system for knowledge acquisition, transfer, sharing, and creation. Huawei's sparse interfirm network with its increasing composition and strong ties coexists with an increasingly cohesive intrafirm network. This facilitates the efficient exploration of external opportunities and the exploitation of internal opportunities. The industrial-district network provides a snapshot of the intrafirm and interfirm

*This chapter was accepted for presentation at the Strategic Management Society Annual Conference, Miami, USA, Nov. 6–9, 2011. And ERIM seminar, Rotterdam on April 2. 2012.

networks in a particular location. This work contributes by supporting corporate catching-up theory, enriching social-network theory, and providing evidence for the value of combining other forms of networking (e.g., strategic alliances, M&As, and corporate venturing) into an open-innovation paradigm.

3.1 Introduction

Catching-up is a concept that originally developed in the field of economics. Its central idea is the technological and economic convergence between leading and following countries (Abramovitz, 1986). Freeman (2002) argued that technology and innovation are central to the catching-up process. When latecomers acquire enough time and sufficient productive capability as well as other resources (especially the human capital necessary for new technologies), catching-up can be achieved by taking advantage of a "window of opportunities" (Perez & Soete, 1988). National catching-up has been studied from two angles. The first is based on the growth model of Romer (1990), the theory of national competitive advantage (Porter, 1990), and national innovation systems (Nelson, 1993). It seeks the factors behind the catching-up, including the development of innovation-enhancing policies and infrastructure and increasing financial and human-capital investment. The second uses empirical studies to explain catching-up factors. For instance, Japan's catching-up is explained by government regulations, shop-floor innovation, and social institutions such as life employment and keiretu (Freeman, 1988). Korea's success is a result of the learning path from imitation to innovation, the technological regime that provides a catching-up ladder, and leapfrogging catching-up patterns (Lee & Lim, 2001).

As the largest emerging economy, China's spectacular economic growth and unprecedented success in catching-up have attracted enormous attention from academics and practitioners alike. Studies attribute China's catching-up to government policies such as FDI, innovation in state sectors (close financial controls, state ownership of firms, and political controls in favor of economic growth), and proactive and pro-business approaches (see the description of the Beijing consensus (Huang, 2010). However, the contribution of corporate catching-up to China's growth cannot be overlooked. By 2011, there were 61 Chinese firms in the Fortune 500 (an increase from 37 in 2009); in comparison

there were just 7 Russian and 7 Indian companies in the list. The LUBS report (Jan. 2009) states that Chinese multinationals should no longer be regarded as "apprentices" on the international stage but instead considered as a new troop of "emerging catch-uppers."

Early studies in this field (e.g., Young, Huang, & McDermott, 1996) emphasized the importance of inward and outward internationalization. They stressed the emerging mode of outward joint ventures and acquisitions and the role of Chinese SOEs[23]. China's economic reform now allows greater scope for corporate initiatives. However, Zhang and Van Den Bulcke (1996) studied the institutional context, observing that outward FDI is heavily dependent on local and central government. They concluded that "those enterprises which developed an early link between the influence of governmental bureaucratic systems and the real entrepreneurial logic are likely to be more successful and competitive than those which have based their international business strategy only on the privileged position which they received from the government."

Child and Rodrigues (2005) studied Chinese firms' inward internationalization through OEM and joint ventures and outward internationalization through acquisition and organic expansion abroad (to acquire advanced technology, R&D capabilities, and brands). Mu and Lee (2005) investigated the Chinese telecommunication industry. They claim that in the technology regime where leapfrogging catching-up occurs, the strategy of trading markets for technology, knowledge diffusion, and industrial promotion by the government are important catching-up factors. Fan (2006) also focused on the telecommunication industry. Fan stresses that endogenous factors such as innovation capability are the key to catching up with multinational corporations. Similarly, Duysters et al. (2009) studied Haier and conclude that alliances, acquisitions, and internal R&D are the main growth strategies. The

[23]Most receive sufficient financial support from the government to carry out outward joint ventures and acquisitions.

leading Chinese economist Liu (2008) concludes that the basic elements of catching-up are market size, market-oriented innovation, global alliances and open innovation, the spillover of FDI, and the role of the government.

There are only a few studies of corporate catching-up in China. This might be the result of a research mindset that focuses on *catching-up factors* rather than *catching-up logic*[24] and *catching-up mechanisms*[25]. On the one hand, previous studies either used internationalization as a label to reflect Chinese catching-up or emphasized the importance of innovation capability. No study measures the degree of Chinese corporate catching-up. On the other hand, catching-up theories are diverse but fall within international business theory. For instance, in early research, international business economics was mainly used to explain the internationalization of developed-country MNEs. Examples include the product life-cycle model[26] (Wells, 1983), the model of third-world enterprises (Lall, 1983) [27], international process theory based on Luostarinen's internationalization model[28] (Luostarinen, 1979) and inward and outward international business activities (Welch & Luostarinen, 1993), and Dunning's OLI theory (Dunning, 2001). Chinese (semi-) state-owned enterprises are the main research targets in the existing literature. International business theory has been expanded by consideration of the political and sociological factors that operate through a country's institutions (Toyne & Nigh, 1998, Child & Rodrigues, 2005). However, the literature has not explained the empirical fact

[24]We define catching-up logic as the process of developing a goal, planning the catching-up, forming a strategy, and executing the plan.
[25]The catching-up mechanism is a firm-specific strategic process that elaborates motivations, strategies and methods, interactive factors, and consequences.
[26]This consists of a chain of events from innovation in an advanced country to technology transfer and diffusion to firms in developing countries, and then to local innovation followed by exports or by FDI if export restrictions exist (Wells, 1983).
[27]Lall (1983) assumes the ability to innovate along different lines from those of developed nations. This model of localized technological change emphasizes the distinctive character of the proprietary assets developed by third-world MNEs and therefore the emergence of different types of multinationals (Young, Huang, & McDermott, 1996).
[28]The model includes product (P), operation (O), and market (M) strategies; this is the so-called POM posture.

that many private Chinese firms have successfully caught up in the global market.

We investigate catching-up mechanisms by studying Huawei Technologies Co., Ltd. We view Chinese catching-up through the lens of resources, CE, and cooperation-based networks. Huawei's catching-up accompanies the process of acquiring social capital in the network to develop social capability. Therefore, we argue that the catching-up logic of nations and firms is similar. In other words, nations enhance their social capability through national institutional systems; correspondingly, firms increase social capability by integrating multiple layers of networks. In Huawei's catching-up process, CE strategies were used to address resource deficiencies. Thus, national catching-up theory, which emphasizes social capability (e.g., Abramovitz, 1986), can be transplanted to the corporate level.

We applied theories of resource-based views and network social capital in the corporate context. Based on Huawei's catching-up process, which advocates open innovation and CE, we propose in Fig. 3.2 a conceptual framework for the catching-up mechanism. The framework indicates that catching-up firms are similar to catching-up nations in that they need sufficient social capabilities to exploit the technology already employed by the technological leaders. They are also similar to entrepreneurial firms that emphasize growth and innovation for technology exploration. There must be large resource gaps, so that addressing these gaps motivates the development of catching-up strategies. The Huawei analysis indicates that cooperation-based networks facilitate the switch from competitive disadvantage to competitive advantage. Therefore, our study supports the theory on the catching-up of emerging-country firms, extending international business theory (Child & Rodrigues, 2005) and CE theory to the catching-up field. Also, since Huawei is a private firm, this study addresses the question of how such firms catch up rapidly without governmental financial support. It also addresses the question of how private firms take advantage of

political support and institutional systems. This contributes to the debate on the role of government versus markets in catching-up (Amsden, 1989; World Bank, 1993; Chang, 1994).

Our intention is to stimulate further discussion rather than to provide a definitive conclusion. This study is organized as follows. Section 2 presents the theoretical background and the conceptual framework. Section 3 discusses the methodology: the sampling, data collection, and data analysis. Section 4 presents our findings for each of Huawei's catching-up phases, and Section 5 provides a discussion and conclusion.

3.2 Theoretical Background and Conceptual Framework

3.2.1 Catching-up theory and social capability

The development of Germany, Japan, South Korea, Taiwan, and some other latecomer countries led to the development of catching-up theory. At the national level, catching-up is equivalent to convergence: the per-capita income of poor countries will grow faster than that of rich countries. Economists continue to debate the determinants of the catching-up process. Neoliberals argue that free-market and free-trade policies are the key to a region's rapid growth and industrial transformation. Developmentalists stress the role of the state in economic development and advocate state planning and policies. Left-wing neoliberals believe that the state should intervene to overcome specific market failures and also stress the importance of market forces. This debate forms the theoretical base for China's growth drive.

The World Bank, using the notion of social capital, has unified two meta-theoretical formulations (from Gerschenkron (1962) and Abramovitz (1986)[29])

[29]Gerschenkron (1962) stressed that "the more backward a country's economy, the more likely was its industrialization to start discontinuously as a sudden great spurt proceeding at a relatively high

into a new formulation of the catching-up process. It incorporates elements of Gerschenkron's perspective of the state into Abramovitz's framework by acknowledging the influence of both state policy and market forces. This formulation emphasizes social capital as a basic element of national catching-up, because it can establish a country's ability to overcome productivity-retarding characteristics (Abramovitz, 1986). Therefore, a country's potential for rapid growth is strongest when it is technologically backward but socially advanced (Abramovitz, 1986, p. 388).

We argue that gaining social capability through social-capital accumulation is the most effective way to become socially advanced. However, it is difficult to measure social capability, although it was recognized by Abramovitz more than twenty years ago. Based on the studies of Ohkawa and Rosovsky (1973) on Japan's economic growth, Abramovitz claimed that the social capability of a country represents its potential for a productivity increase. It is associated with *technical competence* (for example, determined by the quality of the education system), *experience with the organization and management of large-scale enterprises*, and the *nature of the broader economic system*, in particular its openness to competition (pp. 388–9).

Studies of corporate catching-up are rare, and the theory is extremely limited. We assume that catching-up theory is similar at the national and corporate levels. We assume that corporate catching-up logic starts with social advance and proceeds with a combination of social-capability development and social-capital acquisition. We present the parallels between national and corporate catching-up in Fig. 3.1. The left-hand side explains the conditions that allow *latecomer countries* to catch up; the country should be technologically

rate of growth of manufacturing output" (pp. 353–4). He argued that borrowing technologies from advanced countries was one of the primary factors underlying this "sudden great spurt." Abramovitz (1986) claimed that "countries that are technologically backward have a potentiality for generating growth more rapid than that of more advanced countries, provided their social capabilities are sufficiently developed to permit successful exploitation of technologies already employed by the technological leaders" (p. 390).

backward and socially advanced. It must develop social capability through educational systems, experience with the organization and management of large-scale enterprises, and changes to the broader economic system, in particular via an openness to competition. As shown on the right-hand side of Fig. 3.1, firms should establish social capability via similar approaches: for instance, internally through an in-house R&D system in an intrafirm network and externally through collaborations and the expansion of external networks.

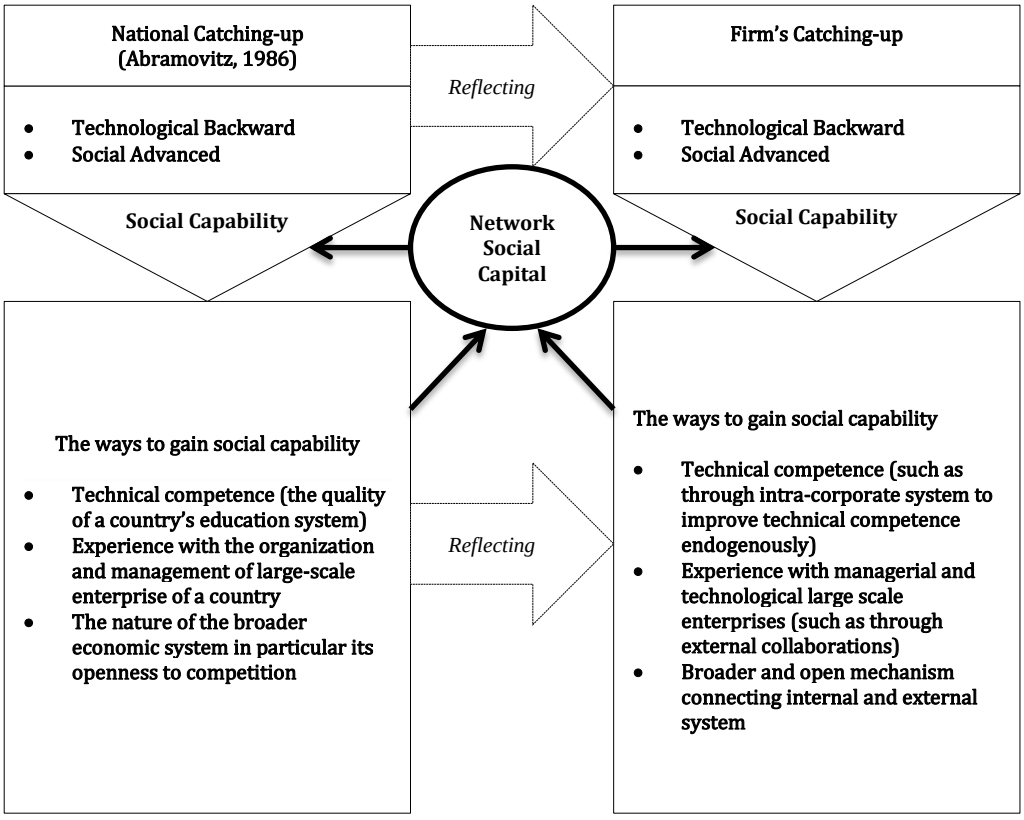


Figure 3.1. Catching-up through social capability at national and corporate levels

3.2.2 Social networks and network social capital

As indicated in Fig. 3.1, either internally or externally, the social network plays an important role in generating social capital and social capability. Social networks provide organizations and individuals with knowledge, resources, markets, and technology acquisition. Social network research at both the interpersonal and interfirm level consists of social-capital research and network-development research (Carpenter, Li, & Jiang, 2012).

Networks have many forms, including intrafirm business units, strategic alliances, franchises, R&D consortia, buyer-supplier relationships, business groups, trade associations, and government-sponsored technology programs. Networks can be classified into *intrafirm networks, strategic-alliance networks, and industrial districts.* An intrafirm network consists of a group of organizations within a firm. The subsidiaries and the headquarters share common values and goals and are controlled by the same owners. In the literature, intrafirm networks are also called *interorganizational groupings* because valuable insights into their internal structures and operations can be obtained from network-related concepts (Ghoshal & Bartlett, 1990). *Strategic-alliance networks* have been studied intensively. In these networks there are multiple alliances with a number of partners. The partners enter into voluntary arrangements that involve the exchange, sharing, or co-development of products, technologies, or services (Gulati, 1995). An *industrial district* consists of independent firms operating in the same or related markets in the same area. Through their partnership they benefit from external economies of scale and scope (Brown and Duguid, 2000). The concept includes industrial clusters, networks of producers, supporting organizations, and local labor markets (Scott, 1992).

Social-capital research takes precedence over social-network research, because social capital can capture the effects of a social network on its participants (Adler & Kwon, 2002; Lin, 2001). In this subfield, there are two distinct yet

interconnected core ideas: social capital and embeddedness. Social capital describes and characterizes firms' relationships in the network and their access to new sources of knowledge and interfirm learning. It reflects the instrumental utility and beneficial consequences of a social network (Burt, 1997; Lin, 2001). For both individuals and organizations, social-capital benefits may include power and influence (Brass & Burkhardt, 1993; Sparrowe & Liden, 1997), enhanced performance (Baldwin, Bedell, & Johnson, 1997; Mehra, Kilduff, & Brass, 2001; Peng & Luo, 2000), greater access to resources (Shane & Cable, 2002; Uzzi, 1996), and reduced transaction costs (Gulati, 1995).

Although there are many definitions of social capital, the fundamental concept is the *ability* of actors to secure benefits by virtue of their membership in social networks or other social structures (Portes, 1998). From this point of view, social capital is equivalent to social capability. Nahapiet and Ghoshal (1998) defined social capital as the sum of the actual and positional *resources* embedded within, available through, and derived from the network of relationships possessed by an individual or social unit. Based on this, social-capital benefits have two sources: resources that are inherent to the social network and the structural patterns of connections across actors (Adler & Kwon, 2002). Social capital can be viewed as a *private good* possessed by individuals (e.g., Burt, 1997; Useem & Karabel, 1986; Leana & van Buren, 1999) or the *public good* of an organization (e.g., Coleman, 1988; Bourdieu, 1986; Leana & van Buren, 1999). Social capital is also highlighted in the field of national catching-up (e.g., Abramovitz, 1986), so it is also emphasized at the national level. We argue that social capital can have advantages for the individuals who create it and the organizations that are involved in it, and that it can help a country to become socially advanced.

Another core idea of social-capital research is embeddedness, which is the contextual influences of social ties and networks on participants' actions (Granovetter, 1985). Embeddedness provides a mechanism through which

networks provide participants with resources and structural benefits and generate social capital (Moran, 2005; Walker, Kogut, & Shan, 1997). Drawing on this, Nahapiet and Ghoshal (1998) connect social capital and embeddedness by stating that social capital has three dimensions, *structural, cognitive,* and *relational*. These correspond to two forms of embeddedness: *relational embeddedness* in concrete ties and *structural embeddedness* in a network (Granovetter, 1992; Moran, 2005).

First, the structural dimension of social capital is similar to structural embeddedness, referring to the pattern of relationships between the network actors (Inkpen & Tsang, 2005). This dimension includes two properties: *social cohesion* and *network range* (Argote, McEvily, & Reagans, 2003). It emphasizes the implication of network structural features (Carpenter, Li, & Jiang, 2012) such as structural equivalence (Turner, 1985) and structural holes (Burt, 1992). *Social cohesion* represents the extent to which a relationship is surrounded by strong third-party connections (Argote, McEvily, & Reagans, 2003). *Network range* is the prevalence of ties that cross institutional, organizational, or social boundaries (Burt, 1992, pp. 148–149).

Secondly, the relational dimension of social capital is similar to relational embeddedness. It represents the personal relationships that people have developed with each other through a history of interactions (Granovetter, 1992), including aspects such as trust and trustworthiness, norms and sanctions, obligations and expectations, and identity and identifications. It is opposed to the structural dimension, indicating those invisible assets that create and bond relationships. It focuses on the effects of network closure (Burt, 2001; Coleman, 1990), incorporating strong ties and the cohesive network formed by those ties to promote a normative environment of trust and reciprocity (Granovetter, 1973; Portes, 1998).

Thirdly, Nahapiet and Ghoshal (1998) define the cognitive dimension of social capital to be the resources providing meaning and understanding between

network members, such as shared representations, interpretations, and systems of meaning. Structurally, shared goals and shared cultures (Inkpen & Tsang, 2005) are mostly used. Shared goals refer to the degree to which network members share a common understanding of and approach to network tasks. Shared culture is similar to tie modality, referring to the set of institutionalized rules and norms that govern appropriate behavior in the network.

We argue that network social capital can reflect network structure (the pattern of relationships that exists among a set of actors; see Phelps (2010)), network composition (the types of actors characterized in terms of their stable traits, features, or resource endowments; see Wasserman & Faust (1994)), and network content (the actors' organizational roles and experience; see Kijkuit & van den Ende (2010)).

There are two theories for the network structure of social capital. The first is the traditional view of social capital, which is supported by network closure theory (Coleman, 1988, 1990). It stresses the positive effect of cohesive social ties or "network closure" on the production of social norms and sanctions that facilitate trust and cooperative exchanges and diminish the risk of opportunisms that can affect cooperative relationships (Granovetter, 1985; Raub & Weesie, 1990). The second is structural-hole theory (Burt, 1992, 1997), which claims that the benefits of social capital result from the diversity of information and brokerage opportunities created by the lack of connections between separate clusters in a social network. Players occupying brokerage positions between these clusters have better access to information and enjoy advantages in negotiating relationships. They are aware of more opportunities and secure more favorable terms in the opportunities they choose to pursue (Gargiulo & Benassi, 2000).

Network-development research focuses on the development and evolution of networks as social phenomena, mainly concentrating on patterns and

precursors of network formation (Carpenter, Li, & Jiang, 2012). The forces that drive the formation of linkages with other organizations include network development opportunities provided by strategic inducements (Ahuja, 2000b); these arise from homophily[30] (McPherson & Smith-Lovin, 1987; McPherson, Smith-Lovin, & Cook, 2001) and instrumentality[31] (Bourdieu, 1986; Li, 1982; Provan, Fish, & Sydow, 2007). Following this logic, networks evolve as social phenomena (Ahuja, 2000a; Gulati & Gargiulo, 1999) on a path-dependent process in which the future development of a network relies on its current structure (Gulati & Gargiulo, 1999; Shipilov & Li, 2008; Watts, 1999).

3.2.3 Corporate entrepreneurship

CE emphasizes for established firms the *capacity* to identify new ways of doing business, develop new technologies and products, and enter new markets in new organizational forms (Covin & Slevin, 1991). CE is also defined as a *process* through which firms innovate, form new business, and transform themselves by changing the business domain or processes (Guth & Ginsberg, 1990).

We consider CE because of our view that successful catching-up firms are characterized by autonomy, innovativeness, risk-taking, high growth, proactiveness, and competitive aggressiveness (Covin & Slevin, 1991). These features also characterize entrepreneurial firms. We argue that catching-up firms must be entrepreneurial firms, because they must be alert to opportunities (Kirzner, 1973), growth-oriented (Stevenson & Jarillo, 1990), and innovative (Covin & Slevin, 1991). Innovation, strategic renewal, and corporate venturing are the three basic components (Zahra, 1995, 1996). Teng (2007) defines innovation as the creation and introduction of new products, production processes, and organizational systems. Zahra (1996) defines strategic renewal as the transformation or revitalization of a company's

[30]The tendency for actors to form social ties with similar others (McPherson, 1983).
[31]The value of networks to actors, determined by the actors' demands and the resources available from networks and partners (Brass et al., 2004; Provan, Fish, & Sydow, 2007).

operations by a change in the scope of its business, its competitive approach, or both. Corporate venturing involves the creation or purchase of new organizations (Block & MacMillan, 1993; Chesbrough, 2002). It allows a firm to take advantage of opportunities in new markets that are unattainable for the current organization (Block & MacMillan, 1993).

CE involves carrying out new combinations (Schumpeter, 1934), leveraging existing resources to obtain additional resources (Greene, Brush, & Hart, 1999), and the pursuit of opportunities (Brown et al., 2001, p. 954). Thus, entrepreneurial firms are likely to experience resource gaps (Teng, 2007), as do catching-up firms. To address these gaps, interfirm relationships such as M&A and alliances are developed to access valuable resources not owned by the firm (Das & Teng, 2000). We argue that similar connections can assist catching-up firms. First, the resource-based view of competitive strategy suggests that firms in the same industry perform differently because they differ in their resources and capabilities (Barney, 1986). Therefore, networks can overcome the disadvantage of "resource poverty" (Welsh & White, 1981) by enabling firms to link activities and resources (Andersson & Wictor, 2003). Secondly, the dynamic-capability view suggests that firms need to develop new capabilities to identify opportunities and respond to them quickly (Jarvenpaa & Leidner, 1998). Networks can develop these capabilities by radar-scanning and connecting internal and external situations.

We depict a conceptual framework for catching-up in Fig. 3.2. First, being socially advanced is the primary condition for corporate catching-up; we presented arguments for this based on national catching-up theory in Section 3.2.1. Secondly, catching-up firms act similarly to entrepreneurial corporations in terms of being alert to opportunities (Kirzner, 1973), growth-oriented (Stevenson & Jarillo, 1990), and innovative (Covin & Slevin, 1991). Both types of firms also have resource gaps (Section 3.2.3). Thirdly, networks are an effective way to address resource gaps; this is shown by CE theory (Section

3.2.3) and corporate catching-up theory (Section 3.2.1). Therefore, technical advance can be achieved if the firm is socially advanced. Fourthly, entrepreneurial opportunities in the catching-up process can be identified through networks at the intrafirm, interfirm, and industrial-district levels, motivating catching-up firms to be innovative, growth-oriented, and alert to opportunities. These four points form the catching-up logic and indicate that the catching-up framework based on a network approach is an open-development system.

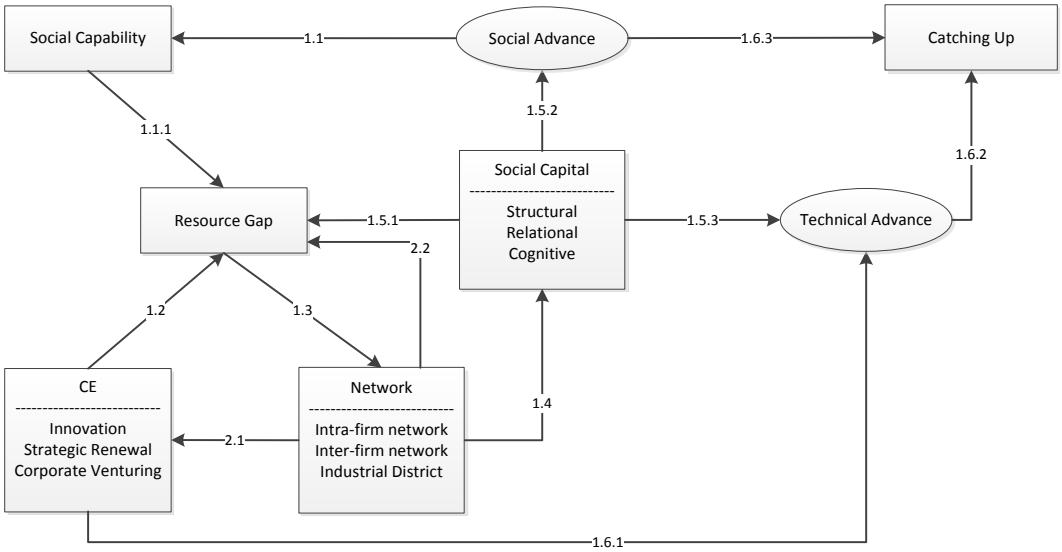


Figure 3.2. Conceptual framework for catching-up

Notes: According to national catching-up theory, catching-up has two components: social advance and technical advance. We list below each step in the process.

1.1: Social advance requires the acquisition of social capability

1.1.1: Resource gaps are identified during the process of gaining social capability

1.2: CE leads to resource gaps

1.3: Three network levels address resource gaps

1.4: Social capital is gained through networking

1.5: Social capital has three functions

1.5.1: It addresses resource gaps

1.5.2: It allows social advances

1.5.3: It allows technical advance

1.6: Catching-up has three components

1.6.1: CE contributes to technical advance

1.6.2: Technical advance leads to catching-up

1.6.3: Social advance leads to catching-up
2.1 Networking, serving as a radar screen, allows a firm to recognizes opportunities for innovation, strategic renewal, and corporate venturing. The process returns to step 1.3.
2.2 Through networking, further resource gaps are recognized. The process returns to step 1.3.

3.3 Research Design

Our methodology is that of the case study, for two reasons. First, corporate catching-up is a socially constructed process. Different firms may use different catching-up mechanisms. This topic requires a qualitative approach that emphasizes processes and meanings without rigorous examination (Denzin & Lincoln, 1994). Thus, instead of measuring "catching-up quantity, amount, intensity, or frequency" from a macro perspective, we use the method of postpositivism (it is the opposite of positivism) (Morgan & Smircich, 1980). It is more appropriate because it appreciates the different constructions and meanings that people place upon their experience (Easterby-Smith et al., 1991). It also focuses on insight, discovery, and interpretation rather than hypothesis testing (Merriam, 1988). Secondly, case studies have been criticized for their lack of scientific rigor and for being unreliable because they lack generalizability (Johnson, 1994). However, they enable researchers to gain a holistic view of a phenomenon or series of events (Gummesson, 1991). A descriptive case study captures the emergent and immanent properties of life in organizations and the ebb and flow of organizational activity, especially where it is changing rapidly (Hartley, 1994). We executed a longitudinal case study. Event analysis was used to study the firm's network in each catching-up period qualitatively and quantitatively.

Sampling

We chose the telecommunication infrastructure industry because it has developed rapidly as a result of global population growth and sustainable economic development. Companies such as AT&T, Vodafone, Verizon, SBC Communications, Bell South, and Qwest Communications appear to be the

sources of technology for this industry. In reality, telecommunication infrastructure and solution providers are the engine of technological change and innovation.

We study Huawei Technologies Co., Ltd. for three reasons. First, Huawei is a private enterprise, with 100% of the shares held by the employees; the existing literature focuses on Chinese (semi-) state-owned companies. Secondly, Huawei's internationalization and innovative performance have been widely acknowledged. By 2010, Huawei was serving 45 of the top 50 telecom operators in the world, covering one-third of the global population. It surpassed Nokia and Siemens to become the second largest global supplier of mobile equipment after Ericsson. Huawei reached position 397 in the Global Fortune 500 in 2010, with annual sales of USD 21.8 billion and a net profit of USD 2.67 billion. It was the only private Chinese company in the list. In 2010, Huawei was ranked the fifth most innovative company in the world (by Fast Company, a respected and award-winning US-based monthly magazine). It was behind only Facebook, Amazon, Apple, and Google. Huawei has announced that its expected growth rate is 38% annually.

In terms of technological capability as evaluated by patent grants, in 2008 Huawei was number one in the world, with 20% more than Ericsson (which ranked second in the industry) and 14 times as many as Cisco Technologies (WIPO, 2008). By 2010, Huawei had filed 49,040 patent applications under the Patent Cooperation Treaty (8,279 overseas) and held a leading position in essential LTE (long-term evolution) technology. Huawei invests more than 10% of its annual revenue in R&D. More than 10% of R&D costs are allocated to pre-R&D. It has 20 R&D centers in China and abroad[32] and 36 training centers worldwide. More than 51,000 employees (46% of the workforce) are engaged

[32]In China, Huawei has R&D centers in Shenzhen, Shanghai, Beijing, Nanjing, Xi'an, Chengdu, and Wuhan. The locations of the overseas R&D centers include Stockholm, Sweden; Dallas and Silicon Valley, USA; Bangalore, India; Ferbane, Ireland; Moscow, Russia; Jakarta, Indonesia; Istanbul, Turkey; Amsterdam, the Netherlands; and Lahore, Pakistan.

in R&D. Huawei's rapid catching-up has been a great success and deserves to be studied.

Data collection

We collected data from interviews, site visits, archival records, the Thomson SDC database, and other sources. The process took almost a year. Since the European market is the most important challenge for Huawei, we informally contacted managers who work in R&D (in Sweden), technology sales (in Belgium), and marketing (in the Netherlands). We also executed a formal round-table interview with executive officer Mr. Leo Sun at Huawei's Western Europe office in Brussels (on 21 September, 2010). Mr. Sun has been working for Huawei for more than fifteen years; he was previously the executive officer in the France office. His career has developed along with Huawei's overseas market (especially in Europe). He was chosen as our interviewee for his rich knowledge of Huawei's catching-up.

The interview questions were semi-structured and explored Huawei's networks, collaborations, major developments, and catching-up stories (Appendix I). We agreed with the interviewee to divide Huawei's development into three stages: 1989–1997 (pre-catching-up), 1998–2006 (catching-up), and 2007–2011 (the frontier stage). These stages are defined based on Huawei's internationalization and innovation performance. Specifically, in the first stage, Huawei focused solely on serving the Chinese market and building its own absorptive capacity. In 1998, Huawei officially stepped into the international market in South East Asia, South America, the Middle East, and Africa and started applying for patents in the international market. Since 2007, Huawei's revenue from overseas markets has exceeded that from the domestic market, and its technological capability has received approval worldwide.

We used archival data to provide nonreactive measures of changes in practice or performance (Webb, 1981). For instance, when the interviewee claimed that

Huawei has shared technology and patents with leading players (competitors), we sought confirmation via archival documents such as newspapers, magazines, websites, and corporate newsletters. To investigate Huawei's network evolution, we collected data on its alliances and acquisitions from the Thomson SDC database. This database includes information on all forms of alliances and is compiled from public information sources (e.g., newspaper reports, industry and trade journals, and Securities and Exchange Commission filings). As scholars have suggested (e.g., Anand & Khanna, 2000; Sampson, 2007), the SDC database is among the few comprehensive information sources that can support large-scale empirical research on alliances and alliance networks. It provides highly inclusive data about partners and the nature of alliance activities (Schilling, 2009). However, it records only collaborations with other firms. We collected information about Huawei's collaborations with universities, research institutes, and other types of organizations from alternative channels such as company newsletters, websites, and the media.

We cannot guarantee that this study has included all the relevant data for the twenty-year period. Therefore, the network ties in this study are event-type; they have a discrete and transitory nature and can be counted over periods of time (Boratti & Halgin, 2011). We count any connections relating to Huawei as a partner, collaborator, customer, or supplier. We also count its involvement in strategic alliances, mergers and acquisitions, licensing, and corporate venturing.

Data analysis

The data analysis has four steps. We first recorded time-ordered events and the corresponding external relationships. Secondly, for each significant relationship, we added an explanation of its specific configuration. Thirdly, we sent a summary to industrial and academic experts for verification. Finally, we chose variables to measure Huawei's network evolution in the three stages. We analyzed the three dimensions of social capital (structural, relational, and cognitive) at the three network levels (intrafirm, interfirm, and cluster). We

also investigated the nature of the network social capital in terms of network size and embedded resources such as the resource range (variety) and contact resources[33]. Finally, we identified the practical catching-up mechanism across the three stages (according to the conceptual framework in Fig. 3.2). We also statistically depicted Huawei's ego-network[34] evolution over the three stages.

3.4 Findings: Huawei's Catching-Up Mechanism

In this section, we test the conceptual framework and identify Huawei's catching-up mechanism. We investigate how Huawei identified resource gaps via networking in the first stage and via CE at the second stage. We also explore how it addressed these gaps through external and internal networks, and how it enhanced CE through intrafirm, interfirm, and industrial-district networks. In summary, networking and social capital act both as catching-up instruments and as the engine for further innovation and growth. Huawei's story demonstrates that the potential for catching-up is primarily determined by a firm's social advance. The social capability generated by the social capital helps the firm to identify more opportunities, find more resources, and increase its technological capability.

According to Lee and Lim (2001), a reasonable measurement of the degree of catching-up should reflect both marketing and technological advances. Therefore, we selected indicators of international market share and technological capability (as a function of both technological effort and the existing knowledge base). We investigate Huawei's performance in the three

[33]According to Flap (1994), social capital is a combination of network size, relationship strength, and the resources possessed by those in the network. Previous studies of social capital focused on measures of embedded resources and/or network positions. Network positions include bridges, density, closeness, betweenness, eigenvectors, and embedded resources. According to Lin (1999), embedded resources are composed of network resources and contact resources. Network resources are the resources embedded in ego-networks and represent accessible resources. They are measured by the resource range and variety. Contact resources are the resources embedded in contacts used for instrumental actions. They are measured by the contact's wealth, status, and/or power.

[34]An ego-network (Burt, 1992) is the cloud of nodes surrounding a given node, together with all the associated ties.

catching-up stages. Its technological capability is estimated by the number of patent grants as an output and the R&D investment as an input. We use patent data to measure technological capability for several reasons. Patents are valid and robust indicators of knowledge creation (Trajtenberg, 1987). They provide codifiable protection of a firm's technical knowledge and correlate with measures that incorporate tacit knowledge (Brouwer & Kleinknecht, 1999). They give a measure of the novel inventions that are externally validated through patent examination processes (Griliches, 1990) and a reliable measure of innovation in the telecom equipment industry (Hagedoorn & Cloodt, 2003). Figure 3.3 shows Huawei's technological capability development in terms of patent grants over the last twenty years[35].

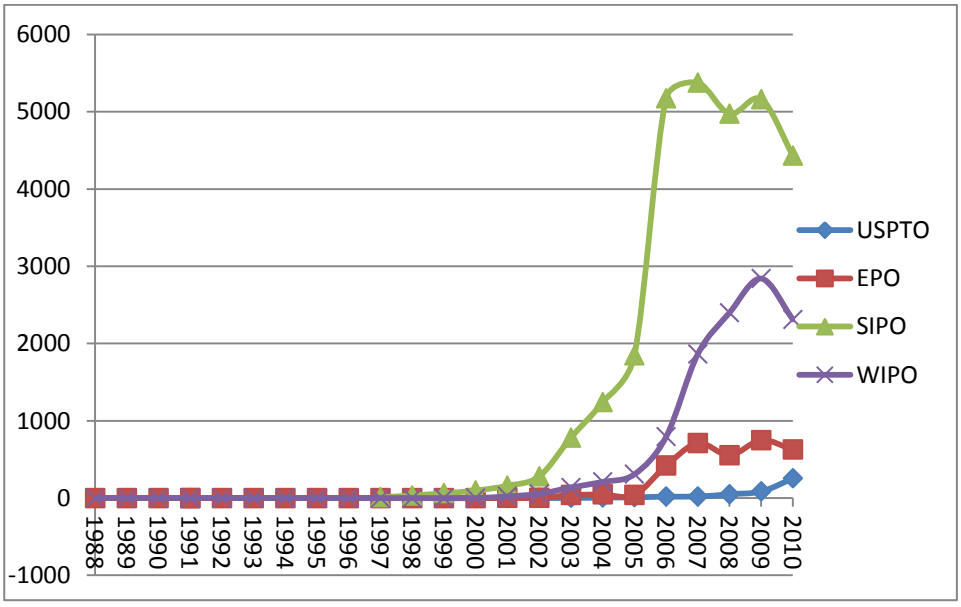


Figure 3.3 Huawei's patent grants in USPTO, EPO, SIPO, and WIPO
Source: USPTO, EPO, SIPO, and WIPO; data collected by author

[35]By 1997, in the first catching-up stage, Huawei had just 11 patents granted by SIPO. In 2005, the number of patents from the four patent offices increased to 2,201. In 2009 the figure was 8,834 and in 2010 it was 7,627. Huawei had patents granted in Europe from 2001 and in the USA from 2002. By 2010, Huawei had 445 USPTO grants (more than any other Chinese firm) and 3,187 EPO grants.

Pre-catching-up phase: 1988–1997

The telecommunication industry is a high-tech industry, and Huawei was considered a latecomer in the early 1990s. Huawei was established in 1988 in the city of Shenzhen (China), primarily specializing in the sale of HAX switches imported from Hong Kong. Our interviewee stated that although Huawei at that time was an unknown small company, its ambition was to develop competitive advantage through innovation (this is stressed by Huawei's former CEO, Mr. Ren Zhengfei).

Huawei covered 24% of the domestic market in the industry by 1997, competing with 200 Chinese counterparts and major domestic competitors such as ZTE and Datang. To avoid direct competition with Shanghai Bell[36] (the most competitive joint venture in the industry in China in the 1990s), Huawei explored rural markets with support from the government's policy for the development of rural telecommunication infrastructure. In 1994, it launched the HONET integrated access network and the SDH product line, becoming the first Chinese firm to install long-distance transmission equipment. A milestone was the successful development in 1995 of the first digital transmission technology, C&C08, for China's rural and less-developed regions. This led to Huawei's dominant position in the Chinese market.

There are many reasons for Huawei's early success. It invested heavily in R&D; it was the only Chinese firm to invest more than 10% of annual revenue in R&D[37] and the only indigenous company willing to pay higher salaries than those paid by multinationals. Other important factors are its private ownership, corporate culture and strategy, accurate assessment of China's segmented markets, and adoption of Mao's warfare philosophy: *encircle and conquer cities*

[36]The first joint venture in China, initiated in the 1980s by the Chinese government. BTM (Bell Telephone Manufacturing Company) held an equity share of 32%, the Belgian government held 8%, and PTIC (Post and Telecommunication Industrial Corporation) held the remaining 60%.
[37]Chinese firms in that period mostly manufactured components for multinationals. Their technologies were mostly embedded in equipment imported from other countries.

by first focusing on seizing the countryside. C&C08 was achieved by addressing the resource gap through technology diffusion from Shanghai Bell[38] (the source of System-12)[39] and the Centre for Information Technology (CIT)[40].

Huawei did not have all the resources necessary to solve its problems. As noted, its initial success owes much to technology diffusion from inward FDI in China (Shanghai Bell). However, its success was also a result of its attitude to collaborations. In the late 1990s, Huawei became frustrated with its corporate management, corporate culture, organizational ineffectiveness, resource wastage, and long-term R&D processes. As a small firm, it did not have the resources to solve all these problems. It therefore chose to collaborate with leading companies, leading Chinese universities, and leading international consultants. This decision was based on the collaborators' rich social capital and resources, cohesive networks, and international reputations.

For instance, by collaborating with top Chinese universities such as Tsinghua University and Renmin University, Huawei identified numerous managerial and technological shortcomings. It identified a series of key factors for its past success and expected future challenges. In 1995, five professors from Renmin University were invited to join Huawei's organizational revolution. These professors had regular discussions with Huawei's executives on CE, corporate strategic transitions, marketing, and HR management. They were also invited to jointly design *Huawei's basic law*[41]. This strategic collaboration led Huawei to

[38]The technology diffusion from Shanghai Bell was both passive and active. First, movement of labor from Shanghai Bell to other companies occurred frequently. Secondly, Shanghai Bell published its technological advances in a journal, *Telecommunications Technology*.
[39]System-12 and HJD-04 are the underlying technologies of C&C08. System-12 technology is mainly for switches at level C3 and above (the transit-switch network in provincial capitals and autonomous regions). HJD-04 allowed Chinese language operation and was therefore popular in less-developed regions.
[40]CIT, together with PTIC and the Luoyang Telephone Equipment Factory (LTEF), set up an R&D consortium to encourage knowledge diffusion from Shanghai Bell to indigenous firms.
[41]This became the formal version of Huawei's corporate culture (the wolf culture). Ren Zhengfei proposed the three characteristics of this wolf culture: an acute sense of smell, aggressiveness, and collaboration.

re-consider issues such as *intrafirm resources, intrafirm and interfirm networks*, and *CE*.

To maintain a leading position in the Chinese market by exploiting incremental technologies and exploring new technologies, in 1997 Huawei initiated a technological alliance with Tsinghua University (the top engineering university in China). Meanwhile, to facilitate open-source research, it set up a research center in Silicon Valley for the development of chips, a research center in Shenzhen for the development of core-technology ASIC chips, the Huawei Beijing Research Institute for data-communication research, and the Huawei Shanghai Research Institute for the development of mobile telecommunication technologies.

In the mid-1990s, with Huawei's increasing reputation in China and international ambitions, Huawei executives were sanguine about their company's prospects. However, Ren Zhengfei recognized that Huawei had many limitations. In the collaboration with Renmin University, these limitations were identified as a lack of organizational expertise and the absence of a viable long-term strategy. Therefore, in 1997 Ren Zhengfei visited MNEs in the USA and decided to establish a new managerial system by collaborating with IBM Consulting. Huawei subsequently installed a new system consisting of integrated product development (IPD) and an integrated supply chain (ISC). Ren Zhengfei commented (Cheng & Liu, 2003): *"…thanks to collaborating with IBM, many of Huawei's problems in the managerial system were recognized and solved, such as lack of accurate and forward-looking assessment in customer needs, duplication of useless work, walls among different departments, dependence on heroes rather than procedures, disordered project plan and management."*

Huawei also worked with other leading consultants to solve the systematic deficiencies in HR management (working with the Hay Group), financial management (working with PwC), and production and quality management

(working with Fraunhofer Gesellschaft).

We stress that although collaborations with universities and consulting firms are common for western MNEs, they were unusual for Chinese firms in the late 1990s. At that time, the national innovation system had not completely transferred to an enterprise-centered system. Firms were not free to initiate collaborations with universities and research institutes but had to be assigned by the government to appointed collaborators. Moreover, this was not considered a "smart" option, because firms that solved their own problems were regarded as "superstar companies." However, since Huawei was a private firm, it operated under fewer political and communist-slogan constraints.

Numerous factors contributed to Huawei's initial success. Of these, its openness to collaboration must not be overlooked. Huawei's strong ties with leading consulting firms and universities gave it the potential to catch up. It accumulated social capital by adding players rich in social capital to its network. This led to the acquisition of management skills, technologies, and an improved social capability.

Huawei's strong ties in the first stage with rich-in-capital partners could be expected to lead to a cohesive network and more knowledge acquisition. This is because a cohesive network transfers the benefits of social capital more easily than a noncohesive network (Reagans & McEvily, 2003). A cohesive network allows firms to increase social capital and diffuse technology.

To summarize the network at the intrafirm level, Huawei accepted IBM's advice to establish IPD and ISC systems. Using these together with the updated HR, financial, and production and quality management systems, it systematically connected its headquarters with all its departments, branches, and research centers. At the interfirm level, Huawei has worked with five leading consulting

firms, two international telecommunication operators (from Russia[42]), and two Chinese universities. Following prior studies (Koza & Lewin, 1999; Rothaermel & Deeds, 2004), we identified exploratory and exploitative connections. We designated alliances covering upstream activities of the industrial value chain (basic research, R&D, etc.) as exploratory connections, and connections focusing on downstream activities (manufacturing, marketing and sales, service, etc.) as exploitative connections. Thus, Huawei's first catching-up stage has two exploratory and seven exploitative collaborative actors.

Huawei's accumulated embedded social capital was used to gain managerial and technological knowledge and to acquire opportunities to reach other network actors in the future. It had not yet moved into overseas industrial districts but primarily acted in Chinese industrial clusters[43] in, for example, Shanghai, Beijing, Xi'an, Nanjing, and Wuhan. It shared resources with its Chinese counterparts. In Table 3.2 we summarize the structural, cognitive, and relational dimensions of the social capital accumulated at this stage. The three components of the CE activities are listed in Table 3.3.

Figure 3.4 shows Huawei's interfirm network. This graph excludes Chinese telecom operators; it includes only technological and managerial collaborators, as indicated by the SDC database.

[42]Russia's market was similar to that of China. Huawei used Russia as a testbed, in preparation for future international endeavors at the next stage.

[43]These cities formed the first generation of national high-tech zones. Huawei chose these locations so that it could share technical resources with its counterparts. Moreover, these cities have many universities: Beijing has 74, Shanghai has 43, Hubei (where Wuhan is the provincial capital) has 61, Jiangsu (where Nanjing is the provincial capital) has 100, and Shaanxi (where Xián is the provincial capital) has 50. Therefore, Huawei could easily find sufficient human capital in these cities. This is another way in which it took advantage of entrepreneurial policies.

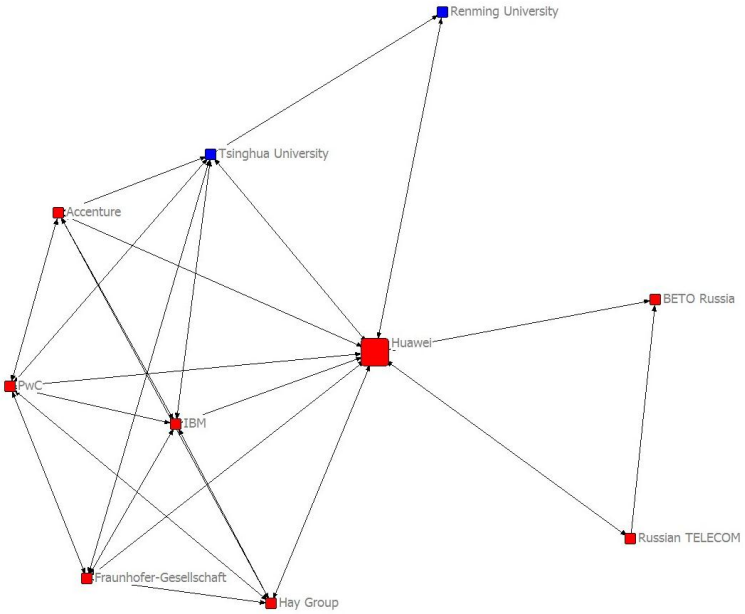


Figure 3.4. Interfirm alliance network: First stage
Notes: Blue: Universities and research institutes. Red: companies.

In this graph, Huawei is the focal actor, or ego. To reflect the ego-network structure, we calculated the ego-network density, efficiency, and constraint. Based on Burt (1992) and Borgatti (1997), Phelps (2010) provides a comparison of the three measures.

The density, efficiency, and constraint of this network were calculated as follows:

$$Ego\ Network\ Density_i = \left[\sum_j \sum_q x_{jq} \Big/ \{N(N-1)\}/2 \right] \times 100\%,\ j \neq q$$

where x_{jq} is the relative strength of the ties between alter j and alter q, and N represents the number of alters to which ego i is connected. The value of x_{jq} is

1 if a relationship exists and 0 otherwise. The term $N(N-1)$ is divided by 2 because alliances are undirected ties. The variable range is 0–100%.

$Density = 38.9\%$

$$Ego\ Network\ constraint_i = \sum_j \left[p_{ij} + \sum_q p_{iq} p_{qj} \right]^2, q \neq i, j$$

where p_{ij} is the proportion of alter i's ties invested in the relationship with alter j. This index measures the extent to which the contacts are connected, i.e., do not have structural holes (gaps between network nodes) (Burt, 1992). This measure ranges from 0 to 1, with higher values indicating more constraint (i.e., fewer structural holes).

$Constraint$=0.315

$$Ego\ network\ efficiency_i = \left[\sum_j \left(1 - \sum_q p_{iq} m_{jq} \right) \right] / N, j \neq q,$$

where p_{iq} is the proportion of alter i's ties invested in the relationship with alter q, $m_{jq}$is the marginal strength of the relationship between alters j and q (the value of m_{iq} is 1 if a tie exists and 0 otherwise), and N represents the number of alliance partners to which the focal firm is connected. This measure ranges from 0 to 1, with higher values indicating greater efficiency (i.e., structural holes).

$Efficiency = 0.654$

Catching-up phase: 1998–2006

The second catching-up stage started in 1998 when Huawei formally stepped into the international market. As stated in its basic law, Huawei aimed to *become better rather than larger, smart and efficient*, by switching from being an

equipment manufacturer to being a complete solution provider in the ICT industry. In a 1998 speech entitled *How long can Huawei's red flag wave?* Ren Zhengfei commented (Cheng & Liu, 2003): *"...We must aim at the best companies in the telecom industry, including Ericsson, Alcatel, Siemens, Nokia, Lucent and Bell Laboratory. We must try to catch up with them and surpass them."* The reaction to this goal was astonishment; even company executives did not believe it would be achieved. However, in retrospect, we must acknowledge Huawei's spirit and its successful achievement of this goal.

By 1998, in the domestic market, Huawei had overtaken Shanghai Bell, becoming the largest manufacturer of digital automatic switches. By 2006, it had been leading the Chinese telecommunication industry for more than eight years, and its overseas market was larger than its domestic market. To enter the international market, Huawei used the same strategy that it earlier used to exploit the domestic market. From 1998, it started moving into emerging markets including Russia, Africa[44], South-East Asia, Central Asia, and Latin America. In less-developed markets, Huawei provided "superior pricing, customer service and brand awareness." It believed that it was "not making it cheaper, but making it better." From 2000, Huawei's international markets were enlarged to include Middle Eastern nations, the UK, the USA, Sweden, and the Netherlands. Huawei's patent grants at this stage ranked number one in China. It was also the top Chinese firm for international patent grants. Huawei provided products and services for switching applications, integrated access networks, NGN, xDSL, optical transports, intelligent networks, GSM, GPRS, EDGE, W_CDMA, CDMA2000, routing applications, and other LAN applications. Its products were equivalent to Cisco's but were 30% to 50% cheaper[45]. John Chambers (the former CEO of Cisco) stated in 2002: "*In the coming years, we will just have one rival which is Huawei.*"

[44]Huawei was the first telecommunication-equipment supplier to enter Kenya and has now become the largest CDMA product provider in Africa.
[45]According to our interviewee, this was because of Huawei's large pool of engineers and its cheaper human resources.

As a private enterprise that receives limited financial support from the government, Huawei's success in the domestic market owes much to its decision to exploit governmental policies for the telecommunication industry[46]. By 2006, Huawei had become the largest solution provider for more than twenty-seven of the thirty-one provincial telecom administrative bureaus. Because of this large inflow of sales income from the domestic market, Huawei's investment in R&D increased rapidly.

Collaboration-based networks facilitated Huawei's development. It enjoyed large rewards from its collaborations with consulting firms such as IBM and universities such as Tsinghua and Renmin. Ren Zhengfei stated: "*It is not only latecomers who believe in development through opportunities, but also front players (such as IBM) who develop dependent on creating opportunities."* He emphasized: *"This progress of opportunity-creating is not only dependent on the technology and innovation you have, but also is interdependent with the network and resource you embraced"* (Cheng & Liu, 2003). This implies that networks serve as instruments to create opportunities. In 2001, Huawei's goal was to compete with Cisco in the data-communication division, Alcatel in the networking division, and Siemens in the optical networking area. Ren Zhengfei stated that Huawei must "*take advantage of strategic alliances to change the competition structure."* Our interviewee commented: "*What Huawei did was not initially perfect, but Huawei has been improving by being stimulated to come up with new ideas, new solutions, and new designs through collaboration with clients, counterparts, and universities."*

The Huawei basic law states that one of Huawei's core values is *to develop advanced core technological systems by open collaboration.* Our interviewee said: *"We are quite proud of sharing a stable collaboration network with our clients. We keep standing, thinking, and working with our customers by sincerely*

[46]From the late 1990s to the early 2000s, the government called for the use of domestic products in the telecommunication industry. It offered firms buyer credits and financial support from the People's Bank of China as incentives.

considering our customers' problems as ours." Except in the customer network, where Huawei was committed to cohesively embedding, the network actors were carefully chosen. As before, it typically chose partners rich in network resources and power in the industry. At the second stage, it had thirty-two collaborations with leading global companies. It focused on alliances with NEC (2001), Agere (2002), Microsoft (2002), 3Com (2003), and Siemens (2003) for the TD-SCDMA technology. It formed alliances with Avici Systems (2003), Infineon Technologies AG (2003), Information & Communication (2004), Nokia Siemens Network (2004), and Motorola for the UMTS and HSPA technologies. By 2005 it had built ten joint research centers with Texas Instruments, Motorola, IBM, Intel, Angere Systems, Sun Microsystems, Altera, Qualcomm, Infineon, and Microsoft.

Collaborations with universities are another characteristic of Huawei's interfirm network. By 2006 it had closely worked with five universities (four Chinese, one Brazilian) on, for example, networking technology (INATEL university), video technology (Beijing University), and a joint research framework (Northwest Polytechnic University). These universities acted as a second intelligent tank for the development of technological capability. Huawei was able to monitor and absorb new scientific ideas because of the open knowledge flow in academia: Huawei's university partners were embedded in cohesive networks with other leading international universities. Thus, Huawei's partners could spontaneously transfer knowledge across networks.

At the intrafirm level, Huawei established more than forty overseas branches and offices in Europe, the USA, Asia, South America, and Africa. By 2006, it had established ten R&D centers around the world, collaborating with suppliers, customers, universities, and leading players. These offices, branches, and R&D centers work together organically under a shared platform, an intrafirm platform developed from the IPD at the first stage.

At the industrial-district level, Huawei aimed to locate each branch close to

customers, counterparts, and suppliers. For instance, its branch in the Netherlands is located in the commercial town Amsterdam Bijmer ArenA, where many well-known companies are based. It offers geographical proximity to Huawei's customers KPN, Vodafone, and T-mobile, as well as other clients and competitors such as Cisco. By being based in an industrial cluster, Huawei can provide fast service to clients, partners, and others.

Huawei established Huawei University in China in 2005 to build its own industrial-district network. This university allows Huawei to bring together talented engineers in the industry. It also helps to spread Huawei's technology in China's ICT sector. This university has seven subsidiaries across China (in Beijing, Xi'an, Nanjing, Hangzhou, Chongqing, Kunming, and Kuilin), enhancing intrasector communication and providing training, conferences, and technology forums. Huawei is therefore considered the Chinese ICT "knowledge hub."

The three levels of networks bring Huawei many benefits. There are indirect returns from technology and knowledge transfer, exchange, and absorption. However, the most valuable acquisition is embedded social capital. The social-capital returns are instrumental and expressive (Lin, 1999). Instrumentally, Huawei acquired new social capital to address its resource gaps. Expressively, this social capital (especially in terms of the relational and cognitive aspects) is a means to consolidate resources and a defence against possible resource loss (Lin, 1999). Huawei was an alter in the ICT industry network in the second catching-up stage, and there was an asymmetric relationship between the ego(s) and Huawei as an alter. In other words, Huawei was able to accrue social credits from egos such as more connections with network-weighted actors whereas the egos were creating social debts to the alters.

The three levels of Huawei's CE (see Table 3.3) were facilitated by its three levels of network social capital. First, Huawei's products and services had been competitive in the global market. Innovation sourcing from collaborations is one of Huawei's competitive advantages. To improve its intrafirm organizational

effectiveness, Huawei restructured its organizational system into a shared platform based on IPD, ISC, IT-based HRM, financial management, and quality-control systems. Secondly, to enlarge its business scope and serve more customers, Huawei created new business domains by expanding its business arena to devices and professional services. Thirdly, to strengthen its technology capability, Huawei executed corporate venturing by acquiring business units/companies from India (targeting Huawei Telecom (India) Co., Pvt in 2003), the USA (3com Corp. in 2003), Hong Kong (Sunday Communications Ltd in 2004), the UK (Marconi Corp. PLC in 2005 and Harbour Networks Holdings Ltd in 2006), and Nigeria (Intercellular Nigeria Ltd in 2006).

To summarize, the second stage of Huawei's network is multidisciplinary, multilevel, and multiregion. Huawei has successfully *kept abreast of the latest technology and quickly incorporated new technology into its knowledge base.* Huawei's network at the second stage is presented in Fig. 3.5: the number of actors has increased to 42, with 26 exploratory connections and 16 exploitative connections. Huawei's centrality in the ICT industry is increasing, with its density reduced to 0.268, efficiency increased to 0.746, and constraint reduced to 0.088. Its connections have two traits: long-term connections and large resource pools of the partners. With the increased social capital and social credits, Huawei's network position in the ICT industry began to center. Together with the firm's improved performance, this cohesive network paved the way for Huawei's next stage of development as an industrial leader.

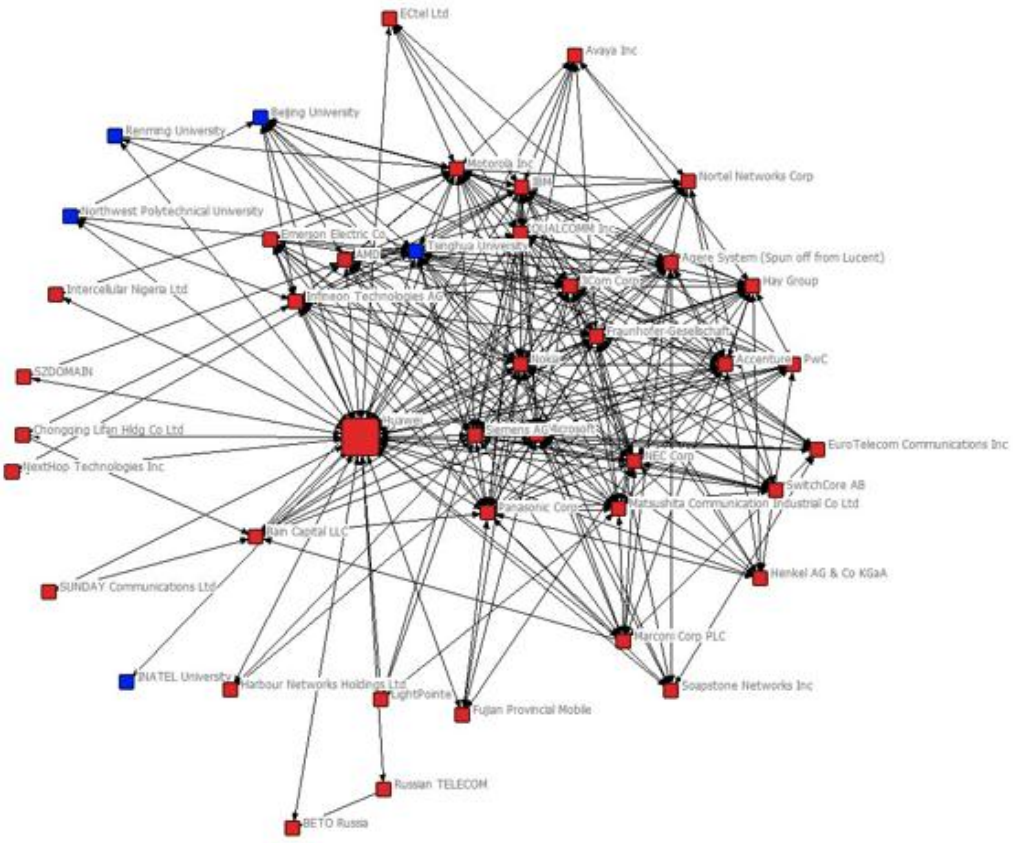


Figure 3.5 Interfirm alliance network: Second stage

Post-catching-up phase: 2007–2011

Huawei's third catching-up stage began in 2007. Its main goals were to maintain its market position and to play a leading role in the ICT industry worldwide. Therefore, it aimed to establish its own ego-technology system and to explore new business arenas. In the 1990s Huawei was a technology follower in the 2G era. In the 2000s it was abreast with the leading players in the 3G era. Currently, given its LTE (4G) patent grants and its international market share, Huawei is the forerunner of its industry and the most proliferate inventor in any industry. In 2008, Huawei was the largest patent owner in the world (WIPO,

2008), with on average three patents granted each day. In 2011, Huawei invested USD 3.76 billion in R&D[47] and served 45 of the world's top 50 telecom operators[48], covering more than one-third of the global population. Today, Huawei has 16 regional organizations, more than 100 branch offices, 20 R&D centers, 36 training centers, and 120,000 engineering-background employees globally. It is ranked in the top three companies in the industry segments of internet switches, fixed-line networks, and wireless networks.

In 2009 the Wall Street Journal[49] wrote: *"European telecommunication-gear companies—global market leader Telefon AB L.M. Ericsson, Nokia Siemens Networks, a joint venture between Finland's Nokia Corp. and Germany's Siemens AG, and Paris-based Alcatel-Lucent SA—are likely to face increased pressure from world No. 2 Huawei in their own backyard."* In 2011, the Economist issued its Innovation Award to Huawei and commented (April 20, 2011):*"…Having just passed Nokia and Siemens, Huawei looks on track to overtake Ericsson, the industry leader, this year."* In 2011, Huawei did indeed overtake Ericsson to become the world's top wireless equipment provider.

Huawei has entered cloud computing and the smartphone business. Its business arenas include Cloud (building blocks for the cloud, including applications and services, storage and securities, and O&M), Pipe (radio access, fixed access, core networks, transport networks, data communication, energy and infrastructure), and Devices (personal devices, home devices, and devices for enterprises). Huawei's smartphones and Android tablets have become popular (with a golden price between USD 70 and 200) in Africa and Latin America. In the next five years, it aims to conquer the European market, becoming one of the top five mobile-phone manufacturers globally.

[47]In 2011 Ericsson's investment in R&D was SEK 32.6 billion (around USD 4.83 billion). However, Ericsson's R&D efficiency as expressed in its annual report had decreased, which according to our interviewee might be due to the high cost of R&D and the small pool of engineers in Europe.

[48]Four of the remaining five are American, and the other is Rogers.

[49]http://online.wsj.com/article/SB1000...tions_business

Huawei technology is well-known for its energy-saving nature. Huawei's advanced green policies have reduced energy consumption by more than 60% per station, up to 5700 Kwh of electricity annually, and have reduced carbon dioxide emissions by 1.7 tons. The Huawei GSM base station has been called the most eco-friendly in the business, because it has reduced energy usage by at least 47%.

Huawei's intrafirm structure has a matrix form, where the business and regional units are both profit centers. They are under the management of Huawei's customer-centric innovation system. The policy is that *business success is the ultimate measure of the value of any technology, product, or solution/process improvement*. Innovation is passionately pursued with unmatched R&D capabilities and by cooperation with industry peers to deliver value to customers.

Huawei claims that its success is relevant to open collaboration, especially collaboration directed by the customer-first principle. Its collaborations in the third stage are characterized by the joining of prestigious alliance clubs and associations. As one of the leading players in the industry, Huawei joined numerous alliance associations to share technologies, IP, and ideas. In May 2006, Huawei was invited to join the SCOPE alliance network and committed to supporting SCOPE's mission of promoting the availability and interoperability of open-carrier grid-base platforms. In July 2007, Huawei joined the HomePlug® Powerline Alliance[50]. Huawei contributed major progress in

[50]The HomePlug Powerline Alliance is an industry-led initiative established to create specifications for high-speed powerline networking products and interplatform command and control within the home, and home broadband access. The alliance accelerates demand for HomePlug-enabled products and services worldwide through the sponsorship of market and user education programs. Its membership has grown to include more than seventy-five industry-leading companies. Sponsor companies include Cisco (CSCO); Comcast (CMCSK); GE Security, Inc., an affiliate of General Electric Co. (NYSE: GE); Intel Corporation; LG Electronics (Korea Stock Exchange: 6657.KS); Motorola (MOT); RadioShack Corporation (RSH); Samsung Electronics Co., Ltd. (SSNGY.PK); Sharp Laboratories of America; TCL Group Holding Co., Ltd (TCL Group); and Texas Instruments Incorporated (NYSE:TXN) (TI). Contributor members include Arkados (OTCBB: AKDS); Conexant (CNXT); Corporate Systems Engineering; Gigle Semiconductor; Huawei Technologies Co., Ltd.; Intellon Corporation; and SPiDCOM Technologies.

"smart grid" and "green energy" technologies and high-speed to-the-home and in-the-home communications. In December 2008, it joined the Open Handset Alliance Network.

In February 2009, Huawei joined the Open Patent Alliance (OPA), a group formed in June 2008 by members of the WiMAX ecosystem including Alcatel-Lucent, Cisco, Clearwire, Intel, and Samsung Electronics. It aims to form a WiMAX patent pool and aggregate patent rights to implement the WiMAX standard. To acknowledge Huawei's significant contribution to OFDM and MIMO broadband wireless technologies, in 2010 OPA awarded it an "Outstanding Contribution and Leadership Award." A Huawei representative said: *"Huawei's joining OPA will ultimately promote Huawei to offer broader choice and lower TCO for WiMAX technology and also will help them deliver more products of high quality around the world at affordable prices"*[51]. In May 2011, Huawei joined the Wi-Fi Alliance[52] as a key sponsor and the director of the organization board.

Huawei's work with other organizations has continued. On its website and in its annual report, Huawei has started using the term "alliance" rather than "collaboration." For instance, Huawei has formed alliances with leading operators such as TeliaSonera and Telenor in Norway and Sweden; Vodafone and BT in the UK; Deutsche Telekom and Telefonica O2 in Germany and Spain; Orange in France; Telecom in Italy; KPN in the Netherlands, France, and Spain; PT in Portugal; Belgacom in Belgium; and ONO in the UK and Spain. In May 2007, Huawei and Symantec signed an agreement to establish a joint venture in order to provide end-to-end solutions in converging networks, security, and storage and computing technologies. In April 2010, PerSay, the voice-

[51]See Huawei's global website: http://www.huawei.com

[52]The Wi-Fi Alliance is a global nonprofit industry association of hundreds of leading companies devoted to the proliferation of Wi-Fi technology across devices and market segments.

authentication technology provider, formed an alliance with Huawei to "pre-integrate" voice biometric solutions into its IP-Contact Center offering. In March 2010, ARA Networks and Huawei announced an original equipment manufacturing (OEM) agreement[53]. In January 2011, Qatar Telecom (Qtel) formed an alliance with Huawei to develop joint solutions for key industries across Qatar and the Middle East.

Huawei continues to form alliances with universities for joint scientific research. It treats universities and institutes as *knowledge and talent incubators.* It has established more than twenty "Huawei High-Level Talented-Person Cultivation Bases" (in Chinese: Huawei Rencai Pei Yang Ji Di) for *advanced research labs* and *joint programs* with Chinese institutes and universities. These joint programs have allowed Huawei to recruit many talented IT graduates.

Huawei has also formed alliances for scientific research and technological training with a number of foreign universities. These include INATEL University, Brazil (since Sept. 2003), Shrif University, Iran (Jul. 2009), the Ministry of Communication and Information (MCI) of Indonesia and Bandung Institute of Technology (ITB), Indonesia (Nov. 2010), and the Royal Melbourne Institute of Technology, Australia (Dec. 2010). In April 2009, Huawei and the Hong Kong University of Science and Technology (HKUST) established a joint Huawei-HKUST Innovation Laboratory. It provides an innovative model for industry-university collaboration, aiming to connect and inspire researchers from both areas. The lab focuses on next-generation communication and networking technologies, bringing together research areas of interest to both Huawei and HKUST. It conducts state-of-the art research that is expected to have a large impact on the ICT industry, the research community, and society in general. In July 2010, Huawei developed this model in China by forming an alliance with

[53]Through this agreement, Huawei provides the ARA Networks Jaguar5000 product as a Huawei cache product and also offers most of ARA Networks' solution portfolio. The Web Cache solution combines Huawei's leading network-consulting capacity with ARA Networks' industry-leading expertise. It is a compelling proposition for customers who seek network-infrastructure efficiency and web-caching solutions.

the University of Electronic Science and Technology, setting up a Huawei-UESTC joint laboratory. This lab aimed to support frontier research in the information industry and Huawei's product development. Since 2008, Huawei has been sponsoring MIT's Communications Futures Program for the study of future telecommunication technologies. On June 14, 2011, Huawei, TELUS, and Carleton signed an agreement worth more than $1.4M to establish a research lab for enterprise cloud services. This lab in Carleton University's new Canal engineering building provides students, faculty, and engineers a platform for research into the real-world problems associated with cloud computing, such as security and performance issues.

By forming alliances with universities from poor countries, Huawei meets its social responsibility to provide free technical training and education. An example is Huawei's "telecom seed for the future" program, which helps to update the skills of local telecom engineering graduates. Offered at Huawei's East Africa state-of-the-art training center, it provides students from Moi, JKUAT, and Nairobi Universities with advanced training in the latest technologies and the development of Android applications. The center has 2 training labs, 5 classrooms, 100 trainees at any one time, more than 25 professional instructors, and more than 50 part-time instructors. By 2010 more than 4500 students had graduated. Huawei has also granted the University of Engineering and Technology (UET) in Lahore authorized learning partner status for Datacom networking training and certification. Under this agreement, Huawei provides the latest networking equipment (worth USD 0.5M) in the Huawei-UET Telecom center, which trains and certifies engineers in enterprise networking technology.

A networking example at the industrial-district level is Huawei's embeddedness via its R&D center in Silicon Valley. This center has been operating for more than ten years and has produced many advanced technologies for Huawei and the ICT industry. At the center's ten-year anniversary, John Roese, its senior VP

said: *"within five miles, I can find a world leading company, a start-up, a great idea, or a university or somebody to work on everything. And when you want to solve ICT problems where you may suddenly be using information technologies in an energy sector and to create an entertainment experience, the most natural place to make it happen is here."* This comment shows that Huawei has taken advantage of its integrative interfirm network and industrial-district network to help meet its innovation goals, instead of simply aiming to be geographically close to its partners. Huawei's broad view of its so-called eco-system enables it to remove the barriers between enterprises, consumers, and carriers in the ICT industry.

Huawei's CE in terms of the three elements is not elaborated here; see Table 3.5. Huawei's network at the third stage is presented in Fig. 3.6. There are now 84 actors, with 61 exploratory alliances and 23 exploitative alliances. The density is 0.124, the constraint is 0.046, and the efficiency is 0.880.

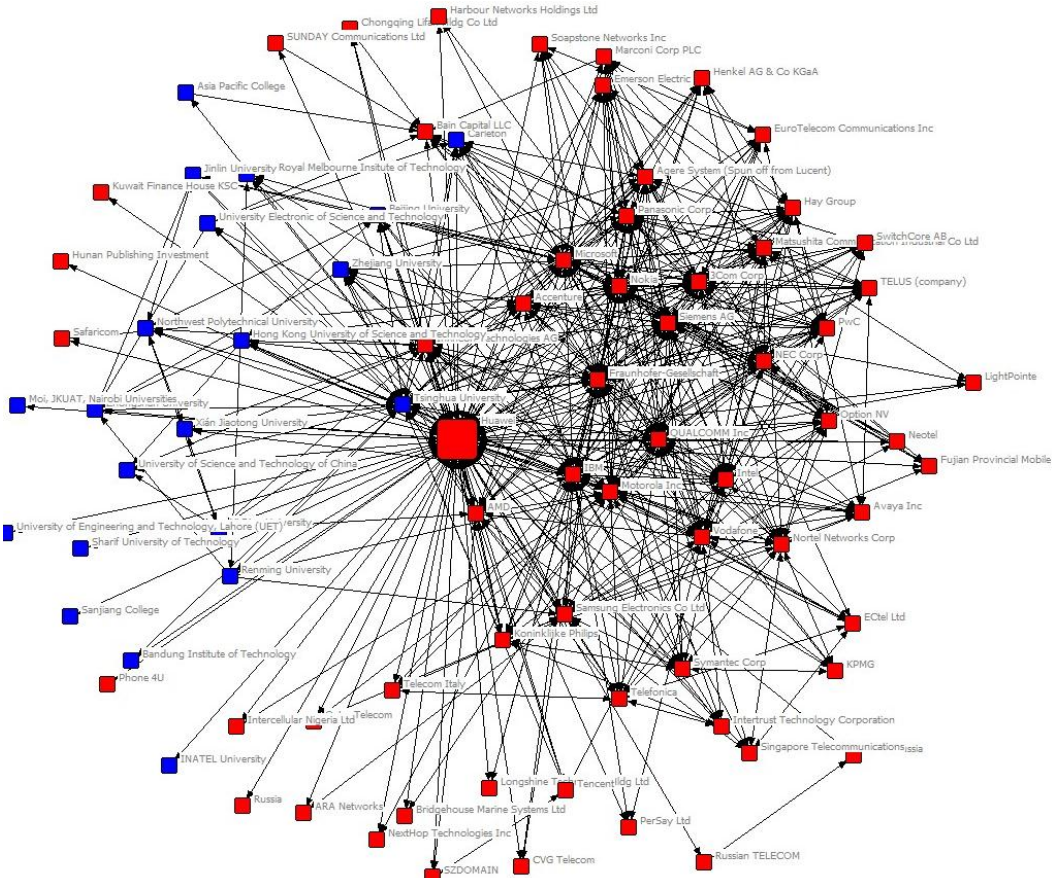


Figure 3.6 Interfirm alliance network: Third stage

Summary and analysis

To summarize, networking is an efficient approach for absorbing, transferring, sharing, and creating knowledge in Huawei's three catching-up stages. Many emerging-country firms catch up by moving from OEM to ODM and then to OBM (Lee, Lee, & Pennings, 2001). In contrast, Huawei's catching-up mechanism involves the networking mechanism and interaction between the internal and external corporate environments. Huawei's network has evolved for twenty

years across the three catching-up stages and the three network layers. This evolution can be summarized as network composition[54], the network structure of social capital, and knowledge transfer.

With regard to network composition, Huawei has focused on working with organizations from developed countries (56% of all actors): Japan, America, and Europe. Of its alliances with developed countries, 36% were with American, 43% with European, and 21% with Japanese firms. These partners all have at least one of the following: a strong industry reputation, excellent technology capability, and rich network social capital. Many (particularly at the first and second stages) are leading industrial players in their regions/sectors. These partners benefit Huawei in two ways. At the early catching-up stage, their strong technological capability and rich network social capital help Huawei to gain social capital and to accumulate absorptive capacity by knowledge diffusion and transfer. At the late catching-up stage, they facilitate Huawei's innovation by knowledge sharing and creation. This is shown by the reduction in the network density across the three stages. We can classify the partners into universities, telecom operators, tech firms, and consulting firms from three segmented regions: developed countries, emerging countries, and China (a total of 12 categories). Stage 1 includes 4 of these categories, stage 2 includes 7, and stage 3 includes 10. At the intrafirm level, the number of business domains and product classes increases. At stage 3, Huawei has 4 large business domains with 13 categories (see Table 3.4).

Figures 3.7 and 3.8 illustrate Huawei's network composition and knowledge flow in the three catching-up stages. The dashed lines in Fig. 3.7 indicate indirect connections, and the solid lines indicate direct connections with Huawei. There are three types of organizations: universities, technology-based firms, and telecom operators (corporations). They are located in three groups of

[54]Network composition characterizes the actors in terms of their stable traits, features, or resource endowments (Wasserman & Faust, 1994).

countries: China, developing countries, and developed countries. This is an open framework so that knowledge from each collaborator can be transferred, diffused, and shared. Huawei acts as a hub, receiving and delivering knowledge.

In the first stage, Huawei worked with Chinese universities, western consulting companies, and Chinese operators to update its managerial system, accumulate absorptive capacity, and dominate the domestic market. In the second stage, it formed alliances with technological firms and operators from western countries, operators from emerging countries, and universities, to access emerging markets, increase its technological capability, and accumulate social capital. In the third stage, Huawei started working with western universities and technological firms from China and emerging countries (where the firms now had an improved technological capacity). It aimed to develop exploratory technologies and to address the resource gaps caused by its enlarged business scale and scope.

Internally, we found that the knowledge transfer from Huawei's R&D subsidiaries and outward R&D alliances in developed markets (such as the research centers in Silicon Valley and Dallas in the USA and Stockholm in Sweden) to headquarters is larger than the conventional flow from headquarters to subsidiaries in developing markets (such as Bangalore in India and Moscow in Russia). Through technological alliances in the segmented international market, Huawei achieves both directions of knowledge transfer.

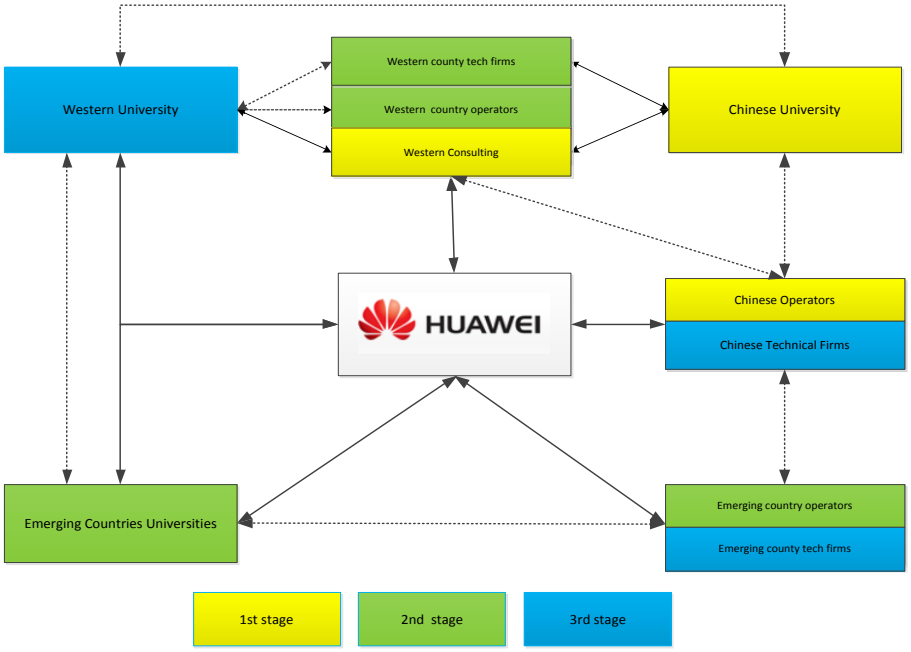
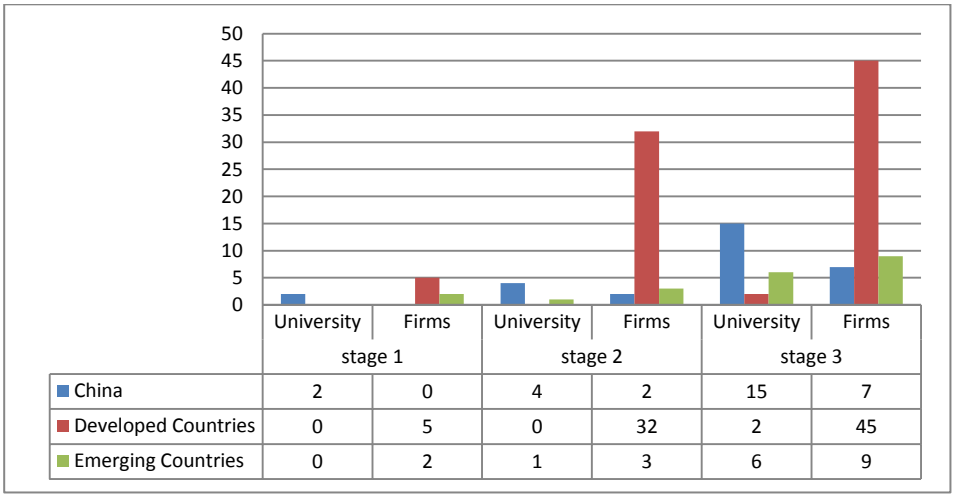


Figure 3.7 Huawei's network composition and knowledge flow at three catching-up stages



	University	Firms	University	Firms	University	Firms
	stage 1		stage 2		stage 3	
China	2	0	4	2	15	7
Developed Countries	0	5	0	32	2	45
Emerging Countries	0	2	1	3	6	9

Figure 3.8 Huawei's alliances through three catching-up stages

Because of the subsidiary mandates (proposed by Cantwell & Mudambi (2005)) and the expectations from headquarters, Huawei's subsidiary R&D centers and outward alliances in the USA, Europe, and other developed countries focus on competence creation. They are expected to introduce new knowledge that can be used by other corporate units or to become centers of excellence (Birkinshaw & Hood, 1998; Frost, Birkinshaw, & Ensign, 2002). They conduct applied research, identify advanced ideas, and transfer back new knowledge. In contrast, the partners in developing countries focus on competence exploitation. They are expected to implement established home-based knowledge effectively in the local environment (Cantwell & Piscitello, 2000). Therefore, in this case knowledge is transferred from headquarters to the subsidiaries.

We can categorize knowledge transfer at the interfirm level based on the typology of DiMaggio and Powell (1983) and Borgatti and Halgin (2011). In the *mimetic process* the ego actively seeks to copy a trait from a node in its environment; this dominates at the early stage. In the *apprentice process* both the ego and its environment are actively trying to help the ego get what the alter has started; this dominates at the late stage. Thus, at the early stage, Huawei acted as an information acquirer, receiving knowledge and social-capital credits from other egos, such as knowledge diffusion from Shanghai Bell and CIT. Later, Huawei became both an acquirer and a provider. As a provider, it offers knowledge and technologies to less-developed markets. As an acquirer, it obtains information from other contacts.

Huawei engages in asymmetric information exchanges: it is primarily a beneficial acquirer (Reagans & McEvily, 2003) in some relationships and a provider in others (Gargiulo, Ertug, & Galunic, 2009). This may be costly (Reagans & McEvily, 2003). However, this cost is diminished because Huawei acts as a provider in emerging markets (e.g., Africa and South America) and balances the knowledge distribution in the network as a provider and an acquirer. Asymmetric information exchanges (Wegner, 1987; Anand, Manz, &

Glick, 1998) do occur. We argue that they can be made symmetric by trading markets for information, balancing the knowledge distribution as a provider and an acquirer in a sparse network, and more importantly by Huawei's commitment[55] to strong ties. In the "brokerage" opportunities created by access to nonredundant information (Burt, 1992), we argue that embedded strong ties in the late stage of a sparse interfirm network facilitate the emergence of trust between the actors. This creates an incentive to cooperate out of concern for one's reputation and group sanctions (Granovetter, 1985; Coleman, 1988). This provides evidence for the reformulated structural hole theory (Burt, 2001, 2005), which indicates that network closure may be a precondition for realizing the benefits of brokerage in settings in which cooperation cannot be taken for granted because of a lack of mutual trust.

In the last twenty years, Huawei's managerial system has been adapted as a result of its collaborations with consulting firms. Therefore, its intrafirm network has become more cohesive and efficient (evolving from an IPD system to a customer-centric system). In contrast, the network density, efficiency, and constraint (Fig. 3.9) show that Huawei's interfirm network has become sparser and more efficient. These two points reveal Huawei's intention to increase its network identity and use networking as an instrument to improve innovation performance. At the early stage, Huawei secured the positive effect of cohesive social ties or "network closure" at both the internal and external level for the production of social norms and sanctions that facilitate trust and cooperative exchanges (Coleman, 1988, 1990).

The cohesive ties, indicated by the strong connections and high network density, have many advantages. They facilitate cooperation (Burt, 1992), accelerate the emergence of trust, and provide incentives to cooperate

[55]According to Granovetter (1973), tie strength is a multidimensional concept involving the duration, frequency, and intimacy between the parties. Campbell (1984) argued that emotional closeness between the parties is another indicator. In Huawei's case, we assume that its commitment to relationships indicates the tie strength and the closeness to other contacts.

(Granovetter, 1985; Burt, 2005) arising from reputation concerns and the high enforcement potential (Raub & Weesie, 1990; Gargiulo, 1993) They enhance the firm's ability to undertake concerted action (Burt, 2005) by amplifying reciprocity (Granovetter, 1974; Lin, Ensel, & Vaughn, 1981; Flap & de Graaf, 1986; Gargiulo & Benassi, 2000). They ease knowledge transfer by decreasing the competitive and motivational impediments that arise (especially when the transfer is beneficial for the recipient but costly for the source; see Argote, McEvily, and Reagans (2003)). They also improve the providers' willingness to devote time and effort to knowledge transfer.

Huawei's lack of social capital and limited knowledge base at the early stage was compensated for by network cohesion with partners rich in social capital and technological capability (Table 3.1). At the late stage, the enlarged interfirm network with a higher degree of centrality and more structural holes offered several advantages. It gave Huawei the freedom to monitor technological opportunities with diverse information, advantages in negotiating relationships, and more flexibility (Burt, 1992, 1997; Gargiulo & Benassi, 2000). It also helped to overcome the *forces of inertia* that may retain ties that no longer have value as social capital (Gargiulo & Benassi, 2000) and the *cognitive lock-in* that isolates a firm from the outer world (Grabher, 1993; Uzzi, 1997). *The cohesive intrafirm network and sparse interfirm network work together to allow Huawei to explore new opportunities through collaboration with external players and to exploit these opportunities by internal cooperation. This, together with the increasing network composition and consistent strong ties at both the intrafirm and interfirm levels, supports the work of Phelps (2010). Phelps' study shows that the benefits of network closure and access to diverse information can coexist in a firm's alliance network. The Huawei case study also shows that the combination of network closure and structural holes with high network composition can exist in a firm between its intrafirm and interfirm network levels (see Table 3.4).*

Huawei's social capital in the three stages based on the study of Lin (1999) is shown in Table 3.1. Table 3.2 shows the three components of social capital across the three network layers over the three catching-up stages. Huawei's CE activities are summarized in Table 3.3. The evolution of Huawei's ego-network structure in terms of degree (exploratory and exploitative), density, efficiency, and constraint is shown in Fig. 3.9. Huawei's network evolution over the three network layers and the consequences are summarized in Table 3.4.

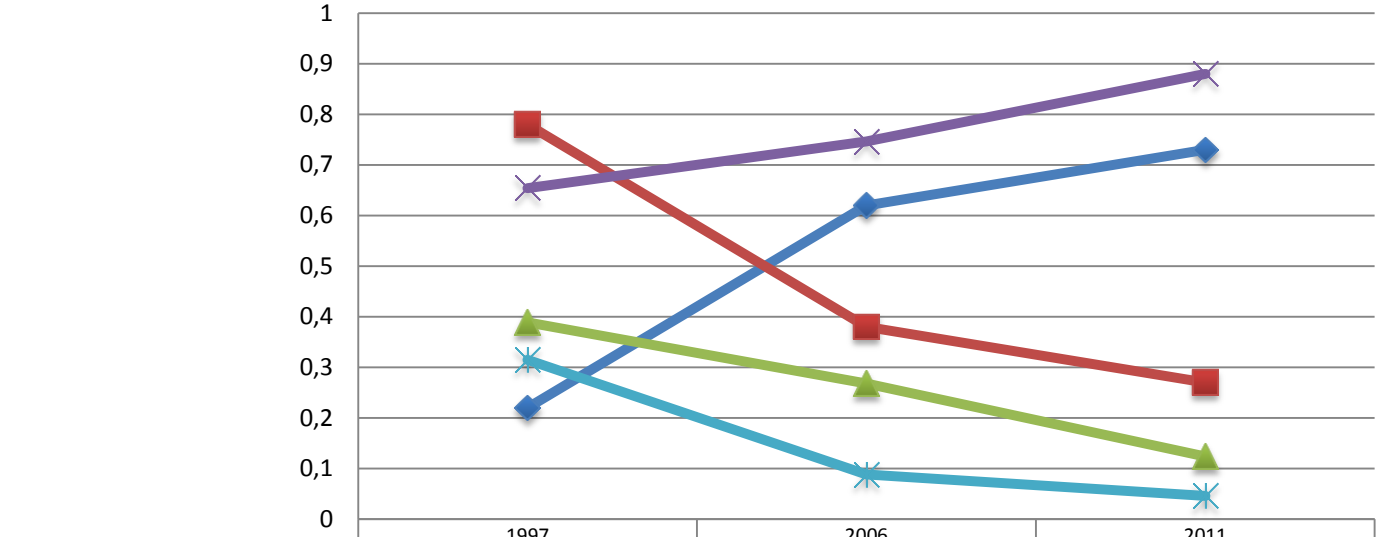
Table 3.1 Measuring Huawei's social capital in three stages

Social Capital		**Phase 1 (1988–1997)**	**Phase 2 (1998–2006)**	**Phase 3 (2007–2011)**
Measure 1: Network Size # of collaborators		9	42	84
Measure 2: Embedded Resources	Network Resources / Ranges, Varieties	2 universities, 5 consulting firms, 2 non-Chinese firms	5 universities, 5 consulting firms, 32 firms	24 universities + more than 20 universities cooperating on training. 6 consulting firms, 54 other firms
	Contact Resources / Powers	Strong structure of social capital, large resource pool, good reputation	Good technological resources, strong structure of social capital	Strong technological capability, strong structure of social capital

Table 3.2 Huawei's three components of social capital across three network layers over three catching-up stages

	Pre-catching-up (1988–1997)			Catching-up (1998–2006)			Post-catching-up (2007–present)		
	Structure	**Relational**	**Cognitive**	**Structure**	**Relational**	**Cognitive**	**Structure**	**Relational**	**Cognitive**
Intrafirm	No marketing branches overseas, only branches (rural market) in China. R&D centers overseas and in China	Huawei Basic Law (#19: efficiency as top priority, fairness as second. Try to be sustainably developed)	Huawei Basic Law (master consciousness）	Overseas and domestic branches	Shared platform	IPD	16 subregions, 100+ branch offices, and 36 training centers globally	Shared Platform	IPD
	Shenzhen is the headquarters, leading other domestic offices			Global headquarters in Shenzhen			Global headquarters in Shenzhen		
Strategic Alliances	2 universities, 5 consulting firms, 2 non-Chinese firms	Huawei basic Law (#24: focus on strategic alliances to learn and accumulate)	Customer requirements decide evolution of product development	5 universities, 5 consulting firms, 22 leading firms	Core Value	"Think and work by standing with customers."	24 key universities, more than 20 universities in training, 6 consulting firms, 53 other firms	Culture of customer - centric innovation	Culture of customer-centric innovation and innovative green solutions
	Closed in joint research, marketing, and			Selectively closed			Closed and long-term in joint research, marketing, management,		Responsible people and departments to

	management						NPD		organize
Industrial district	Shenzhen industrial zone and other industrial zones in China such as Shanghai, Beijing, Xi'an, Nanjing, Chengdu, and Wuhan.	Not much attention to industrial district, focus on competing with a few Chinese firms	Leading position. Large discourse power	Each overseas branch is intentionally located close to customers	Local employees, responsible department, training program in many universities (Huawei certificate)		16 subregions, 100+ branch offices, and 36 training centers in each industrial cluster globally. In Europe, 2 regional and 36 national spare-part centers, 6 training centers, total of 8000 service engineers, 83% from service partners	Working with customers and competitors in nearby locations; locally based to improve trust	Innovative green solutions
	Competing with Zhongxing, Datang, etc.			Huawei University			Geographically close and close partnerships		



	1997	2006	2011
Proportion of Exploratory Actors	0,22	0,62	0,73
Proportion of Exploitative Actors	0,78	0,38	0,27
Ego Network Density	0,389	0,268	0,124
Ego Network Efficiency	0,654	0,746	0,88
Ego Network Constraints	0,315	0,088	0,046

Figure 3.9 Evolution of Huawei's ego-network structure based on various measurements

Table 3.3 Huawei's CE activities

	Innovation		**Corporate Venturing**		**Strategic Renewal**	
	NP	OS	Creation of new business organization	Purchase of new business organization	Change of scope	Competitive approach
1st stage	• HONET integrated access network and SDH product line. • C&C08; • 1997: GSM products, CDMA, and UMTS …	Huawei Basic Law, wolf-like corporate culture	No	No	ICT infrastructure manufacturer	Competitive in rural regions
2nd stage	UMTS products and solutions, and HSPA, switching, integrated access network, NGN, xDSL, optical transport, intelligent networks, GSM, GPRS, EDGE, W_CDMA, CDMA2000 …	Shared platform and integrative product development (IPD) system	Establish business organizations such as terminal, core network, NGN, and digital communication	Acquired 6 new organizations	Complete solution provider	Competitive in international market mainly in developing countries and a few developed countries
3rd stage	Breakthrough innovation in WCDMA, GSM, CDMA, NGN, Datacom, optical networks, broadband, and intelligent networks, especially in LTE (4G) and cloud computing technologies …	Customer-centric innovation system (incorporating IPD)	Formation of 4 large business domains[56] and 13 scopes.	Acquired 4 new organizations	Established ego-network based on own technologies	Global competitive advantage: low price, high quality, innovation

[56] Cloud (building blocks for the cloud, including applications and services, storage and securities, and O&M), Pipe (radio access, fixed access, core networks, transport networks, data communication, energy and infrastructure), and Devices (personal devices, home devices, and devices for enterprises), and others

Table 3.4 Network evolution and consequences

		Intrafirm	**Interfirm**	**Industrial district**
Network composition		Up	Up	Up
Network Closure	Tie strength	Strong	Strong	Strong
	Density	Up	Down	Up
Network Structural Holes		X	Up	X
Benefits and Consequences		Increased norms, trust, and cooperation internally	• Increased network identity • Knowledge and market diversity • More opportunities • Cognitive and relational base for cooperation • Overcome cognitive lock-in and forces of inertia	Snapshot of intrafirm and interfirm network at particular location
		• Explore opportunities externally through structural holes; exploit opportunities internally through cohesive intrafirm network. • Secure function and flexibility function (Gargulio, Ertug, & Galunic, 2009) • Open innovation • Network closure and diversity can coexist (Phelps, 2010) • Network closure is precondition for structural holes (Burt, 2005)		

3.5 Discussion

Catching-up is a complicated topic, because it needs long-term observation at both the corporate level and the national level. An effective catching-up model for a firm is associated with the corresponding international development era. It is also closely related to the dispositions of the corresponding industry and its development inertia. The original Japanese corporate catching-up model is an example; it takes into account reverse engineering, the Japanese business management system, and in-house technology development. It has been effective in a manufacturing-based industrial system, but has faced challenges in adapting to the information-based economic system that emerged in the 1990s (Kondo & Watanabe, 2003).

Previous studies mostly focused on the development of Chinese SOEs from a political point of view. We aim to identify the Chinese catching-up framework from an entrepreneurial perspective. By echoing national catching-up theory at the corporate level, we argue that social advance is the precondition for technical advance, and catching-up firms need social capability to acquire social capital. Assuming that catching-up firms are similar to entrepreneurial firms in terms of innovation and growth-orientation, it is important that they address resource gaps.

By integrating national catching-up theory, network theory, and CE theory, we have proposed a conceptual framework for catching-up (Fig. 3.2) and tested it in the Huawei case. We have demonstrated that networking is an overall approach to help catching-up firms gain social capital, identify resource gaps, address these gaps, and create new growth opportunities. We further investigated the impact of the network as a predictor and the consequences for the catching-up process. First, as a predictor of catching-up, we found that diverse interfirm connections with consulting firms, universities, technological firms, and telecom operators provide catching-up firms with an enlarged

network composition. This feature, together with an evolved sparse network and an increased degree of network centrality, gives catching-up firms opportunities to acquire, share, give, and create knowledge, technologies, and markets by contacting central and peripheral network actors. Thus, the increased information diversity is sourced from both the network composition and the structural holes.

Secondly, the increased diversity can be maximized by strong ties that provide the relational and cognitive basis for a common understanding among the different actors. Structural holes and a network composition that contributes to the structural component of social capital might reduce the advantages of network closure such as the acquisition of social capital. However, replacing weak ties with strong ties in a sparse network is able to compensate for this. This shows that network closure and structural holes do not conflict. In contrast, they can coexist and complement each other, because strong ties in a sparse network, with their positive impact on relational and cognitive social capital, can maximize the impact of the structural dimension of social capital. Therefore, interfirm network evolution from dense to sparse provides catching-up firms with sufficient windows of opportunities (Perez & Soete, 1988). These windows help the firm to gain "resources and abilities" to address the resource gap. At the early stage the firm can contact players with a similar technological background in the cohesive network. At the late stage it can create more opportunities and respond to these opportunities via its sparse network with strong ties.

Thirdly, to achieve technical advance, the intrafirm network must work with the interfirm network. According to the Huawei example, a cohesive intrafirm network can effectively digest the external information acquired and exploit the opportunities found. We are not ranking the importance of the three network levels but instead emphasizing that network phenomena are another consequence of the process, in addition to consequences such as rewards and

performance (Borgatti & Halgin, 2011). This means that network evolution is not only path-dependent but also layer-dependent.

Finally, the industrial-district network is a snapshot of the interfirm and intrafirm networks. The impact and evolution of the two network levels are reflected in a geographic region that includes diverse players and opportunities. Also, it is a snapshot of the open-innovation paradigm in firms from emerging countries.

This study makes several significant contributions to the literature on the catching-up of firms from emerging economies. First, we have provided a catching-up framework that captures motivations, options, modes, processes, and consequences. As far as we know, this work is the first study to provide a complete catching-up picture (from the perspective of technological and social capability) for Chinese firms.

Secondly, by presenting a longitudinal case study, this study has contributed to the controversial issue of the role of government versus markets (Amsden, 1989; World Bank, 1993; Chang, 1994). We have shown that the government's development of a national innovation system has helped firms to acquire social capital through cooperation-based networks. However, market forces compel catching-up firms to be more innovative and growth-oriented. We have also contributed to the debate on the Beijing consensus versus the Washington consensus (Huang, 2010) by supporting the Washington consensus from an entrepreneurship perspective.

Thirdly, we have contributed to network theory. We have shown that network closure is a precondition for structural holes (Burt, 2005). Network closure predicts catching-up and has network evolution as a consequence, leading to a reverse impact on CE activities. We have also provided evidence for endogeneity (the *network theory of networks* of Borgatti and Halgin (2011)) of network theory (the consequences of network processes and structures) and

the theory of networks (the mechanisms and processes that interact with network structures to yield certain outcomes). We have shown that these two processes can occur together.

This study might initiate a new discussion on the "strength of weak ties" theory (Granovetter, 1973), because the argument that "bridging ties are unlikely to be strong" might conflict with the situation for catching-up firms. Granovetter (1973) uses getting a job and Burt (1992) uses getting promoted to demonstrate the role of weak ties as a bridge or structural hole (their terminology differs). However, the application of bridging ties / structural holes in the catching-up paradigm has not previously been demonstrated. Burt (1992, 2001) agrees that weak ties form a bridge based on his argument that weak ties are more likely to decay. Borgatti and Halgin (2011) argue that weak ties are useful because they tend to bridge network clusters and their structural holes. In contrast, our case study demonstrates that strong ties can replace weak ties; they provide a greater value for novel ideas because they create relational and cognitive bases between partners.

This study also contributes to network theory by considering an ego's attributes (such as its creativity) and the attributes of the ego's contacts (e.g., their intelligence, gullibility, and power) (Borgatti & Halgin, 2011).

Finally, this study contributes to the open-innovation paradigm by providing new evidence from a multinational from an emerging country. It provides practical support for this paradigm and its drivers, modes, processes, and consequences (Beije & Dittrich, 2008). It also reveals an intersection between CE and the paradigm: using CE to identify/create and exploit opportunities (Ireland, Covin, & Kuratko, 2009) requires enterprises to be more open and collaborative. This study suggests that social networks should receive more attention as an aggregate form of the open-innovation strategy.

This study has several implications. First, Huawei's rapid catching-up at the technological and market levels implies that any company that aims to be a leading player internationally must act in an entrepreneurial manner. Secondly, accumulating social capital in networks is essential. This helps to address resource gaps, build absorptive capacity, and pave the way for further exploration. Thirdly, the selection of partners for the initial collaborations is important. At the first stage, firms should choose partners rich in social capital, for linking and learning. At the second stage, they should choose partners rich in technological and innovation resources, for leveraging and lifting (capability). At the last stage they should choose those willing to exchange and create knowledge, for maintaining and innovating. Moreover, firms should take advantage of the national innovation system that encourages universities, research institutes, and firms to work together. Without strong academic assistance, latecomer firms will struggle to catch up with and keep abreast of leading players. Open innovation at the national and corporate levels allows advanced companies to enrich their technological portfolios and their levels of innovation. It is also useful for latecomer firms, allowing them to catch up and to address resource gaps.

This study has two limitations. First, it focused on a single industry and a single company; reviewers might question its generalizability. However, this approach allows researchers to gain a holistic view of a phenomenon (Gummesson, 1991). Our method follows that of Dittrich, Duysters, and de Man (2007) for IBM, by extending the method of repeated observation in case studies (Yin, 1989) and combining qualitative and quantitative analysis. The combination provides a more solid basis for drawing conclusions than that offered by a purely quantitative description (Dittrich, Duysters, & de Man, 2007). Since we aim to stimulate discussion rather than to provide a definitive conclusion, we look forward to future studies that explore the catching-up mechanism of firms from emerging countries. Secondly, this study lacks first-hand data from Huawei's competitors, customers, suppliers, and collaborators. Such information would

make the evaluation more comprehensive.

Chapter 4 Role of Entrepreneurship Education in University Students' Entrepreneurial Intention in China [*]

Using Ajzen's theory of planned behavior and Shapero's entrepreneurial event model as well as entrepreneurial cognition theory, we attempt to identify the relationship between entrepreneurship education, exposure to entrepreneurial activity, perceived desirability and feasibility, and entrepreneurial intentions (EI) for Chinese university students. The data were collected from a survey of ten universities; we received 494 effective responses. We used probit estimation to show that entrepreneurship education contributes more to entrepreneurship knowledge than exposure does. Perceived desirability significantly impacts EI whereas there is no significant impact from perceived feasibility. There is a significant negative impact from exposure (which is surprising) and a significant positive impact from entrepreneurship education. Males and people from technological universities and/or backgrounds have higher EI than females and people from other universities and backgrounds. There are also significant positive interactive effects by gender, university type, and study major on the relationship between entrepreneurship education and EI.

[*]This chapter was accepted for presentation at the Annual Conference of the Academy of Innovation and Entrepreneurship, Tsinghua University, Beijing, China, July 1–3, 2011. The current version is accepted to present in Strategic Management Society Annual Conference-Special Conference in China, Guangzhou, China, Dec. 14-16.2012. The revised version has been accepted to publish in the *International Entrepreneurship and Management Journal* (in press).

4.1 Introduction

Entrepreneurship plays an important role in economic development by incubating technological innovations, increasing economic efficiency, and creating new jobs (Shane & Venkataraman, 2000). Therefore, tremendous research attention has been devoted to entrepreneurship in recent decades. One of the most widely studied questions is: *What makes an entrepreneur*? Specifically, *what are the basic factors that lead an individual to be willing to become an entrepreneur* (i.e., that determine his or her EI; see Bird (1988) and Boyd and Vozikis (1994))? In most career choice models, EI is considered the antecedent of entrepreneurial behavior. It is in turn determined by attitudes, and attitudes are affected by "exogenous influences" such as traits and situational variables (Ajzen, 1991; Krueger, Reilly, & Carsrud, 2000).

In previous studies on EI, researchers have explored the complex relationships among entrepreneurial ideas and their consequences. Theorists have studied intentionality and its formation. The pioneering theorist in this area, William James (1890/1950), introduced the general term "will" that defines intention as an independent faculty of the mind, operating through a person's ability to hold the intended image in the mind and the consent called inner dialog or self-talk. The psychoanalytic theorist Bugental (1980) found that the process of intentionality involves persistence, perseverance, and courage. The cognitive theorists Fishbein and Ajzen (1975) demonstrated the importance of internal elements such as expectation, attention, and beliefs for behavioral outcomes. EI focuses on either creating a new venture or creating new values in existing ventures. Katz and Gartner (1986) argue that this intention includes both the entrepreneur's intention (internal locus) and the intentions of other stakeholders, the markets, and so on (external locus).

To date, scholars have recognized several determinants of individuals' EI, including their traits and personalities (e.g., the big five (Ciavarella et al., 2004), risk-taking propensity (Zhao, Seibert, & Hills, 2005), and self-efficacy (Zhao,

Seibert, & Hills, 2005)), exposure to entrepreneurial activity (e.g., Krueger 1993; Matthews & Moser, 1996), and gender (e.g., Eccles, 1994; Wilson, Kickul, & Marlino, 2007; Marlow & McAdam, 2012). Previous studies also indicate a linkage between entrepreneurship education and entrepreneurial activities (Galloway & Brown, 2002; Gorman, Hanlon, & King, 1997; Henderson & Robertson, 2000). According to McIntyre and Roche (1999, p. 33), entrepreneurship education is the process of providing individuals with the concepts and skills to recognize opportunities that others have overlooked, and to have the insight and self-esteem to act where others have hesitated.

Entrepreneurship education has received tremendous attention in terms of research and practical training (e.g., Donckels, 1991; Crant, 1996; Robinson & Sexton, 1994; Gorman, Hanlon, & King, 1997; Zhao, Seibert, & Hills, 2005). However, there is an ongoing debate on whether entrepreneurs are born or made. One side of this debate emphasizes personal characteristics and family influences (endogenous factors). The other side emphasizes the role of entrepreneurship education (Garavan & O'Cinneide, 1994, p. 3; McMullan, Chrisman, & Vesper, 2002; Souitaris, Zerbinati, & Allaham, 2007). Such education stimulates an individual's motivation to create a new venture (Cho, 1988).

Although entrepreneurship education is recognized to be important, there have been relatively few empirical studies of its impact, distinct from that of general education, on perceptions of entrepreneurship (Krueger & Brazeal, 1994; Peterman & Kennedy, 2003) and on EI. Entrepreneurship knowledge is assumed to accumulate through experience and education. Examining the role of education in this accumulation will clarify the role of education in EI formation. We aim to clarify the underlying mechanisms through which entrepreneurship education affects EI.

We have developed a comprehensive framework to address the impact of entrepreneurship education on individual knowledge accumulation and EI. We

incorporate entrepreneurship education and knowledge into an EI-based model and consider them to be displacement trigger factors (proposed by Shapero (1984)). We applied this model in China and collected data from ten leading universities including Tsinghua University, Renmin University, Beijing University of Aeronautics and Astronautics, Nanjing University, Xián Jiaotong University, and Wuhan University. By collecting data from both universities that offer entrepreneurship education and those that do not, we analyzed the impact of such education. We conclude that entrepreneurship education has a significant positive effect on Chinese students' EI and knowledge accumulation. It also has significant positive interactive effects especially for technological universities, technological majors, and males.

This study makes both theoretical and practical contributions. At the Second Entrepreneurial Cognition Conference (held in 2005 at the Ivey Business School at the University of Western Ontario), Mitchell et al. (2007) discussed four areas for future research into entrepreneurship: *person, situation, cognition,* and *motivation*. We have explored all four areas. Theoretically, this study proposes an adapted EI-based model that includes entrepreneurship education and knowledge. Students in Chinese universities were questioned about their entrepreneurial cognition and attitude and the impact on their EI. Our conclusions on the cognitive impact of entrepreneurship education suggest that such education has a place in the EI-based model. Practically, this study provides scientific evidence for educators, practitioners and policy-makers on the importance of entrepreneurship education and its role in a country's overall development.

This chapter is organized as follows. Section 2 describes the theoretical background. Section 3 presents the conceptual framework and the hypotheses. Section 4 discusses the data and methods. Section 5 presents the results, and Section 6 provides concluding remarks.

4.2 Theoretical Models Of EI Formation

To explore the relationship between EI and its antecedents, scholars have introduced six models. The first model (Shapero, 1984) is the *entrepreneurial event model (EEM).* This model considers business creation as an event that can be explained by the interaction between initiative, ability, management, relative autonomy, and risk. Using this model, Walstad and Kourilsky (1998) investigated the relationship between attitudes and knowledge for ethnic entrepreneurship in the USA. Peterman and Kennedy (2003) examined the effect of participation in an enterprise education program in Australia on perceptions of desirability and feasibility.

The second model is the *theory of planned behavior* (TPB), introduced by Ajzen (1991). It claims that any behavior requires a certain amount of planning and can be predicted by the intention to adopt that behavior. In the 1990s, Kolvereid (1996b) tried to predict the employment choices of 128 Norwegian undergraduate business students. Tkachev and Kolvereid (1999) investigated the employment intentions of 512 Russian university students from medical and technical courses. More recent studies by Paço et al. (2011), Miller et al. (2009), Schwarz et al. (2009), and Liñán and Chen (2009) were also conducted within the context of the TPB. Liñán and Chen (2009) argue that perceptions of society and external values influence the motivational factors determining EI. Miller et al. (2009) state that the TPB has three components that predict behavioral intentions. These are 1) the attitude toward or desire for the behavior as well as global positive or negative evaluations of it; 2) social and subjective norms taking into account other people's opinions of the behavior; and 3) the perceived feasibility of the behavior. Schwarz et al. (2009) define three fundamental attitudinal antecedents of intent: the personal attitude toward outcomes of the behavior, the perceived social norms, and the perceived behavioral control (self-efficacy).

Krueger, Reilly, & Carsrud (2000) compared Shapero's EEM and Ajzen's TPB using a sample of 97 senior university business students in the USA. They concluded that EEM is slightly superior for assessing EI. Audet (2002) used EEM and TPB to analyze the longitudinal EI of Canadian undergraduate business students. Audet found that the temporal stability of an intention is a requirement for an intention-based model to accurately predict behavior. Therefore, the link between EI and venture creation may prove difficult to establish. Paço et al. (2011) found that TPB is an appropriate tool for modeling the development of EI through pedagogical processes. However, they did not consider the contribution of entrepreneurship education to the development of competences related to EI, social and civic skills, and cultural awareness. This motivates our study.

The third model is the *entrepreneurial attitude orientation (EAO)* introduced by Robinson et al. (1991). It claims that attitude prediction can be explained by four factors (achievement, self-esteem, personal control, and innovation). Koh (1995) used this model to investigate the entrepreneurial orientation of 200 undergraduate business students in Hong Kong. Koh shows that psychological, demographic, and family characteristics influence EI. In particular, there is a significant association between a greater need for achievement, a higher propensity to take risks, more tolerance of ambiguity, greater innovativeness, and EI. Tan, Long, & Robinson (1996) collected data from 167 entrepreneurship students and 182 other students. They then used the discriminatory power of the EAO scale to differentiate student groups from different academic disciplines.

The fourth model, introduced by Krueger and Carsrud (1993), uses a scale that permits greater flexibility in the analysis of exogenous influences, attitudes, and intentions (Paço et al., 2011). The fifth model (Krueger & Brazeal, 1994) starts from the perspective of corporate venturing and enterprise development. The sixth model is the *Davidsson Model* (Davidsson, 1995) where intention is

influenced by the conviction defined by general attitudes, domain attitudes, and the current situation. The variables used in this model include ability, necessity, opportunity, values, and attitude.

There is a substantial literature on entrepreneurial cognition theory that illustrates the thought-action connections. The dominating perspective is that of *heuristics-based logic* (Busenitz & Barney, 1997), referring to the simplifying strategies that individuals use to make decisions (Tversky & Kahneman, 1973, 1974). This approach argues that individuals and situations vary in the extent to which decision shortcuts are used (Busenitz & Barney, 1997). Heuristics-based logic is influenced by beliefs that originate in specific methods for solving problems for which no formula exists; these methods are based on informal processes and experience (Busenitz & Barney, 1997; Busenitz & Lau, 1996).

Another aspect of cognition theory that helps to clarify entrepreneurial decision-making is the *entrepreneurial expertise* approach. Because entrepreneurs develop unique knowledge structures and process information differently, they prevail in the face of bounded rationality because of their "entrepreneurial expertise" (Mitchell, 1994). This expertise provides knowledge structures and expert scripts that allow users to perform significantly better than those without such expertise. There is a growing body of evidence showing that in entrepreneurship, cognition in the form of expert scripts influences decision making despite bounded rationality and specifically influences the venture creation decision (Busenitz & Lau, 1996; Mitchell, 1994; Mitchell et al., 2000). A related approach to entrepreneurial expertise is *effectuation.* This approach differs from the causation-based entrepreneurial process in which entrepreneurs are considered to be change agents who specialize in recognizing and exploiting opportunities available within the economic system (Shane & Stuart, 2002). In the effectuation approach, the future is assumed to be unpredictable but entrepreneurs can control a value-creating part of it through the use of an available set of means (Mitchell et al.,

2007). Therefore, thought and action proceed together in an attempt to create one of several possible outcomes. Entrepreneurs can use the means at their disposal to influence their future without having to predict it (Sarasvathy, 2001a, 2001b).

Alertness is the aspect of entrepreneurial cognition that explains why some recognize opportunities and others do not. Basically, alertness is the attentiveness to new opportunities; it implies unique thinking and reasoning (Mitchell et al., 2007).

Entrepreneurship research should focus (Fiske & Taylor, 1984; Mitchell et al., 2007) on person, situation, cognition, and motivation. Mitchell et al. (2007, p. 11) outline several research questions. Based on these, Krueger (2007) suggests examining the deep beliefs underlying cognitive structures, entrepreneurial attitudes, EI, and entrepreneurial actions. There is evidence that the cognitive level is influenced by individual perceptions of venturing together with personal, sociological, and environmental variables (Liñán, Urbano, & Guerrero, 2011). Previous studies have evaluated internal factors such as the perceived desirability and feasibility of entrepreneurial activities. We adapt Ajzen's TPB and Shapero's EEM to incorporate the external factors that help budding entrepreneurs to build unique knowledge of *entrepreneurial expertise* and *effectuation.*

4.3 Theoretical Framework and Hypotheses

Bird (1988) defines intentionality as a state of mind directing personal attention, experience, and action toward a specific goal. This can be an intentional behavior (Bird, 1988) or a predictor of planned entrepreneurial behavior (Krueger, 1993). Shapero and Sokol's model (Shapero & Sokol, 1982) is used to describe an *entrepreneurial process* where intentionality is central (Bird, 1988). This model indicates that EI stems from the *perception of feasibility and desirability*, and this path is affected by the cultural and social

context. This perception of personal choice-making in cultural and social environments has been adopted empirically by Krueger, Reilly, and Carsrud (2000), Peterman and Kennedy (2003), Wilson, Kickul, and Marlino (2007), and others.

Under the assumption that human behavior has an inertia that can be interrupted or replaced by *something*, Shapero argued that perceived desirability and feasibility determine the relative credibility of alternative behaviors, and EI arises *partially* from exposure to entrepreneurial activity (Shapero, 1975; Shapero & Sokol, 1982). This might be the *displacement* that triggers credibility and EI. If EI formation is a result of both displacement and credibility as Shapero suggested, there should be something to initiate this displacement. However, this is lacking in previous studies. Shapero argued that the displacement is often negative, such as job loss or divorce, but can also be positive, such as an inheritance or a lottery win.

However, in an opportunity-based entrepreneurship environment, people's inertia is often overcome by knowledge or education. For instance, those with exposure to entrepreneurial activity have the necessary knowledge base, and this knowledge could stimulate them to start a business. For those without such exposure, such as most university students, entrepreneurship education can be an effective way to acquire the necessary knowledge. Therefore, we argue that entrepreneurship education or exposure to entrepreneurial activity (e.g., via friends, relatives, or ex-employers) can fulfill the *displacement* function and trigger an individual's EI. Although the role of entrepreneurship education has received attention (Krueger, 2009; Souitaris, Zerbinati, & Allaham, 2007), there are few empirical studies that explore entrepreneurship knowledge formation via education and the impact of education on EI. We therefore incorporate entrepreneurship knowledge in the EI model. We argue that this knowledge can be sourced from exposure to entrepreneurial activity and/or education.

Ajzen's TPB is applied in psychology to discover, for example, career preferences, weight-loss goals, seatbelt use, and coupon use (Ajzen, 1987; Kim & Hunter, 1993). In entrepreneurship research it is used to explore the determinants of EI (Kolvereid, 1996a; Tkachev & Kolvereid, 1999; Krueger, Reilly, & Carsrud, 2000; Fayolle & Gailly, 2005; Veciana, Aponte, & Urbano, 2005; Liñán, Urbano, & Guerrero, 2011). TPB considers three antecedents of intention: *the attitude toward the act, subjective norms,* and *perceived feasibility* (or behavioral control).

The *attitude toward the act* is the attractiveness of the behavior or the degree to which the individual holds a positive or negative personal valuation of entrepreneurship (Ajzen, 1991). It is equivalent to the perception of the personal desirability of the behavior in Shapero's model. *Subjective norms* measure the perceived social pressure from family, friends, or significant others (Ajzen, 1991), referring to people's perceptions of a particular behavior. This includes the family's expectation for an individual's behavior and the expected support from other significant people. However, this factor is difficult to capture and has less predictive impact for subjects with a highly internal locus of control (Ajzen, 1987) or a strong orientation toward taking action (Bagozzi et al., 1992). Therefore, to measure the second factor, scholars try to identify the most important social influences such as role models, mentors, and personal networks. Several studies found no significant direct relationship between subjective norms and EI (Krueger, Reillly, & Carsrud, 2000; Autio et al., 2001). In this study, we measure subjective norms via self-evaluation. We introduce exposure to entrepreneurial activity into the model and measure the exposure from self, ex-employers, relatives and friends, and parents. This reveals the self-evaluated influence of exogenous role models. *Perceived feasibility* refers to the perception of situational competence and reflects the perceived ability to become self-employed. It is called self-efficacy by Bandura (1997) and is equivalent to perceived feasibility in Shapero's model.

The conceptual framework is presented in Fig. 4.1. We combine Ajzen's TPB, Shapero's EEM, and entrepreneurial cognitive theory (Mitchell et al., 2007). We incorporate perceived desirability (attitude in TPB), perceived feasibility (perceived behavior control in TPB), and exposure to entrepreneurial activity (indirectly referring to the subjective norm in TPB). We introduce entrepreneurship education and exposure to entrepreneurial activity as the *displacement factors,* equivalent to the credibility factors of perceived desirability and feasibility. Based on entrepreneurial cognition theory, we argue that education plus exposure to entrepreneurial activity facilitate the development of *knowledge structure* and *entrepreneurial expertise* and the formation of strategies for individual career-choice decisions. By acquiring entrepreneurship knowledge from different sources, people can develop an *alertness* to entrepreneurial opportunities. Since the educational environment is another influential factor, we also consider university orientation (technological or not) and the study major.

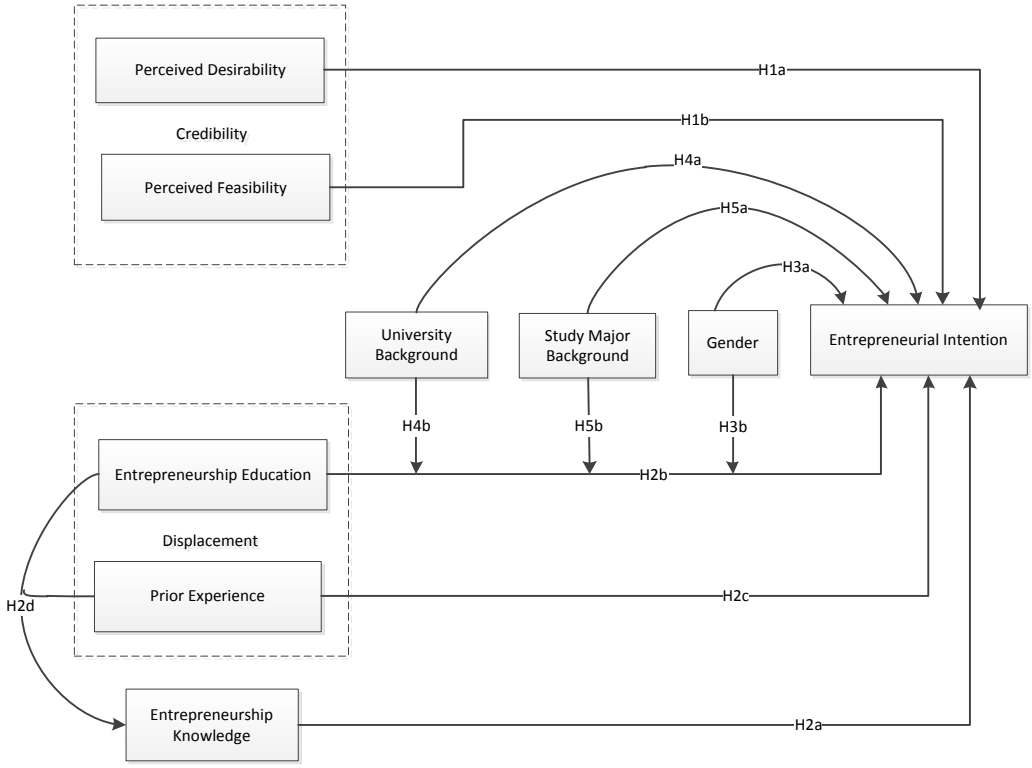


Figure 4.1 Updated EI model

According to Morris and Jones (1999), the entrepreneurship process has two seminal components: an event (the implementation of a new idea, product, or service) and an agent (the individual or group that assumes the responsibility for the event). Krueger (1993) argues that the intention to create a firm and the propensity to act are the main forces that make the creation of a firm possible. Scholars such as Gatewood, Shaver, and Gartner, (1995), Krueger et al. (1993, 1994, 2000, 2007, 2009), and Guerrero, Rialp, & Urbano (2008) argue that *intention is related to attitudes, specifically perceived desirability and feasibility*. We suggest that this is also true in China.

Hypothesis 1a: Perceived desirability is positively related to EI.

Hypothesis 1b: Perceived feasibility is positively related to EI.

As elaborated in the conceptual framework, we argue that entrepreneurship knowledge is positively related to EI. This hypothesis is based on entrepreneurial cognition theory. We argue that *entrepreneurial expertise* and *entrepreneurship knowledge structure* can be acquired from various sources, and this knowledge triggers EI through entrepreneurial *alertness*.

Entrepreneurship education is an important knowledge source. Similarly to other careers, the path to entrepreneurship is rooted in the simple processes of deliberate practice. As in sports, games, and the arts, this path is associated with the creation of cognitive systems that give rise to excellence (Mitchell, 2005). Education and/or experience is an important antecedent in the formation of a cognitive system (Charness, Krampe, & Mayer, 1996). Thus, it is important to investigate the relationship between education and entrepreneurship (Galloway & Brown, 2002; Gorman, Hanlon, & King, 1997; Henderson & Robertson, 2000) and that between education and EI as the precedent of entrepreneurial activities.

Cho (1988) suggested that education promotes EI because entrepreneurship-related knowledge and skills stimulate an individual's motivation to create a new venture. Donckels (1991) addressed the promotion of education to encourage entrepreneurial behavior. Gorman, Hanlon, and King (1997) and Kuratko (2003) argued that entrepreneurship can be learned or at least encouraged via education. Gorman, Hanlon, and King (1997), McMullan, Chrisman, and Vesper (2002), and Peterman and Kennedy (2003) showed that particular entrepreneurship support programs were successful in encouraging entrepreneurs to start a business or to improve their business performance.

Since university education has a clear impact on personal career choice, entrepreneurship education at universities is important. A study by Peterman and Kennedy (2003) found that exposure to such education affects EI, but it surveyed high-school students. Souitaris, Zerbinati, and Allaham (2007) used a pretest/post-test experimental design to show that entrepreneurship programs

improve the attitudes and the EI of science and engineering students. We therefore form hypotheses on the impact of entrepreneurship knowledge and education on EI.

Hypothesis 2a: Entrepreneurship knowledge is positively related to EI.

Hypothesis 2b: Entrepreneurship education is positively related to EI.

A third important factor in entrepreneurial intention models, next to perceived desirability and feasibility, is prior exposure to entrepreneurial experience. By examining prior exposure to experience we may explain additional variance in intentions (Azjen, 1987; Kreuger et al., 2000). In previous studies, prior entrepreneurial exposure such as having self-employed parents is considered to be a key predictor of self-employment (Dunn & Holtz-Eakin, 2000; Hout & Rosen, 2000; Krueger, 1993; Shapero & Sokol, 1982. This is comfirmed by others who show that prior exposure to entrepreneurship and experience in the family business (e.g. Dyer and Handler, 1994; Shapero, 1975) will affect the family members' intentions towards entrepreneurial action. Children raised up in a family business environment are spontaneously exposed to entrepreneurial circumstance by listening, seeing, feeling, knowing, and understanding real entrepreneurial events. This kind of exposure is according to Carr and Sequeira (2007) an important factor in the development of informational requirements and behavioral skills necessary for self-employment. Consequently, they find support for a positive relationship between prior family business exposure and entrepreneurial intent. In a similar vein, Hundley (2006) argues that a positive effect is established by the acquisition of entrepreneurial capital (skills, values and other attributes conducive to success in self-employment) from exposure to a self-employed parent. In a family business, parents often teach their children relevant skills, values and confidence that is needed to establish their own business (Carr and Sequeira, 2007).

We expect that this positive impact also occurs when a person is exposed to an entrepreneurial setting of his/her friends, relatives, employers, or selves. Besides the parents, these people may serve as a role model as well and positively diffuse their entrepreneurial knowledge. Scott and Twomey (1988) confirm that exposure to entrepreneurial experience can vary, either by tapping into the experience of others or one's own. Consequently, as a result of exposure to various role models, we expect that prior entrepreneurial exposure is likely to have a positive effect on an individual's entrepreneurial intention. With regard to entrepreneurship education, its role has been attracted more attention. Particularly in practical business field, entrepreneurship education is highlighted to provide the knowledge, skill to build entrepreneurship knowledge base and motivate entrepreneurial success in various settings[57]. Therefore, we hypothesize as follows.

Hypothesis 2c: Exposure to entrepreneurial experience is positively related to EI.

Hypothesis 2d: Entrepreneurship education plays a major role in building an entrepreneurship knowledge base.

Along with their growing influx into the workforce over the last half century, women have become more active in entrepreneurial activities (Bowen & Hisrich, 1986). This has led to studies of the relationship between gender and EI (Bowen & Hisrich, 1986). Several studies indicate that the preference for self-employment is an important indicator of actual involvement in self-employment, and that women have a lower preference for self-employment vis-à-vis wage employment than do men (Blanchflower, Oswald, & Stutzer, 2001; Grilo & Irigoyen, 2006). Hsu, Roberts, and Eesley (2007) provide evidence that women alumna lag their male counterparts in the rate at which they become

[57]The European Union Commission analyzes entrepreneurship education at all education levels in Europe.
http://europa.eu/legislation_summaries/education_training_youth/general_framework/n26111_en.htm

entrepreneurs. Verheul, Uhlaner, and Thurik (2005) found that women tend to select different activities, choosing less frequently those activities that both genders view as entrepreneurial. Zhao, Seibert, and Hills (2005) show that gender is not related to entrepreneurial self-efficacy but is directly related to EI: women reported lower EI than men did. Wang and Wong (2004) show that gender affects the EI of Singaporean students.

Women may feel as capable of performing entrepreneurial tasks as men do but may perceive the environment as more difficult and less rewarding. The under-representation of women in entrepreneurship, called the "pipeline" effect (Wilson, 2002), may arise from gender-related constraints. Such constraints impede career progression, which in turn encourages premature departure from related fields of employment (Marlow & McAdam, 2012) and limits women's ability to accrue appropriate entrepreneurial capital (Crump, Logan, & McIlroy, 2007). The under-representation may also occur because females have a strong genetic influence and no shared-environment influence on their tendency to become entrepreneurs, whereas males have no genetic influence but a large shared-environment influence (Zhang et al., 2009). Many studies show that males have higher EI than females do, but this result may not be valid in China. By 2011 25% of Chinese entrepreneurs were female, and 80% of these women state that the motivation fuelling their entrepreneurial spirit is self-realization[58]. Moreover, the literature is not conclusive on the effect of gender on the relationship between entrepreneurship education and the willingness to engage in start-up activities. Therefore, we hypothesize:

Hypothesis 3a: Females have lower EI than males do.
Hypothesis 3b: Gender has a positive interactive impact on the relationship between entrepreneurship education and EI.

[58]Source: People's Daily Online (Sept. 17, 2011), http://english.peopledaily.com.cn/90778/90862/7598064.html

We classified universities into two categories, technological universities and other universities. We also explored the EI differences for students from the different types of universities. Students frequently informed us that they were willing to do something related to their technological backgrounds. Thus, we hypothesize (hypotheses 4a and 5a below) that students from technological universities or with technological majors have higher EI than those without this background. The arguments are based on the *entrepreneurial expertise approach* and the *effectuation approach* in the theory of entrepreneurial cognition.

Entrepreneurial expertise is based on the available set of means and on knowledge structures and expert scripts that may be formed during knowledge accumulation. Such expertise provides budding entrepreneurs with the ability to identify opportunities, especially when there is assistance from a business incubator. According to Smilor and Gill (1986, p. 1), a business incubator seeks to effectively link talent, technology, capital, and know-how in order to leverage entrepreneurial talent and to accelerate the development of new companies. Students in technological universities or with technological backgrounds would be better able to tap entrepreneurial opportunities and/or realize their own entrepreneurial ideas. We also aim to identify the role of university type and study major in the relationship between education and EI. We argue that education is more applicable to students with technological backgrounds; it may help to increase self-esteem and EI. Accordingly, we formulate hypotheses 4b and 5b.

Hypothesis 4a: Students from technological universities have higher EI than those from other universities.

Hypothesis 4b: Technological universities have a positive interactive impact on the relationship between entrepreneurship education and EI.

Hypothesis 5a: Students with technological majors have higher EI than those with other majors.

Hypothesis 5b: Technological majors have a positive interactive impact on the relationship between entrepreneurship education and EI.

4.4 Data and Methods

Sample

The data were collected from a questionnaire-based survey in ten Chinese universities from May to August 2010. The questionnaire consisted mainly of structured questions. To reduce the selection bias, these ten universities include both technological and other universities[59]: the Chinese Academy of Science, Tsinghua University (technological), Beihang University (technological), Renmin University, Beijing Institute of Technology (technological), Beijing University of Technology (technological), the Central University of Finance and Economics, Shanghai University, Wuhan University of Technology (technological), and Zhejiang University. Of these ten universities, five universities are in the list of entrepreneurship-education models and five are not. The geographical bias was reduced by selecting universities from international metropolises such as Beijing and Shanghai and provincial capitals such as Hangzhou and Wuhan. Our contacts helped us to distribute the questionnaires randomly in a number of university courses where the students were from various study backgrounds and education levels. Therefore, we can confirm that this process was randomly executed. We eventually received 510 returned surveys (a 72.86% response rate; 700 questionnaires were distributed), of which 494 were fully completed.

In the 494 effective responses, 72% of the respondents were younger than 26 years old; 64% were undergraduate students, 27% masters students, and 9%

[59]A technological university is a university specializing in engineering science and technology.

Ph.D. students. The gender distribution was almost equal: 51% male and 49% female. There were 176 responses (35%) from engineering-oriented majors including electronic engineering, industrial electronic automation, mechanical engineering, information systems, optical engineering, chemical engineering, nuclear engineering, construction engineering, and biomedical engineering. Only 171 surveys (35%) came from engineering-oriented universities.

Measures

The questions were designed based on our model and related to desirability, feasibility, and exposure to entrepreneurial activity. They were derived from robust pretested sources: an unpublished questionnaire used in Shapero and Sokol (1982), Shapero (1984), and the published studies of Cooper, Woo, and Dunkelberg (1988) and Krueger et al. (1993, 2000).

Dependent Variables

Entrepreneurship intention is a dummy variable (yes=1 and no=0). It is set based on the responses to questions such as: Do you think you will start a business in the future?

Independent Variables

Perceived desirability was based on three subquestions: d(1) To what extent do you desire to have a new business?; d(2) How tense would you be?; and d(3) How enthusiastic are you? Each response was given on a Likert scale from 1 (lowest) to 5 (highest). The final score is calculated by averaging the scores for the three questions.

Perceived feasibility was measured in the same way, based on three subquestions: f(1) How hard would it be to run a new business?; f(2) How certain are you of success?; and f(3) How sure of yourself are you?

Entrepreneurship knowledge is a dummy variable, where 1 indicates knowledge and 0 indicates no knowledge; it is self-evaluated by the respondents.

According to Krueger et al. (1993, 2000), breadth of exposure to entrepreneurial experience is a better predictor of attitudes toward starting a new venture than any individual experience, and good experiences have more impact than bad experiences. However, heuristically, the career-choice decision involves various factors considered *integratively*. Therefore, we measured *exposure to entrepreneurial activity* in an integrated index *PE'*. We formed this index by multiplying the *weighted experience breadth* (*EB*) (sourced from parents and relatives, friends, self, and ex-employers) and the self-evaluated consequences of this exposure, called the *experience quality*. We gave each source of *EB* a weight of 0.25; the weight of a positive influence was 1 and that of a negative influence was -1. The advantage of this integrated index of exposure is its reflection of the self-evaluated exposure in terms of both quantity and quality. As an example, the PE' index for a respondent who reported a positive influence from parents, a negative influence from friends, no personal experience, and a positive influence from ex-employers is 0.25 (=0.25*1+0.25*(-1)+0.25*0+0.25*1)[60].

Entrepreneurship education is another independent variable. Its value was based on a scaled question. It was set to 2 for students with entrepreneurship education, to 1 for students who plan to acquire such education, and to 0 for students with no such education and no plans to acquire it.

Other independent variables include *gender* (female=0, male=1), *type of university (*technological=1, other=0), and *type of major* (technological=1, other=0). A technological university is a university authorized by the Bureau of Chinese Education as a teaching and research institute specializing in engineering science and technology. A non-technological university may teach these subjects but does not specialize in them.

[60]A confirmed factor analysis showed that these four categories represent exposure to entrepreneurial activity.

Control Variables

The control variables in this study are *age* and *education level* (PhD level=3; Master level=2; Bachelor level=1)

Method

We wish to investigate the impact of entrepreneurship knowledge, desirability, and feasibility on EI. The literature mostly focuses on the relationship between desirability, feasibility, exposure to entrepreneurial activity, entrepreneurship education, and EI. Based on this literature, we assume that these are valid exogenous factors. Since our main theoretical contribution concerns entrepreneurship knowledge as a displacement trigger in the EI-based model, the structural equation (Eq. (1)) presents the linear relationships between the regressors and the dependent variable. Since entrepreneurship knowledge is difficult to capture with a self-evaluated question, errors-in-variables and a simultaneous causality relationship between entrepreneurship knowledge and EI might coexist. Thus, we predict that entrepreneurship knowledge is an endogenous explanatory variable.

$$Pr.(EI=1) = \beta_0 + \beta_1 desirability + \beta_2 feasibility + \beta_3 entrepreneurship\ knowledge + \beta_4 education\ level + \beta_5 gender + \beta_6 type\ of\ university + \beta_7 type\ of\ major + \beta_8 age + u \quad (1)$$

In Eq. (1), we assume that $Cov(desirability, u)=0$ and $Cov(feasibility, u)=0$.

We tried *instrumental variable estimation* to solve the endogeneity problem. Since we argued in the conceptual framework that entrepreneurship knowledge sources from entrepreneurship education and exposure to entrepreneurial activity, we suggest that these are the potential instrumental variables for the endogenous regressor, entrepreneurship knowledge. Before applying Eq. (1), we perform *endogeneity* and *over-identification* tests to confirm the endogeneity problem and to identify the appropriate instrumental variable, as shown in Eq. (2).

$$\text{Entrepreneurship knowledge} = \pi_0 + \pi_1 Desirability + \pi_2 Feasibility + \pi_3 extrepreneurial\_activity + \pi_4 Entrepreneurship\_Education + v \quad (2)$$

where

$$E(v) = 0, Cov(\pi_1, v) = 0, Cov(\pi_2, v) = 0, Cov(\pi_3, v) = 0, Cov(\pi_4, v) = 0, \pi_3 \neq 0, \pi_4 \neq 0$$

note: extrepreneurial_activity in the equation denotes exposure to entrepreneurial activities

The result of the *endogeneity test* showed that entrepreneurship knowledge is indeed an endogenous variable, and it is over-identified by two variables, EE and PE'. To identify the appropriate instrumental variable, we used *EE* and *PE' sequentially* to instrument entrepreneurship knowledge, so the over-identification test was not necessary. The test showed that *entrepreneurship education* is more significant than exposure to entrepreneurial activity (measured by PE) for instrumenting entrepreneurship knowledge[61]. Moreover, this test indicates that education plays a larger role than exposure in forming entrepreneurship knowledge.

We then applied IVprobit estimation methods to identify the targeted relationships in Eq. (1). We used probit estimation methods for the separate impact of entrepreneurship education and exposure to entrepreneurial activity on EI.

4.5 Results

Table 4.1 presents the descriptive statistics and the variable correlations.

[61]The test indicates that entrepreneurship knowledge does not predict EI if we consider exposure to entrepreneurial activity as an IV, but it can predict EI if we consider *entrepreneurship education* as an IV.

Table 4.1 Descriptive statistics and variable correlations

Variable	Observations	Mean	Std. Dev.	Min	Max
(1) EI	494	.7186235	.4501266	0	1
(2) Perceived Desirability	494	3.632.928	.9947959	0	5
(3) Perceived Feasibility	494	331.444	.8935212	0	5
(4) Entrepreneurship Knowledge	494	.5202429	.5000965	0	1
(5) Entrepreneurship Education	494	.8137652	.7161799	0	2
(6) Exposure to Entrepreneurial Activity	494	.2368421	.2534327	-0.5	1
(7) University Type	494	.6315789	.4828654	0	1
(8) Study Major	494	.2894737	.4539778	0	1
(9) Gender	494	.51417	.5003058	0	1
(10) Age	494	23.79	4.27	17	56
(11) Entrepreneurship Education*Gender	494	.4392713	.682553	0	2
(12) Entrepreneurship Education*University	494	.5465587	.7240145	0	2
(13) Entrepreneurship Education*Study Major	494	.2327935	.5099989	0	2

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
(1) EI	1.00												
(2) Perceived Desirability	0.57*	1.00											
(3) Perceived Feasibility	0.45*	0.79*	1.00										
(4) Entrepreneurship Knowledge	0.26*	0.27*	0.30*	1.00									
(5) Entrepreneurship Education	0.32	0.30*	0.27*	0.43*	1.00								
(6) Exposure to Entrepreneurial Activity	-0.04	0.02	-0.01	0.002	-0.02	1.00							
(7) University Type	0.18*	0.03	-0.03	0.08	0.09*	0.06	1.00						
(8) Study Major	0.12*	0.06	0.04	-0.06	-0.01	-0.02	0.30*	1.00					
(9) Gender	0.17*	0.06	0.12*	0.05	0.06	0.05	0.19*	0.14*	1.00				
(10) Age	0.10*	0.09	0.09*	0.15*	0.16*	0.07	0.19*	-0.23*	0.12*	1.00			
(11) Entrepreneurship Education*Gender	0.32*	0.20*	0.20*	0.26*	0.62*	-0.02	0.15*	0.07	0.63*	0.20*	1.00		
(12) Entrepreneurship Education*University	0.34*	0.25*	0.20*	0.32*	0.73*	0.05	0.58*	0.11*	0.12*	0.24*	0.52*	1.00	
(13) Entrepreneurship Education*Study Major	0.16*	0.16*	0.09*	0.12*	0.34*	-0.04	0.20*	0.72*	0.11*	-0.17*	0.26*	0.35*	1.00

Table 4.2a Probit and IVprobit estimation of EI

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Independent Variables	(IVProbit)	(IVProbit)	(Probit)	(Probit)	(Probit)	(Probit)	(Probit)
Desirability	0.85***	0.86***	1.02***	1.06 ***	1.05***	1.08 ***	1.08***
	0.15	0.15	0.13	0.14	0.13	0.14	0.14
Feasibility	-0.04	-0.1	0.14	0.08	0.09	0.05	0.13
	0.13	0.13	0.14	0.14	0.14	0.14	0.15
Exposure to Entrepreneurial Activity	-0.42*	-0.48*	-0.48 **	-0.60 **	-0.67**	-0.62**	-0.56**
	0.27	0.28	0.3	0.31	0.32	0.31	0.31
Entrepreneurship Education (E-education)			0.45 ***	0.46 ***	0.15	0.56 ***	0.13
			0.11	0.11	0.17	0.13	0.15
Entrepreneurship Knowledge (IV=E-education)	1.42 ***	1.49***					
	0.24	0.25					
University (technological=1)		0.14		0.30*	-0.04	0.34**	0.32**
		0.16		0.17	0.22	0.17	0.17
Gender (male=1)		0.39***		0.47***	0.48***	0.48 ***	-0.02
		0.14		0.16	0.16	0.16	0.22
Major (technological=1)		0.35**		0.29*	0.27*	0.53 **	0.36**
		0.17		0.2	0.19	0.26	0.16
Cross Effects							
Entrepreneurship Education * University					0.54***		
					0.23		

Entrepreneurship Education * Major						-0.37 *	
						0.26	
Entrepreneurship Education * Gender (male=1)							0.82***
							0.25
Control Variables							
		-0.04		-0.04	0.02	-0.04	-0.05
Education Level (Bachelor=1, Master=2, PhD=3)		0.14		0.16	0.16	0.15	0.16
Age		0.004		0.015	0.01	0.01	0.01
		0.02		0.03	0.28	0.02	0.03
Constant	-3.02 ***	- 3.26***	-3.72***	-4.40 ***	-4.12***	-4.42***	-4.29***
	0.47	0.69	0.45	0.67	0.69	0.67	0.7
Log Likelihood	-488.82	-473.63	-192.42	-180.4	-177.67	-179.37	-174.61
Chi2 of Wald test of model (IVProbit) or LRChi2 (Probit)	198.2	215.43	202.29	226.31	231.77	228.37	237.89
Pseudo R2			0.34	0.39	0.39	0.39	0.41
Prob>Chi2 of Wald test of exogeneity	0.0003	0.0002					
Number of Observations	494	494	494	494	494	494	494

Sig: *** (<=0.01), ** (<=0.05) * (<=0.10), two tails

Table 4.2b Probit Estimation of Entrepreneurship Knowledge

DV: Probability (Entrepreneurship Knowledge)	
Independent Variables	
Entrepreneurship Education	0.77***
	(0.095)
Exposure to Entrepreneurial Activity	0.069
	(0.24)
Desirability	0.053
	(0.11)
Feasibility	0.39***
	(0.12)
Constant	-2.07***
	(0.36)
Pseudo R2	0.18
Prob>Chi (2)	0

Sig: *** (<=0.01), ** (<=0.05), * (<=0.10), two tails

The models in Table 4.2a include the estimations involving EK instrumented by EE and PE' separately. For Hypothesis 1a, all the models show that perceived desirability has a significant positive effect on EI. In a different cultural context, this result is consistent with the conclusion of Luthje and Franke (2003) that students (from MIT) who have a favorable attitude are more likely to become self-employed. Therefore, Hypothesis 1a is supported. The effect of perceived feasibility on EI is not clear. Different results appear in each model; they are not significant. Previous studies agree that perceived feasibility can affect affective states and behaviors (Markham, Balkin, & Baron, 2002), but this is not shown in our test. We attribute this unexpected result to the negative environmental components of perceived behavioral control. These include (1) *administrative complexities* that consume time and money and may discourage people from starting a business (World Bank, 2008), (2) *access to finance,* which is often identified as an important barrier to entry to self-employment (Bates, 1995), and (3) the *general economic climate,* which determines the opportunities available and the risks and rewards of setting up shop (Verheul et al., 2002). Moreover, our respondents were students who mostly had no personal entrepreneurial experience, so they may feel uncertainty about their inner locus of control and about environmental controls. Thus, although Hypothesis 1b is not supported, this is consistent with Guerrero et al.'s conclusion (Guerrero, Rialp, & Urbano, 2008) that feasibility does not have a positive impact on student EI.

Instrumented by entrepreneurship education, in models 1 and 2 entrepreneurship knowledge has a significant positive impact on EI. Hypothesis 2a is therefore supported. In addition, the value of the EK coefficient is higher than that of desirability and feasibility, indicating that the former plays a more important role. The results for models 3, 4, and 6 provide significant support for Hypothesis 2b, that entrepreneurship education has a positive impact on EI.

The positive impact of exposure to entrepreneurial activity on EI (Hypothesis 2c) is not supported. In contrast, this variable has a *significant negative* impact on EI. We are surprised but very excited to see this result. Our finding partially confirms the argument put forward by Carr and Sequeira (2007, page 1090) who argue the following: "individuals with prior family business experience may incorporate their experiences, such that their attitudes and behaviors towards entrepreneurial action are shaped *positively or negatively* towards business ownership". A possible explanation for the negative impact of entrepreneurial exposure on EI that we find in our study could be that the respondents in our sample are mainly exposed to negative entrepreneurial experiences. Prior exposure to negative entrepreneurial experiences (e.g. bankruptcy) from other role models may strengthen the perceived fears and risks of self-employment and as such may have a negative impact on students' entrepreneurial intention. For instance, if students have a self-employed family from which they gain negative information due to failure or setback, students might be de-motivated to undertake entrepreneurial activities leading towards a diminished entrepreneurial intention. In addition, the failure rate (98%) of Chinese students' entrepreneurial activities is extremely high[62]. This exposure to high failure rates and corresponding risks of self-employment, when the alternative is a comparatively stable income from wage employment, might negatively affect students' view of entrepreneurial activities as well.

Hypothesis 2d states that entrepreneurship education plays a more important role than exposure to entrepreneurial activity in building knowledge. We chose education as the IV of EK, indicating that EE has a major impact on EK. To verify this result, we ran another probit regression based on Eq. (2). Table 4.2b shows that entrepreneurship education plays a larger role in entrepreneurship knowledge than all the other factors. Therefore, Hypothesis 2d is supported.

[62] Source: Chinese University Students' Career Guide, Nov. 21, 2011.

Hypotheses 3a and 3b suggest an (interactive) impact of gender on EI. Both hypotheses are significantly supported, so females have lower EI than males do. Model 7 offers evidence that if all students receive entrepreneurship education, males have a higher (0.82-0.02=0.80) log-chance of EI than females do.

Hypotheses 4a and 4b suggest an (interactive) positive impact from technological universities on EI. The results supported both hypotheses. The results of model 5 indicate that if all students receive entrepreneurship education (where those who have received such education will have a 0.15 higher log-chance of EI than those who have not), students from technological universities have a higher (0.54-0.04=0.5) log-chance of EI than those from other universities.

Similarly, Hypotheses 5a and 5b, on the (interactive) impact of study major on EI, were significantly supported. In particular, model 6 shows that if all students receive entrepreneurship education, those from technological majors have a higher (0.56-0.37=0.19) log-chance of EI than those from other majors.

4.6 Conclusion

The significance of this study lies in our attempt to explain the philosophy that *"entrepreneurship can be increased through education, especially entrepreneurship education"* (European Commission, 2006) by estimating the impact of entrepreneurship education on EI[63]. We adapted Shapero's EEM and Ajzen's TBP as well as entrepreneurial cognition theory by incorporating *entrepreneurship knowledge* as the displacement trigger in the EI-based model. We argued that entrepreneurship knowledge sources from entrepreneurship education or/and exposure to entrepreneurial activity. Moreover, education and factors such as desirability, feasibility, and exposure influence students' EI.

[63]EI can have a positive impact on entrepreneurial behavior.

Our main findings are that perceived desirability has a significant positive impact on EI, whereas perceived feasibility does not. Entrepreneurship knowledge is an important displacement antecedent of EI with a significant positive impact. Education, as a source of entrepreneurship knowledge, has a significant positive impact on EI, whereas exposure to entrepreneurial activity has a significant negative impact. In addition, males have higher EI than females, which is consistent with the conclusion (Zhao, Seibert, & Hill, 2005) that gender is directly related to EI: women reported lower EI than men did[64]. Moreover, people from technological universities and majors have higher EI than those from other universities and majors. This finding helps to fill the gap in the literature in the relationship between university orientation (study major) and EI. It also offers empirical evidence for Shane's argument on the relationship between prior knowledge and the discovery of entrepreneurial opportunities (Shane, 2000).

The interactive effects indicate that entrepreneurship education has a greater effect on EI for males than females, for students from technological universities than from other universities, and for students from technological majors than from other majors. These findings provide empirical evidence to support entrepreneurship education in technological universities and majors.

Whereas entrepreneurship education seems to facilitate entrepreneurial intention, prior entrepreneurial exposure generates a negative and even stronger effect. Although this effect of entrepreneurial exposure is surprising and warrants more research it is in line with recent work of Carr and Sequeira (2007) who argue that prior exposure to entrepreneurship can be either positive or negative. When students have witnessed the negative consequences of entrepreneurship (bankruptcy, long hours of working, stress etc.), this might decrease their entrepreneurial intention in the future. The fact that this effect appears to be even stronger than the effect of entrepreneurship education

[64]Zhang et al. (2009) explain that this is because men have a larger shared-environment influence on EI.

indicates that this factor can no longer be ignored by entrepreneurship research. The study of entrepreneurial exposure therefore seems to be an interesting and relatively unexplored field of future research.

This study also indicates that entrepreneurship education has stronger impact on building up an individual's entrepreneurial-knowledge reservoir. In terms of the three questions[65] that are central to entrepreneurship research (Baron, 2004), our study contributes to the first. It also contributes to interpreting the impact of entrepreneurship education on cognitive formation and on the debate about whether or not entrepreneurs can be made. Therefore, this study contributes to the theory of entrepreneurial cognition, to both TPB and EEM, and to entrepreneurship education.

Our findings have implications for educators, potential entrepreneurs, and policy-makers. Educators should try to strengthen entrepreneurship education, especially for undergraduate students and those with technological majors. With appropriate education, potential entrepreneurs can recognize opportunities, search for resources economically, and organize efficient teams. Such education stimulates EI and improves entrepreneurs' ability to manage and grow new ventures.

This study has three main limitations. First, we studied university students, which might limit the applicability of our results to other groups. Secondly, we did not track the respondents' entrepreneurial behavior after the survey. Thirdly, we did not analyze the results at the provincial level. We recommend that future studies be based on a larger dataset so that students' EI before and after entrepreneurship education can be compared. Other groups could be studied, such as middle-school students, those who are carrying out entrepreneurial activities in incubators, and those who undertake entrepreneurship education. Scholars could use path analysis or multilevel

[65]See Section 1.3.

analysis to further explore the interactive effects of entrepreneurship education on EI.

Chapter 5 Discussion

5.1 Discussion

There are three dominant areas in entrepreneurship studies: entrepreneurship as an engine to drive national economic growth, CE as an instrument to facilitate corporate performance, and individual EI as the source of entrepreneurial behavior. These three focuses have formed a general picture of entrepreneurship studies (as shown in figure 1.1), either at national level, corporate level, or individual level. Taking an attitude to fill up the gap in this picture, the "niche" research spots were recognized by taking into account of emerging countries, such as China. Firstly, in China, entrepreneurship does not considered as the drive of national economic growth, but also China's specific economic transition is the igniter of entrepreneurship development. Second, in the entrepreneurial environment developing in China, corporate entrepreneurship strategies do not help Chinese firms facilitate corporate performance, but bridge to acquire social capital to achieve corporate-level catching-up. Third, in China, with booming entrepreneurial activities, the determinants of new generations' intention to start own business attract attention. In summary, entrepreneurship education becomes one of the tools to stimulate entrepreneurial intention for young generations. These three levels of entrepreneurship development in China covers economic, management, and psychological studies, taking into account of antecedents, process, and consequences of each level of entrepreneurial activities, behaviors, and intentions. By taking all of these together, this dissertation addresses an overall research question: *How does entrepreneurship develop in China at the national, corporate, and individual levels?* As indicated in the introduction session, this

research generates three major chapters to discuss each level of entrepreneurship development in China.

Entrepreneurship has played a significant role in China's rapid growth; Huang (2010) presented evidence for this. However, China's entrepreneurship development cannot be isolated from its transitional environment, which has involved political and economic reforms. To explore entrepreneurship development in the recent economic transition stage, I first asked: what stage has entrepreneurship in China reached? To answer this question, one must select the transitional pillars that are important in the context of Chinese reform. As explained in Chapter 2, I chose four: GDP per capita to reflect the standard of living and poverty reduction, educational resources to reflect reform in the national institutional system (the heavy investment in higher education), FDI to reflect the open economy, and the unemployment rate to reflect the consequences of reform in state-owned sectors[66].

Before evaluating the impact of these four factors on entrepreneurial activities in China, I discussed the Chinese entrepreneurship environment, beginning at the start of the economic reform at the end of the 1970s. I then showed the evolution of entrepreneurial development, with its lower-case-v shape. GDP per capita increased from 1996 (the year that private entrepreneurship was formally acknowledged) to 2008. This corresponds to China's economic transition: from the factor-driven phase to a transitional stage between the factor-driven and efficiency-driven phases, and then to the efficiency-driven stage. Taking this into account, I focused on the most recent transition stage (the efficiency-driven stage) and analyzed the impact of economic transition (in terms of the four pillars) on entrepreneurship development.

I cautiously drew data from NBSC, covering thirty provinces (excluding Tibet) from 2005 to 2008. I did not include earlier data because NBSC records are

[66]These four dimensions are not thoroughly investigated, because of data availability and limited observation.

inconsistent at the regional level and because entrepreneurial policies have changed over time. Segmented views of the transition stages that exclude the interactive impact of different policies would provide a more accurate evaluation of the significance of different stages for China's entrepreneurship development. By focusing on the most recent economic transition and estimating its role in entrepreneurship development I can reflect the accumulative impact over time.

I applied OLS random panel-data estimation to measure the direct and indirect (interactive) effects of the four transitional pillars. The results reveal the positive impact of China's economic transition on entrepreneurship development. Typically, GDP per capita has a significant inverted-U-shaped impact on entrepreneurship, which reflects the government's focus on state sectors and urban infrastructure since 2007 (to reduce the marginal rate of increase in self-employment). Educational resources and economic openness are positively related to entrepreneurship (and have a positive interactive impact on economic growth), corresponding to GEM's report (GEM Global Report, 2008), which states that Chinese entrepreneurs are likely to be highly educated. Unemployment has a positive push effect and a negative interactive effect on GDP per capita, demonstrating that China's entrepreneurship had developed (by 2008) into a transitional phase between necessity-based and opportunity-based. Unemployed people are likely to prefer wage employment to self-employment, which is consistent with the efficiency-driven development stage of that time.

This study contributes to empirical studies on the relationship between the economic-development stage and entrepreneurship development. It provides another view of entrepreneurship development in a transitional economy. Moreover, this study contributes to the debate on the Beijing consensus versus the Washington consensus. In terms of the former, this study indicates that entrepreneurship development in China is government-led and owes much to

the governmental initiation of institutional transition. However, the results suggest that the *ex ante* dimensions of entrepreneurship development correspond to the requirements of the Washington consensus (at least in terms of economic openness). Hence, I take a middle position in this lively debate: I believe that China's development is driven by both scenarios. At the political level, which I argue is the framework level, China follows the Beijing consensus, because it has long-term political decision-making (by a single political party) and experimentation-based policy development (defined by Deng Xiaoping). At the micro level however, economic development is driven by the Washington consensus. China is trying to build up a formal institutional framework that supports private property rights, economic openness, financial reforms, macroeconomic stability, and political liberalization. There is a contradiction between the political liberalization defined by the Washington consensus and the current situation in China. However, I still argue that, as a result of the government's proactive behavior, quiet progress is being made on every disputed issue (including liberalization).

Chapter 2 investigated Chinese entrepreneurship development at the macro level. I explored corporate entrepreneurial development and its impact on corporate catching-up. The catching-up concept originated in the economics field at the national level. The investigation of corporate catching-up, especially for emerging countries, is challenging because there is a theoretical deficit. National catching-up theory indicates that innovation is essential for catching-up and social advance is a necessary precondition for catching-up (Abramovitz, 1986). I assumed that similar arguments would apply to corporate catching-up, and I wanted to explore the underlying mechanism. I used CE theory, resource-based theory, dynamic-capability theory, and network theory to explain my corporate catching-up framework. I tested the framework in a case study of Huawei Technologies Co., Ltd. The results show that social capability helps a firm to acquire social capital, diffuse technology and knowledge, improve its social status, address resource gaps, and explore opportunities. Moreover, the

results indicate that catching-up firms are similar to entrepreneurial firms in terms of growth-orientation, innovation, and alertness. CE strategies, particularly collaboration-based networks, facilitate corporate catching-up. Huawei's growth indicates that networking improves social capability and allows a company to exploit and explore new technologies and new opportunities.

The methodology of this case study is both qualitative and quantitative. We interviewed executives at Huawei, incorporated second-hand data from databases (the Thomson SDC database, WIPO, EPO, USPTO, and SIPO), and explored information from archival data and the media. We quantitatively and qualitatively analyzed the impact of the three components of network social capital (structural, relational, and cognitive) accumulated from the three network layers (intrafirm, interfirm, and industrial district) in Huawei's three catching-up stages (pre-catching-up, catching-up, and post-catching-up). This led to more reliable conclusions than those provided by a purely quantitative analysis (Dittrich et al., 2007).

I also made peripheral findings. For instance, the integration of the three network layers is an overall approach for corporate catching-up. This is because of the structural, relational, and cognitive social capital gained from networks for knowledge acquisition, transfer, sharing, and creation internally and externally. Structurally, a sparse interfirm network with increased network composition and strong ties can coexist with a cohesive intrafirm network. This facilitates external opportunity exploration and internal opportunity exploitation. Moreover, the industrial-district network provides a snapshot of intrafirm and interfirm networks in a particular location. Theoretically, this work supports corporate catching-up theory, enriches social network theory, and provides support for the aggregation of strategic alliances, M&As and corporate venturing in an open-innovation paradigm. This study provides empirical evidence for the process by which people exploit opportunities

within existing organizations (Shane, 2012). Practically, this work has many strategic implications for latecomer catching-up firms.

Chapters 2 and 3 presented a partial picture of China's entrepreneurship development. Chapter 2 indicated that China's entrepreneurship is moving from necessity-based to opportunity-based, and higher education now plays a role. Chapter 3 showed that corporate catching-up is closely associated with individual EI and behavior. Any entrepreneurial behavior can be traced down to the individual level. Krueger (1993) indicates that intentionality is a predictor of entrepreneurial behavior. Therefore, it is important to understand the determinants of EI endogenously and exogenously.

Given the results of chapters 2 and 3 and the observation that the emerging generation of entrepreneurs has more education, I predicted that there would be several influential factors. These are the perceived desirability, the perceived feasibility, and the entrepreneurship cognition developed through education or exposure to entrepreneurial activity. Chapter 4 aimed to identify the role of education in shaping individual EI. It indirectly contributes to the discussion about whether entrepreneurs are born or made. I used a conceptual framework (Fig. 4.1) based on Ajzen's TPB and Shapero's EEM. The data were collected via a survey of ten Chinese universities. The questionnaire consisted mainly of structured questions, adapted from robust pretested sources: an unpublished questionnaire used in Shapero and Sokol (1982), Shapero (1984), and the published studies of Cooper, Woo, and Dunkelberg (1988) and Krueger et al. (1993, 2000). To reduce the selection bias, we surveyed both technological and other universities, five of which are entrepreneurship-education role models. The geographical bias was reduced by selecting universities from international metropolises such as Beijing and Shanghai and provincial capitals such as Hangzhou and Wuhan. Our contacts helped us to distribute the questionnaires randomly in a number of common courses with students from various study backgrounds and different education levels.

Eventually, 510 questionnaires were returned (a 72.86% response rate; 700 questionnaires were distributed) and 494 of them were fully completed.

A probit regression showed that education is the major source of entrepreneurship knowledge and has a significant positive impact on EI. However, exposure to entrepreneurial activity has a negative impact on EI in China. More interestingly, the results show that males and students with technological backgrounds have higher EI than females and those without this background. These results are strengthened by the moderate impact of entrepreneurship education, which indicates that such education is more likely to have positive consequences for technological universities and majors than for other universities and majors.

This work makes contributions in two areas. (1) By adapting the TPB (Ajzen, 1991) and the EEM (Shapero & Sokol, 1982), this study contributes theoretically by integrating the two streams of theory. We have shown the role of entrepreneurial knowledge in the EI model and compared the impact of different variables on EI. (2) This study contributes to empirical knowledge by providing supporting evidence. Entrepreneurship research should focus (Mitchell et al., 2007) on person, situation, cognition, and motivation. This study provides evidence for the source of individual entrepreneurial cognition in the Chinese context.

Shane and Venkataraman (2000) argue that entrepreneurship should be seen as a process and not as the embodiment of a type of person. Following this, I argue that in terms of opportunity identification, evaluation, and exploitation this process is important not only at the individual level but also at the corporate and national levels. Recently, Shane (2012) has claimed that existing studies of entrepreneurship do not provide a sufficient understanding of how the context influences the identification and exploitation of opportunities. However, we do have a better understanding of the process by which people exploit opportunities within existing organizations. I have provided evidence

for and insight into this topic in the context of emerging and transitional economies.

Regarding the process perspective of entrepreneurship (Shane, 2012), the three core chapters of this dissertation loop as a *reciprocal process* between (1) the EI-formation process, which can be the *ex ante* step of identifying and exploiting high-potential opportunities (Chapter 4), (2) the process of identifying and exploiting catching-up opportunities in existing organizations (Chapter 3), and (3) the process of understanding the impact of institutions and corporate characteristics on entrepreneurship (Chapter 2)[67]. This loop can be explained as follows: first, process (2) cannot work without process (1), because corporate identification and exploration are carried out by individuals. Secondly, process (1) depends on process (2), because process (2) involves actors in process (1). The relationship between process (3) and process (2) is similar, meaning that if process (3) at the national level is entrepreneur-friendly, the development of process (2) is facilitated, and this leads to more efficient entrepreneurial progress. Meanwhile, process (2) helps to drive process (3) at an aggregate level.

5.2 Practical Implications

This dissertation has focused on China's entrepreneurship development at the national, corporate, and individual levels. Our results have implications for national policy-makers, firms, educators, and (potential) entrepreneurs.

At the national level, Chapter 2 has implications for policy-makers and large firms. China's 12th Five-Year Plan[68] for National Economic and Social Development states that "inclusive growth" (meaning that economic growth should benefit a greater proportion of citizens) will become a major goal in the

[67] These three processes are identified by Shane (2012) as less-developed areas.

68 http://cbi.typepad.com/china_direct/2011/05/chinas-twelfth-five-new-plan-the-full-english-version.html

next five years. Thus, the impact of economic transition on entrepreneurial activities is increasingly important.

China is still a policy-led country where there is a preference for a predictable and steady regulatory environment for long-term development. For economic growth in the Chinese context it is important to understand the relationship between entrepreneurship and economic transition. Chapter 2 implies that in the current situation where there are both necessity-based and opportunity-based entrepreneurial activities, it is important to reduce the proportion of the former. This involves reducing passive layoffs, especially in less-developed inland regions. Moreover, to develop China into an innovation-driven economy, the government should support opportunity-based activities by encouraging CE in large companies and investing in entrepreneurship education. To reduce the unemployment rate, the government should form policies that support open innovation and collaborations between different organizations. Several local governments (e.g., the Jiangsu provincial government) have built entrepreneur-friendly institutional systems for Chinese returnees and talented locals. They are encouraged to start innovation-based ventures in Suzhou, Nanjing, and other cities. Chapter 2 also implies that encouraging opportunity-based activities requires increasing investment in education, reducing the gap between rich and poor, and encouraging FDI (particularly investment that will diffuse technology). As entrepreneurship becomes more opportunity-based, China's economic development can become innovation-driven.

Chapter 3 has several implications. First, Huawei's rapid catching-up at the technological and market levels implies that any company that aims to be a leading player internationally must act in an entrepreneurial manner and use corporate entrepreneurial (CE) strategies, because structural, relational, and cognitive social capital can be gained from CE strategy networking and allow the catching-up firm to identify and address resource gaps and to create and respond to new opportunities. Secondly, accumulating social capital in

networks is essential. This helps to address resource gaps, build absorptive capacity, and pave the way for further exploration. Thirdly, the selection of partners for the initial collaborations is important. At the first stage, firms should choose partners rich in social capital, for linking and learning. At the second stage, they should choose partners rich in technological and innovation resources, for leveraging and lifting (capability). At the last stage they should choose those willing to exchange and create knowledge, for maintaining and innovating. Moreover, firms should take advantage of the national innovation system that encourages universities, research institutes, and firms to work together. Without strong academic assistance, latecomer firms will struggle to catch up with and keep abreast of leading players. Open innovation at the national and corporate levels allows advanced companies to enrich their technological portfolios and their levels of innovation. It is also useful for latecomer firms, allowing them to catch up and to address resource gaps.

Chapter 4 has implications for educators, policy-makers, and (potential) entrepreneurs. It shows that education is an effective approach for enriching the entrepreneurship knowledge base and stimulating EI. Educators and policy-makers are advised to emphasize such education, particularly in universities. Lectures, internships, incubations, and practical exercises are required. The benefit of this investment depends on gender and individual background. Specific education programs could be designed for engineers and other technological-background employees to help them acquire entrepreneurship knowledge and respond to opportunities.

5.3 Limitations And Future Research

The main limitation of this dissertation is that it does not adequately explain the statistical interaction of the three levels of analysis, although I tried to interpret this via theoretical arguments. Another limitation is the limited sample, which might influence the generalizability. For example, Chapter 2 was based on data for 14 years and panel datasets for 4 years and 30 Chinese

regions. I limited the time period because of the inconsistency of earlier data from this database. However, future studies could work with regional data for each period. Therefore, future research could compare entrepreneurship development across different regions.

Chapter 3 provided a case study of Huawei Technologies Co., Ltd. The limitation of this chapter is that I studied just one firm. I tried to eliminate this disadvantage by performing an in-depth quantitative and qualitative analysis. However, future studies could compare several firms.

Chapter 4 investigated the relationship between entrepreneurship education and EI. This study has three limitations. The sample is limited to university students, which might limit the applicability of the results to other groups. Secondly, I did not track the respondents' entrepreneurial behavior after the survey. Thirdly, this study did not consider regional differences. Future studies could investigate EI before and after entrepreneurship education. Furthermore, the sample could be enlarged to include other groups, such as middle-school students, those who are carrying out entrepreneurial activities in incubators, and those who undertake entrepreneurship education. Scholars could use path analysis or multilevel analysis to further explore the interactive effects of entrepreneurship education on EI.

References

Chapter 1

Abramovitz, M. 1986. Catching-up, forging ahead and lagging behind. *The Journal of Economic History,* 46(2): 385-406.

Acs, Z. 2006. How is entrepreneurship good for economic growth? *Innovations*, Winter 2006: 97-107.

Acs, Z. & Varga, A. 2005. Entrepreneurship, agglomeration and technological change. *Small Business Economics*, 24(3): 323-334.

Alvarez, S.A. 2003. Resources and hierarchies: Intersections between entrepreneurship and strategy. In Z.J. Acs & D.B. Audretsch (Eds.), *Handbook of Entrepreneurship Research*. Kluwer Academic Publishers, London, 247-263.

Amsden, A. 1989. *Asia's Next Giant: South Korea and Late Industrialization.* Oxford Univ. Press, Oxford.

Audretsch, D.B. & Thurik, R. 2004. A model of the entrepreneurial economy. *International Journal of Entrepreneurship Education,* 2(2): 143-166.

Austin, J., Stevenson, H., & Wei-Skillern, J. 2006. Social and commercial entrepreneurship: Same, different, or both? *Entrepreneurship Theory and Practice,* 30(1): 1-22.

Baron, R.A. 2004. The cognitive perspective: A valuable tool for answering entrepreneurship's basic "why" questions. *Journal of Business Venturing*, 19(2): 221-239.

Burt, R.S. 2005. *Brokerage and Closure. An Introduction to Social Capital.* Oxford University Press, New York.

Busenitz, L.W., West, G.P., Shepherd, D., Nelson, T., Chandler, G.N., & Zacharakis, A. 2003. Entrepreneurship research in emergence: Past trends and future directions. *Journal of Management,* 29: 285-308.

Chandler, G.N. & Lyon, D.W. 2001. Issues of research design and construct measurement in entrepreneurship research: The past decade. *Entrepreneurship Theory and Practice,* 26(4): 101-113

Chang, H.-J. 1994. *The Political Economy of Industrial Policy.* St. Martin Press, New York

Child, J. & Rodrigues, S.B. 2005. The internationalization of Chinese firms: A case for theoretical extension? *Management and Organization Review*, 1(3): 381-410.

Ciavarella, M.A., Buchholtz, A.L., Riordan, C.M., Gatewood, R.D., & Stokes, G.S. 2004. The big five and venture survival: Is there a link? *Journal of Business Venturing,* 19(4): 465-483.

Cooper, A.C. 2003. Entrepreneurship: The past, the present, the future. In Z.J. Acs & D.B. Audretsch (Eds.), *Handbook of Entrepreneurship Research*. Kluwer Academic Publishers, London, 21-34.

Covin, J.G. & Slevin, D.P. 1991. A conceptual model of entrepreneurship as a firm behavior. *Entrepreneurship Theory and Practice,* 16: 7-24.

Davidsson, P. 2003. The domain of entrepreneurship research: Some suggestions. In J. Katz & D. Shepherd (Eds.), *Advances in Entrepreneurship, Firm Emergence and Growth*, JAI, London, 6: 315-372.

Eccles, J. 1994. Understanding women's educational and occupational choices. *Psychology of Women Quarterly*, 18: 589-609.

European Commission 2003. Green Paper on Entrepreneurship in Europe. Brussels, 21.01.2003, COM (2003) 27 final, available at: http://ec.europa.eu/enterprise/entrepreneurship/green_paper/green_paper_final_en.pdf

Fini, R., Grimaldi, R., Marzocchi, G.L., & Sobrero, M. 2010. The determinants of corporate entrepreneurial intention within small and newly established firms. *Entrepreneurship Theory and Practice*, 36(2): 387-414.

Greenwood, R. & Suddaby, R. 2006. Institutional entrepreneurship in mature fields: The big five accounting firms. *Academy of Management Journal,* 49(1): 27-48.

Guth, W.D. & Ginsberg, A. 1990. "Guest editors" introduction: Corporate entrepreneurship. *Strategic Management Journal*, 11(Summer Special Issue): 5-15.

Huang, Y. 2008. *Capitalism with Chinese Characteristics: Entrepreneurship and the State.* Cambridge University Press.

Huang, Y. 2010. Debating China's economic growth: The Beijing consensus or the Washington consensus. *Academy of Management Perspectives,* 24(2): 31-47.

Ireland, R.D., Reutzel, C.R., & Webb, J.W. 2005. Entrepreneurship research in AMJ: What has been published, and what might the future hold? *Academy of Management Journal,* 48(4): 556-564.

Ireland, R.D., Webb, J.W., & Coombs, J.E. 2005. Theory and methodology in entrepreneurship research. In D. Ketchen & D.D. Bergh (Eds.), *Research Methodology in Strategy and Management,* 2: 1-32.

Krueger, N. 1993. The impact of prior entrepreneurial exposure on perceptions of new venture feasibility and desirability. *Entrepreneurship Theory and Practice*, 18(1): 5-21.

Lazear, E.P. 2004. Balanced skills and entrepreneurship. *American Economic Review*, 94(2): 208-211.

Lazear, E.P. 2005. Entrepreneurship. *Journal of Labor Economics*, 23(4): 649-680.

Lee, C.-M., Miller, W., Hancock, M., & Rowen, H. (Eds.) 2000. *The Silicon Valley Edge: A Habitat for Innovation and Entrepreneurship*. Stanford University Press, Stanford.

Low, M.B. & MacMillan, I.C. 1988. Entrepreneurship: Past research and future challenges. *Journal of Management*, 14: 139-161.

Low, M. B. 2001. The adolescence of entrepreneurship research: Specification of purpose. *Entrepreneurship Theory and Practice*, 26(4): 17–25.

Maguire, S., Hardy, C., & Lawrence, T. 2004. Institutional entrepreneurship in emerging fields: HIV/AIDS treatment advocacy in Canada. *Academy of Management Journal*, 47(5): 657-679.

Mair, J. & Marti, I. 2006. Social entrepreneurship research: A source of explanation, prediction, and delight. *Journal of World Business,* 41(1): 36-44.

Marlow, S. & McAdam, M. 2012. Analyzing the influence of gender upon high-technology venturing within the context of business incubation. *Entrepreneurship Theory and Practice*, 36(4): 655-676.

Matthews, C.H. & Moser, S.B. 1996. A longitudinal investigation of the impact of family background and gender on interest in small firm ownership. *Journal of Small Business Management*, 34(2): 29-43.

McMullen, Jeffery S. 2011. Delineating the Domain of Development Entrepreneurship: A Market-Based Approach to Facilitating Inclusive

Economic Growth. *Entrepreneurship Theory and Practice*, 35 (1) (January 17): 185-193.

North, D. 1990. *Institutions, Institutional Change, and Economic Performance.* Norton, New York.

Packalen, K.A. 2007. Complementing capital: The role of status, demographic features, and social capital in founding teams' abilities to obtain resources. *Entrepreneurship Theory and Practice*, 31(6): 873-891.

Parker, S.C. 2004. *The Economics of Self-Employment and Entrepreneurship*. Cambridge University Press, Cambridge, UK.

Parker, S.C. & Robson, M.T. 2004. Explaining international variations in self-employment: Evidence from a panel of OECD countries. *Southern Economic Journal*, 71(2): 287-301.

Phan, P.H. 2004. Entrepreneurship theory: Possibilities and future directions. *Journal of Business Venturing*, 19: 617-620.

Ruef, M. 2003. The structure of founding teams: Homophily, strong ties, and isolation among U.S. entrepreneurs. *American Sociological Review*, 68(2): 195-222.

Sarasvathy, S.D. 2004. The questions we ask and the questions we care about: Reformulating some problems in entrepreneurship research. *Journal of Business Venturing,* 19: 707-717.

Sarasvathy, S.D. & Venkataraman, S. 2011. Entrepreneurship as method: Open questions for an entrepreneurial future. *Entrepreneurship Theory and Practice*, 35(1): 113-135.

Schramm, C. 2006. *The Entrepreneurial Imperative*. Harper Collins, New York.

Shane, S. & Venkataraman, S. 2000. The promise of entrepreneurship as a field of research. *Academy of Management Review,* 25: 217-226.

Sharma, P. & Chrisman, J.J. 1999. Toward a reconciliation of the definitional issues in the field of corporate entrepreneurship. *Entrepreneurship Theory and Practice,* 23(3): 11-27.

Shepherd, D.A. and Holger Patzelt. 2011. The New Field of Sustainable Entrepreneurship: Studying Entrepreneurial Action Linking 'What Is to Be Sustained' With 'What Is to Be Developed'. *Entrepreneurship Theory and Practice,* 35 (1) (January 17): 137-163.

Smith, K.G., Gannon, M.J., & Sapienza, H.J. 1989. Selecting methodologies for entrepreneurial research: Trade-offs and guidelines. *Entrepreneurship Theory and Practice*, 13(1): 39-49.

Teng, B.S. 2007. Corporate entrepreneurship activities through strategic alliances: A resource-based approach toward competitive advantage. *Journal of Management Studies*, 44(1), 119-142.

Vesper, K.H. 1982. Introduction and summary of entrepreneurship research. In C.A. Kent, D.H. Sexton, & K.H. Vesper (Eds.), *Encyclopedia of Entrepreneurship*. Prentice-Hall, Englewood Cliffs, NJ.

Wagner, J. 2003. Testing Lazear's jack-of-all-trades view of entrepreneurship with German micro data. *Applied Economics Letters*, 10(11): 687-689.

Wales, W., Monsen, E., & McKelvie, A. 2011. The organizational pervasiveness of entrepreneurial orientation. *Entrepreneurship Theory and Practice*, 35(5): 895-923.

Weber, K., Heinze, K.L., & DeSoucey, M. 2008. Forage for thought: Mobilizing codes in the movement for grass-fed meat and dairy products. *Administrative Science Quarterly*, 53(3): 529-567.

Wiklund, J., Davidsson, P., Audretsch, D.B., & Karlsson, C. 2011. The future of entrepreneurship research. *Entrepreneurship Theory and Practice,* 35(1): 1-9.

Wilson, F., Kickul, J., & Marlino, D. 2007. Gender, entrepreneurial self-efficacy, and entrepreneurial career intentions: Implications for entrepreneurship education. *Entrepreneurship Theory and Practice,* 31(3): 387-406.

World Bank. 1993. *The East Asian Miracle: Economic Growth and Public Policy.* Oxford Univ. Press, New York.

Zahra, S.A. 1995. Corporate entrepreneurship and company performance: The case of management leveraged buyouts. *Journal of Business Venturing*, 10: 225-247.

Zahra, S.A. 1996. Governance, ownership, and corporate entrepreneurship: The moderating impact of industry technological opportunities. *Academy of Management Journal,* 39: 1713-1735.

Zhao, H., Seibert, S.E., & Hills, G.E. 2005. The mediating role of self-efficacy in the development of entrepreneurial intentions. *Journal of Applied Psychology*, 90(6): 1265-1272.

Chapter 2

Acs, Z. 2006. How is entrepreneurship good for economic growth? *Innovations*, Winter: 97-107.

Acs, Z.J. 2007. How is entrepreneurship good for economic growth? Presentation at the *25th Economic Conference of Progress Foundation* (Oct. 31, 2007), Zurich, Switzerland.

Acs, Z., Audretsch, D.B., & Evans, D.S. 1994. Why does the self-employment rate vary across countries and over time? *Discussion paper No. 871. CEPR,* London.

Acs, Z. & Varga, A. 2005. Entrepreneurship, agglomeration and technological change. *Small Business Economics*, 24(3): 323-334.

Aitken, B. J., & Harrison, A. E. 1999. Do Domestic Firms Benefit from Direct Foreign Investment ? Evidence from Venezuela. *The American Economic Review*, 89(3): 605–618.

Audretsch, D.B. & Thurik, A.R. 2001. What is new about the new economy: Sources of growth in the managed and entrepreneurial economies. *Industrial and Corporate Change*, 10: 267-315.

Audretsch, D.B. & Thurik, R. 2004. A model of the entrepreneurial economy. *International Journal of Entrepreneurship Education,* 2(2): 143-166.

Anderson, E., Lundvall, E., 1997. National innovation systems and the dynamics of the division of labor. In: Edquist, C. (Ed.), *Systems of Innovation: Technologies, Institutions and Organizations.* Pinter, London.

Autio, E. 2003. High-potential entrepreneurship. *Working paper at Institute of Strategy and International Business*, Helsinki University of Technology.

Backer, K. D. E. (2003). Does Foreign Direct Investment Crowd Out Domestic Entrepreneurship ? *Review of Industrial Organization*, 22:67–84.

Bai, C., Lu, J., & Tao, Z. 2006. Property rights protection and access to bank loans: Evidence from private enterprises in China. *Stanford Working Paper No. 281.*

Batjargal, B. & Liu, M. 2004. Entrepreneurs' access to private equity in China: The role of social capital. *Organization Science*, 15(2): 159-172.

Baumol, W.J. 1990. Entrepreneurship: Productive, unproductive and destructive. *Journal of Political Economy*, 98: 893-921.

Becker, G. & Murphy, K.M. 1992. The division of labor, coordination costs, and knowledge. *Quarterly Journal of Economics*, 107(4): 1137-1160.

Blau, D.M. 1987. A time series analysis of self employment in the United States. *Journal of Political Economy*, 95(3): 445-467.

Blomström, M., 1986. Foreign Investment and Productive Efficiency: The Case of Mexico, *Journal of Industrial Economics* , 35(1): 97– 110.

Blomström, M., Kokko, A. and Zejan,M. (Eds.) 2000. *Foreign Direct Investment: Firm and Host Country Strategies.* NewYork: Palgrave.

Blomström, M, and Sjöholm, F. 1999. Technology Transfer and Spillovers: Does Local Participation with Multinationals Matter? *European Economic Review*, 43:4–6 (1999), 915–923.

Brandt, N. 2004. Business dynamics, regulation and performance. *OECD Science, Technology and Industry Working Papers*. 2004/3.

Buckley, P.J. Clegg, J., & Wang, C. 2007. Is the relationship between inward FDI and spillover effects linear? An empirical examination of the case of China. *Journal of International Business Studies,* 38(3): 447-459.

Cai, H., Todo, Y., & Zhou, L. 2007. Do multinationals' R&D activities stimulate indigenous entrepreneurship? Evidence from China's "silicon valley." *NBER Working Paper*, 13618: http://www.nber.org/papers/w13168

Carkovic, M., and Levine, R. 2005. Does FDI Accelerate Economic Growth? (pp. 195–220), in Theodore H. Moran, Edward M. Graham, and Magnus Blomström (Eds.), *Does FDI Promote Development?: New Methods, Outcomes and Policy Approaches* (Washington, DC: Institute for International Economics, 2005).

Carree, M., van Stel, A., & Wennekers, S. 2002. Economic development and business ownership: An analysis using data of 23 OECD countries in the period 1976-1996. *Small Business Economics*, 19(3): 271-290.

Caves, R. E., 1974. Multinational Firms, Competition and Productivity in Host Country Markets, *Economica* 41: 176–193.

Chamon, M. & Eswar, P. 2008. *Why are Savings Rates of Urban Households in China Rising?* International Monetary Fund, Washington, DC.

Chang, S,-J. & Xu, D. 2008. Spillovers and competition among foreign and local firms in China. *Strategic Management Journal,* 29(5): 495-518.

Chudnovsky, D. 1993. Introduction: Transnational corporations and industrialization. In D. Chudnovsky (Ed.), *Transnational Corporations and Industrialization*. UNCTAD (United Nations Library on Transnational Corporations, v. 11), Routledge, London and New York.

Cornelius, P. & McArthur, J.W. 2002. *The Global Competitiveness Report 2001-2002.* World Economic Forum.

DiMaggio, P. & Powell, W. 1983. The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48: 147-160.

De Backer, K. & Sleuwaegen, L. 2003. Does Foreign Direct Investment Crowd Out Domestic Entrepreneurship? *Review of Industrial Organization*, 22: 67–84.

Estrin, S., Meyer, K., & Bytchkova, M. 2006. Entrepreneurship in transition economies. In M. Casson, B. Yeung, A. Basu, & N. Wadeson (Eds.), *The Oxford Handbook of Entrepreneurship.* Oxford Univ. Press, Oxford.

European Commission 2003. *Green Paper on Entrepreneurship in Europe*. Brussels,
21.01.2003, COM (2003) 27 final, available at:

http://ec.europa.eu/enterprise/entrepreneurship/green_paper/green_paper_final_en.pdf

Evans, D.S. & Jovanovic, B. 1989. An estimated model of entrepreneurial choice under liquidity constraints. *Journal of Political Economy*, 97(4): 808-827.

GEM Global Report. 2002.
http://www.gemconsortium.org/about.aspx?page=global_reports_2002

GEM Global Report.2005. http://www.gemconsortium.org/

GEM Global Report. 2008. http://www.gemconsortium.org/

GEM Global Report. 2010. http://www.gemconsortium.org/

Gilad, B. & Kaish, S. 1986. *Handbook of Behavioral Economics*. JAI Press.

Gregory, N., Tenev, S., & Wagle, D. 2000. *China's Emerging Private Enterprises: Prospects for the New Century.* World Bank Publications.

Grossman, G. M. 1984. International Trade, Foreign Investment, and the Formation of the Entrepreneurial Class, *American Economic Review*, 74: 605–614.

Hausman, J. 1978. Specification tests in econometrics. *Econometrica*, 46: 1251-1271.

Hebert, R.F. & Link, A.N. 1982. *The Entrepreneur: Mainstream Views and Radical Critiques.* Praeger, New York.

Huang, Y. 2008. *Capitalism with Chinese Characteristics: Entrepreneurship and State During the Reform Era.* Cambridge University Press, New York.

Huang, Y. 2010. Debating China's economic growth: The Beijing consensus or the Washington consensus. *Academy of Management Perspectives,* 24(2): 31-47.

Johansson, E. 2000. Self-employment and liquidity constraints: Evidence from Finland. *Scandinavian Journal of Economics*, 102: 123-134.

Johnson, S., McMillan, J., & Woodruff, C. 2000. Entrepreneurs and the ordering of institutional reform. *Economics of Transition*, 8(1): 1-36.

Kirzner, I., 1973. *Competition and Entrepreneurship*. University of Chicago Press, Chicago, USA.

Kirzner, I. 1983. The entrepreneur, mainstream views and radical critiques (book review). *Southern Economic Journal,* 50(2): 611-613.

Kirzner, I. 1997. Entrepreneurial discovery and the competitive market process: An Austrian approach. *Journal of Economic Literature*, 35: 60-85. Knight, F.H. 1921. *Risk, Uncertainty, and Profit.* Houghton Mifflin, New York.

Koppl, R. (2006). Austrian economics at the cutting edge. *Review of Austrian Economics*, 19(4), 231-241.

Kosova, R. 2010. Do foreign firms crowd out domestic firms? evidence from the Czech republic*. Review of Economics and Statisitics*, 92(November): 861–881.

Lazear, E.P. 2004. Balanced skills and entrepreneurship. *American Economic Review*, 94(2): 208-211.

Lazear, E.P. 2005. Entrepreneurship. *Journal of Labor Economics*, 23(4): 649-680.

Ledeneva, A. 1998. *Russia's Economy of Favours: Blat, Networking and Informal Exchange.* Cambridge University Press, Cambridge.

Lee, C.-M., Miller, W., Hancock, M. & Rowen, H. (Eds.) 2000. *The Silicon Valley Edge: A Habitat for Innovation and Entrepreneurship*. Stanford University Press, Stanford.

Li, J., and Matlay,H. 2006. Chinese entrepreneurship and small business development: an overview and research agenda. *Journal of Small Business and Enterprise Development* 13 (2): 248-262.

Liao, D. & Sohmen, P. 2001. The development of modern entrepreneurship in China. *Stanford Journal of East Asian Affairs*, 1: 27-33.

Lin, N. 2012. Capitalism in China: a centrally managed capitalism and its future. *Management and Organization Review,* 7(1): 63-96.

Liu, X., and W. S. 2001. Comparing innovation systems: a framework and application to China's transitional context. *Research Policy*, 30(7): 1091–1114.

Markusen, J. R., and A. J. Venables.1999. Foreign Direct Investment as a Catalyst for Industrial Development, *European Economic Review*, 43: 335–356.

McMillan, J. & Woodruff, C. 1999. Interfirm relationships and informal credit in Vietnam. *Quarterly Journal of Economics*, 114(4): 1285-1320.

McMillan, J. & Woodruff, C. 2002. The central role of entrepreneurs in transition economies. *Journal of Economic Perspectives*, 16(3): 153-170.

Minniti, M. & Lévesque, M. 2008. Recent development in the economics of entrepreneurship. *Journal of Business Venturing*, 23: 603-612.

Newman, K. 2000. Organizational transformation during institutional upheaval. *Academy of Management Review*, 25: 602-619.

North, D. 1990. *Institutions, Institutional Change, and Economic Performance.* Norton, New York.

OECD 2007. A framework for addressing and measuring entrepreneurship. OECD Statistics Working Paper No. 2. Available at SSRN: http://ssrn.com/abstract=1090374

OECD, 2008. *The Social Impact of FDI*, Policy Brief (July 2008).

Oxenfeldt, A., 1943. *New Firms and Free Enterprise.* American Council on Public Affairs, Washington, DC.

Parker, S.C. 2004. *The Economics of Self-employment and Entrepreneurship*. Cambridge University Press, Cambridge, UK.

Parker, S.C. & Robson, M.T. 2004. Explaining international variations in self-employment: Evidence from a panel of OECD countries. *Southern Economic Journal*, 71(2): 287-301.

Peng, M.W. 2001. How entrepreneurs create wealth in transition economies. *Academy of Management Executive*, 15: 95-110.

Peng, M.W. 2003. Institutional transitions and strategic choice. *Academy of Management Review*, 28(2): 275-296.

Peng, M.W. & Heath, P. 1996. The growth of the firm in planned economies in transition: Institutions, organizations, and strategic choices. *Academy of Management Review*, 21(2): 492-528.

Porter, M.E. 1990. *The Competitive Advantage of Nations*. Free Press, New York.

Porter, M.E., Sachs, J.D., & Cornelius, P.K. 2002. The global competitiveness report 2001–2002. World Economic Forum.
http://www.nectec.or.th/pld/indicators/documents/WEF-%20Global%20Competitiveness%20Report%202001.pdf

Qian, Y. 2000. The process of China's market transition (1978–98): The evolutionary, historical, and comparative perspectives. *Journal of Institutional and Theoretical Economics*, 156(1): 151-171.

Schramm, C. 2006. *The Entrepreneurial Imperative*. Harper Collins, New York.

Schumpeter, J.A. 1934. *The Theory of Economic Development.* Harvard University Press, Cambridge, MA.

Scott, W.R. 1995. *Institutions and Organizations.* Sage, Thousand Oaks, CA.

Shane, S. 2000. Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science*, 11(4): 448-469.

Shane, S. & Venkataraman, S. 2000. The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25(1): 217-226.

Smallbone, D. & Welter, F. 2001. The distinctiveness of entrepreneurship in transition economies. *Small Business Economics*, 16(4): 249-262.

Storey, D.J. 1991. The birth of new firms: Does unemployment matter? A review of the evidence. *Small Business Economics*, 3: 167-178.

Swaan, W. 1997. Knowledge, transaction costs and the creation of markets in post socialist economies. In P. Hare & J. Davis (Eds.), *Transition to the Market Economy.* Routledge, London.

Thurik, A.R., Carree, M.A., van Stel, A.J., & Audretsch, D.B. 2008. Does self-employment reduce unemployment? *Journal of Business Venturing*, 23: 673-686.

Tian, X. 2007. Accounting for sources of FDI technology spillovers: Evidence from China. *Journal of International Business Studies,* 38: 147-159.

United Nations Conference on Trade and Development. 2003*. World Investment Report* (New York: United Nations, 2003).

Wagner, J. 2003. Testing Lazear's jack-of-all-trades view of entrepreneurship with German micro data. *Applied Economics Letters*, 10(11): 687-689.

Wennekers, A.R.M. 2005. *Entrepreneurship at the Country Level: Economic and Non-Economic Determinants.* PhD Thesis at Erasmus University of Rotterdam.

Wennekers, S., Van Stel, A., Thurik, R., & Reynolds, P. 2005. Nascent entrepreneurship and the level of economic development. *Small Business Economics*, 24(3): 293-309.

Wong, C.P.W. 1988. Interpreting rural industrial growth in the post-Mao period. *Modern China*, 14(1): 3-30.

Wong, P.K., Ho, Y.P., & Autio, E. 2005. Entrepreneurship, innovation and economic growth: Evidence from GEM data. *Small Business Economics*, 24(3): 335-350.

Wooldridge, J.M. 2002. *Econometric Analysis of Cross Section and Panel Data*. MIT Press, Cambridge, MA.

Yang, J. Y., Tipton, F. Ben, & Li, J. 2011. A review of foreign business management in China. *Asia Pacific Journal of Management*, 28(3): 627–659.

Young, S. 1995. *Private Business and Economic Reform in China.* M.E. Sharpe, New York.

Zhang, Y., Li, H., Li, Y., & Zhou, L.-A. 2010. FDI spillovers in an emerging market: The role of foreign firms' country origin diversity and domestic firm's absorptive capacity. *Strategic Management Journal,* 31: 969-989.

Chapter 3

Abramovitz, M. 1986. Catching-up, forging ahead and lagging behind. *Journal of Economic History,* 46(2): 385-406.

Ahuja, G. 2000a. Collaboration networks, structure holes, and innovation: A longitudinal study. *Administrative Science Quarterly*, 45(3): 425-455.

Ahuja, G. 2000b. The duality of collaboration: Inducements and opportunities in the formation of interfirm linkages. *Strategic Management Journal,* 21: 31-343.

Adler, P. S, and Kwon, S. 2002. Social capital: prospects for a new concept. *The Academy of Management Review*, 27 (1): 17-40.

Amsden, A. 1989. *Asia's Next Giant: South Korea and Late Industrialization.* Oxford Univ. Press, Oxford.

Anand, B.N., & Khanna, T. 2000. The structure of licencing contracts. *Journal of Industrial Economics,* 48(1): 103-135.

Anand, V., Manz, C.C., & Glick, W.H. 1998. An organizational memory approach to information management. *Academy of Management Review,* 23: 796-809.

Argote, L., McEvily, B., & Reagans, R. 2003. Managing knowledge in organizations: An integrative framework and review of emerging themes. *Management Science*, 49(4): 571-582.

Baldwin, T. T, Bedell,M.D., and Johnson,J.L. 1997. The Social Fabric of a Team-Based M.B.A. Program: Network Effects on Student Satisfaction and Performance. *Academy of Management Journal,* 40 (6): 1369-1397.

Barney, J.B. 1986. Strategic factor markets: Expectations, luck, and business strategy. *Management Science,* 23(10): 1231-41.

Beije, P. and Dittrich, K. 2008. Developing a research framework for sectoral modes of open innovation. *R&D Management Advanced Workshop "Integrating knowledge-challenges for R&D Management".* Linkoping, Sweden, 15-16 September, 2008.

Birkinshaw, J. & Hood, N. 1998. Multinational subsidiary evolution: Capability and charter change in foreign-owned subsidiary companies. *Academy of Management Review*, 23(4): 773-795.

Block, Z. & MacMillan, I.C. 1993. *Corporate Venturing: Creating New Business within the Firm*. Harvard Business School Press, Boston, MA.

Borgatti, S.P. 1997. Structural holes: Unpacking Burt's redundancy measures. *Connections,* 20(1): 35-38.

Borgatti, S.P. & Halgin, D.S. 2011. On network theory. *Organization Science,* Articles in Advance: 1-14.

Bourdieu, P. 1986. The forms of capital. In: J.G. Richardson (Ed.) *Handbook of Theory and Research for Sociology of Education*. Greenwood Press, New York, 241-258.

Brass, D.J. & Burkhardt, M.E. 1993. Potential power and power use: An investigation of structure and behavior. *Academy of Management Journal,* 36: 441-470.

Brass, D.J., Galaskiewicz, J., Greve, H.R., & Tsai, W. 2004. Taking stock of networks and organizations: A multilevel perspective. *Academy of Management Journal,* 47: 795-817.

Brouwer, E. & Kleinknecht, A. 1999. Innovative output and a firm's propensity to patent: An exploration of CIS micro data. *Research Policy,* 28: 615-624.

Brown J.S., and Duguid, P. 2000. Mysteries of the region: knowledge dynamics in Silicon Valley. http://www.lancs.ac.uk/ias/annualprogramme/regionalism/docs/Duguid_paper.pdf

Brown, T.E, Davidsson, P., and Wiklund,J. 2001. An operationalization of Stevenson's conceptualization of entrepreneurship as opportunity-based firm behavior. *Strategic Management Journal,* 22 (10) (October): 953-968.

Burt, R.S. 1992. *Structural Holes: The Social Structure of Competition.* Harvard University Press, Cambridge, MA.

Burt, R.S. 1997. The contingent value of social capital. *Administrative Science Quarterly,* 42: 339-365.

Burt, R.S. 2001. Structural holes versus network closure as social capital. In N. Lin, K.S. Cook, & R.S. Burt (Eds.), *Social Capital: Theory and Research*. Aldine, New York, 31-56.

Burt, R.S. 2005. *Brokerage and Closure. An Introduction to Social Capital.* Oxford University Press, New York.

Campbell, D. J. 1984. The effects of goal-contingent payment on the performance of a complex task. *Personnel Psychology,* 37: 23-40.

Cantwell, J. & Mudambi, R. 2005. MNE competence-creating subsidiary mandates. *Strategic Management Journal*, 26(2): 1109-1128.

Cantwell, J. & Piscitello, L. 2000. Accumulating technological competence: Its changing impact on corporate diversification and internationalization. *Industrial and Corporate Change*, 9(1): 21-51.

Carpenter, M., Li, M., & Jiang, H. 2012. Social network research in organizational context: A systematic review of methodological issues and choice. *Journal of Management,* March 2012.

Chang, H.-J. 1994. *The Political Economy of Industrial Policy.* St. Martin Press, New York.

Cheng, D.S. & Liu, L.L. 2003. *The Truth of Huawei (Huawei Zhenxiang)*. Contemporary China Publishing House (Dangdai Zhongguo Chubanshe).

Chesbrough, H.W. 2002. Making sense of corporate venture capital. *Harvard Business Review,* 80: 90-99.

Child, J. & Rodrigues, S.B. 2005. The internationalization of Chinese firms: A case for theoretical extension? *Management and Organization Review*, 1(3): 381-410.

Coleman, J.S. 1988. Social capital in the creation of human capital. *American Journal of Sociology,* 94: S95-S120.

Coleman, J.S. 1990. *Foundations of Social Theory.* Harvard University Press, Cambridge, MA.

Covin, J.G. & Slevin, D.P. 1991. A conceptual model of entrepreneurship as a firm behavior. *Entrepreneurship Theory and Practice,* 16: 7-24.

Das, T.K. & Teng, B. 2000. A resource-based theory of strategic alliances. *Journal of Management,* 26: 31-61.

Denzin, N. K., & Lincoln, Y. S. 1994. Introduction: Entering the field of qualitative research. In N. K. Denzin& Y. W. Lincoln (Eds.), *Handbook of Qualitative Research:* 1–17. Thousand Oaks, CA: Sage.

DiMaggio, P.L. & Powell, W.W. 1983. The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociology Review,* 48(2): 147-160.

Dittrich, K., Duysters, G., & De Man, A.-P. 2007. Strategic repositioning by means of alliance networks: The case of IBM. *Research Policy,* 36: 1496-1511.

Dunning, J.H. 2001. The eclectic (OLI) paradigm on international production: Past, present, and future. *International Journal of Economics and Business,* 8: 173-190.

Duysters, G., Jacob, J., Lemmens, C., & Yu, J. 2009. Internationalization and technological catching-up of emerging multinationals: A comparative case study of China's Haier group. *Industrial and Corporate Change,* 18: 325-349.

Easterby-Smith, M., Thorpe, R., & Lowe, A. 1991. *Management Research an Introduction*. Sage, London.

Flap, H.D. & de Graaf, N.D. 1986. Social capital and attained occupational status. *Netherlands J. Soc.*, 22: 145-161.

Flap, H.D. 1994. *No Man Is An Island: The Research Program of a Social Capital Theory.* World Congress Of Sociology. Bielefeld, Germany, July.

Freeman, C. 1988. Japan: A new national system of innovation? In G. Dosi, C. Greman, R. Nelson, et al. *Technical Change and Economic Theory*. Printer, London, 340-348.

Freeman, C. 2002. Continental, national and sub-national innovation system: Complementarity and economic growth. *Research Policy,* 31: 191-211.

Frost, T., Birkinshaw, J., & Ensign, P. 2002. Centers of excellence in multinational corporations. *Strategic Management Journal*, 23(11): 997-1018.

Gargiulo, M. 1993. Two-step leverage: Managing constraint in organizational politics. *Administration Science Quarterly,* 39: 1-19.

Gargiulo, M, & Benassi, M. 2000. Trapped in your own net? Network cohesion, structural holes, and the adaptation of social capital. *Organization Science,* 11(2): 183-196.

Gargiulo, M., Ertug, G., & Galunic, C. 2009. Two faces of control: Network closure and individual performance among knowledge workers. *Administrative Science Quarterly,* 54: 299-333.

Gerschenkron, A. 1962. *Economic Backwardness in Historical Perspective: A Book of Essays.* Belknap Press of Harvard University Press, Cambridge, MA.

Ghoshal, S. & Bartlett, C.A. 1990. The multinational corporation as an interorganizational network. *Academy of Management Review,* 15(4): 603-625.

Gummesson, E. 1991. *Qualitative Methods in Management Research.* Sage Publications. Newbury Park, California.

Grabher, G. 1993. The weakness of strong ties: The lock-in of regional development in the Ruhr area. In G. Grabher (Ed.), *The Embedded Firm.* Routledge, London.

Granovetter, M.S. 1973. The strength of weak ties. *American Journal of Sociology,* 78: 1360-1380.

Granovetter, M.S. 1974. *Getting a Job.* Harvard University Press, Cambridge, MA.

Granovetter, M.S. 1985. Economic action and social structure: A theory of embeddedness. *American Journal of Sociology,* 91: 481-510.

Granovetter, M. 1992. Economic institutions as social constructions: A framework for analysis. *Acta Sociologica,* 35(1): 3-11.

Greene, P.G., Brush, C.G., & Hart, M.M. 1999. The corporate venture champion: A resource-based approach to role and process. *Entrepreneurship Theory and Practice,* 23: 103-122.

Griliches, Z. 1990. Patent statistics as economic indicators: A survey. *Journal of Economics Literature,* 28: 1661-1707.

Gulati, R. 1995. Social structure and alliance formation patterns: A longitudinal analysis. *Administrative Science Quarterly,* 40: 619-652.

Gulati, R. & Gargiulo, M. 1999. Where do interorganizational networks come from? *American Journal of Sociology,* 104: 1439-1438.

Guth, W.D. & Ginsberg, A. 1990. "Guest editors" introduction: Corporate entrepreneurship. *Strategic Management Journal,* 11(Summer Special Issue): 5-15.

Hagedoorn, J. & Cloodt, M. 2003. Measuring innovative performance: Is there an advantage in using multiple indicators? *Research Policy,* 32: 1365-1379.

Hartley, J. 1994. Case studies in organizational research. In Catherine Cassell & Gillian Symon (Eds.), *Qualitative methods in organizational research, a practical guide* (pp.208-229). London: Sage

Huang, Y. 2010. Debating China's economic growth: The Beijing consensus or the Washington consensus. *Academy of Management Perspectives,* 24(2): 31-47.

Inkpen, A.C. & Tsang, E.W.K. 2005. Social capital networks and transfer knowledge. *Academy of Management Review,* 30(1): 146-165.

Jarvenpaa, S. & Leidner, D. 1998. An information company in Mexico: Extending the resource-based view of the firm to a developing country context. *Information Systems Research,* 9(4): 342-61.

Johnson, D. 1994. *Research Methods in Educational Management.* Financial Times/Pitman.

Kijkuit, B. & van den Ende, J. 2010. With a little help from our colleagues: A longitudinal study of social networks for innovation. *Organization Studies,* 31(4): 451-479.

Kirzner, I. 1973. *Competition and Entrepreneurship.* University of Chicago Press, Chicago, IL.

Kondo, R. & Watanabe, C. 2003. The virtuous cycle between institutional elasticity, IT advancement and sustainable growth: Can Japan survive in an information society? *Technology in Society*, 25: 319-355.

Koza, M.P. & Lewin, A. 1999. The coevolution of network alliances: A longitudinal analysis of an international professional service network. *Organization Science*, 10: 638-653.

Lall, S. 1983. The theoretical background. In S. Lall (Ed)., *The New Multinationals.* Wiley, Chichester.

Leana, C.R. & van Buren, H.J. 1999. Organizational social capital and employment practices. *Academy of Management Review,* 24(3): 538-555.

Lee, C., Lee, K., & Pennings, J.M. 2001. Internal capabilities, external networks, and performance: A study on technology-based ventures. *Strategic Management Journal,* 22: 615-640.

Lee, K. & Lim, C. 2001. Technological regimes, catching-up and leapfrogging: Findings from the Korean Industries. *Research Policy,* 30: 459-483.

Lin, N. 1999. Building a network theory of social capital. *Connections*, 22(1): 28-51.

Lin, N. 2001. *Social Capital: A Theory of Social Structure and Action.* Cambridge University Press, Cambridge, UK.

Lin, N., Ensel, W., & Vaughn, J. 1981. Social resources and strength of ties: Structural factors in occupational status attainment. *American Sociology Review,* 46: 393-405.

Liu, X. 2008. China's development model: An alternative strategy for technological catch-up. *SLPTMD Working Paper Series* No. 020. University of Oxford, Department of International Development.

Luostarinen, R. 1979. *Internationalization of the Firm.* Acta Academiae Oeconomcae Helsinginesis, Helsinki.

LUBS. 2009. http://www.leeds.ac.uk/news/article/269/rise_in_chinese_outward_foreign_direct_investment

McPherson, M. 1983. An ecology of affiliation. *American Sociological Review,* 48: 519-532.

McPherson, J.M., & Smith-Lovin, L. 1987. Homophily in voluntary organizations: Status distance and the composition of face-to-face groups. *American Sociological Review,* 52: 370-379.

McPherson, J.M., Smith-Lovin, L., & Cook, J.M. 2001. Birds of a feather: Homophily in social networks. *Annual Review of Sociology,* 27: 415-444.

Merriam, S.B. 1988. *Case Study Research in Education: A Qualitative Approach.* San Francisco: Jossey-Bass.

Morgan, G., and Smircich, L. 2012. The case for qualitative research. *Academy of Management Review*, 5 (4): 491-500.

Moran, P. 2005. Structural vs. relational embeddedness: Social capital and marginal performance. *Strategic Management Journal,* 26: 1129-1151.

Mu, Q. & Lee, K. 2005. Knowledge diffusion, market segmentation and technological catch-up: The case of the telecommunication industry in China. *Research Policy,* 34(6): 759-783.

Nahapiet, J. & Ghoshal, S. 1998. Social capital, intellectual capital, and organizational advantage. *Academy of Management Review*, 23(2): 242-266.

Nelson, R.R. 1993. *National Innovation System: A Comparative Analysis.* Oxford Univ. Press, Oxford.

Ohkawa, K., and Rosovsky, H. 1973. *Japanese Economic growth.* Standford, CA: Standford U. Press.

Peng, M.W. & Luo, Y. 2000. Managerial and firm performance in a transition economy: The nature of a micro-macro link. *Academy of Management Journal,* 43: 486-501.

Perez, C. & Soete, L. 1988. Catching-up in technology: Entry barriers and windows of opportunity. In G. Dosi, et al. (Eds.), *Technical Change and Economic Theory.* Printer, New York, 458-479.

Phelps, C.C. 2010. A longitudinal study of the influence of alliance network structure and composition on firm exploratory innovation. *Academy of Management Journal,* 53(4): 890-913.

Porter, M.E. 1990. *The Competitive Advantage of Nations.* Free Press, New York.

Portes, A. 1998. Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology,* 24: 1-24.

Provan, K.G., Fish, A., & Sydow, J. 2007. Interorganizational networks at the network level: A review of the empirical literature on whole networks. *Journal of Management,* 3: 479-516.

Raub, W. & Weesie, J. 1990. Reputation and efficiency in social interactions: An example of network effects. *American Journal of Sociology,* 96: 626-654.

Reagans, R., and McEvily,B. 2003. Network Structure and Knowledge Transfer: The Effects of Cohesion and Range. *Administrative Science Quarterly,* 48 (2): 240-267.

Romer, P. 1990. Endogenous technological change. *Journal of Political Economy,* 98: S71-102.

Rothaermel, F.T. & Deeds, D.L. 2004. Exploration and exploitation alliances in biotechnology: A system of new product development. *Strategic Management Journal*, 25: 201-221.

Sampson RC. 2005. Experience effects and collaborative returns in R&D alliances. *Strategic Management Journal*, 26(11): 1009–1031.

Schilling, M.A. 2009. understanding the alliance data. *Strategic Management Journal,* 260 (August 2008): 233-260.

Schumpeter, J.A. 1934. *The Theory of Economic Development.* Harvard University Press, Cambridge, MA.

Scott, D.W. 1992. *Multivariate Density Estimation: Theory, Practice, and Visualization*. John Wiley & Sons, Inc.

Shane, S. & Cable, D. 2002. Network ties, reputation, and the financing of new ventures. *Management Science,* 48: 364-381.

Shipilov, A.V. & Li, S.X. 2008. Can you have your cake and eat it too? Structural holes' influence on status accumulation and market performance in collaborative networks. *Administrative Science Quarterly*, 53: 73-108.

Sparrowe, T., and Liden, R.C. 1997. Process and structure in leader-member exchange. *The Academy of Management Review,* 22(2): 522- 552.

Stevenson, H.H. & Jarillo, J.C. 1990. A paradigm of entrepreneurship: Entrepreneurial management. *Strategic Management Journal,* 11: 17-27.

Teng, B.S. 2007. Corporate entrepreneurship activities through strategic alliances: A resource-based approach toward competitive advantage. *Journal of Management Studies*, 44(1): 119-142.

Toyne, B. & Nigh, D. 1998. A more expansive view of international business. *Journal of International Business Studies,* 29: 863-876.

Trajtenberg, M. 1987. Patents, citations, and innovations: Tracing the links. *Working paper no. 2457,* National Bureau of Economics Research, Washington, DC.

Turner, J.H. 1985. Review. *American Journal of Sociology,* 90: 1336-1338.

Useem, M. & Karabel, J. 1986. Pathways to top corporate management. *American Sociological Review*, 51(2): 184-200.

Uzzi, B. 1996. The source and consequences of embeddedness for the economic performance of organizations: The network effect. *American Sociological Review,* 61: 674-698.

Uzzi, B. 1997. Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative Science Quarterly,* 42: 35-67.

Walker, G., Kogut, B., & Shan, W. 1997. Social capital, structural holes and the formation of an industry network. *Organization Science,* 8: 109-125.

Wasserman, S. & Faust, K. 1994. *Social Network Analysis: Methods and Applications.* Cambridge University Press, Cambridge, UK.

Watts, D.J. 1999. Networks, dynamics, and the small-world phenomenon. *American Journal of Sociology,* 105: 493-527.

Webb, E.J. 1981. *Nonreactive Measures in the Social Sciences*. Houghton Mifflin, Boston, MA.

Wegner, D.M. 1987. Transactive memory: A contemporary analysis of the group mind. In B. Mullen & G. Goethals (Eds.), *Theories of Group Behavior*. Springer-Verlag, New York, 185-208.

Welch, L.S. & Luostarinen, R. 1993. Inward-outward connections in internationalization. *Journal of International Marketing,* 1: 44-57.

Wells, L. Jr. 1983. *The Third World Multinationals.* MIT Press, Cambridge, MA.

Welsh, J.A. & White, J.F. 1981. Converging on characteristics of entrepreneurs. In K.H. Vesper (Ed.), *Frontiers of Entrepreneurship Research.* Babson Center for Entrepreneurial Studies, Wellesley, MA, 504-515.

WIPO. 2009. http://www.wipo.int/portal/index.html.en

World Bank. 1993. *The East Asian Miracle: Economic Growth and Public Policy.* Oxford Univ. Press, New York.

Yin, R.K. 1989. *Case Study Research: Design and Methods.* Sage, London.

Young, S., Huang, C.-H., & McDermott, M. 1996. Internationalization and competitive catch-up processes: Case study evidence on Chinese multinational enterprises. *Management International Review,* 36(4): 295-314.

Zahra, S.A. 1995. Corporate entrepreneurship and company performance: The case of management leveraged buyouts. *Journal of Business Venturing*, 10: 225-247.

Zahra, S.A. 1996. Governance, ownership, and corporate entrepreneurship: The moderating impact of industry technological opportunities. *Academy of Management Journal,* 39: 1713-1735.

Zhang, H.Y. & Van Den Bulcke, D. 1996. International management strategies of Chinese multinational firms. In J.K. Child & Y. Lu (Eds.), *Management Issues in China: International Enterprises*. Routledge, London, 141-164.

Chapter 4

Ajzen, I. 1987. Attitudes, traits and actions: Dispositional prediction of behavior in social psychology. *Advances in Experimental Social Psychology,* 20: 1-63.

Ajzen, I. 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2): 179-211.

Audet, J. 2002. A longitudinal study of the entrepreneurial intentions of university students. *Academy of Entrepreneurship Journal*, 10(1): 1-15.

Autio, E., Keeley, R. H., Klofsten, M., Parker, G. C., & Hay, M. 2001. Entrepreneurial Intent among Students in Scandinavia and in the USA. *Enterprise and Innovation Management Studies,* 2(2): 145-160.

Bagozzi, R.P., Baumgartner, H. & Yi, Y. 1992.Appraisal processes in the enactment of intentions to use coupons. *Psychology and Marketing,* 9:6:469–486.

Baron, R.A. 2004. The cognitive perspective: A valuable tool for answering entrepreneurship's basic "why" questions. *Journal of Business Venturing,* 19(2): 221-239.

Bates, T. 1995. Self-employment entry across industry groups. *Journal of Business Venturing*, 10(2): 143-156.

Bian, Y., 2005. Guanxi. In: Beckert, J., Zafirovski, M. (Eds.), *Inter- national Encyclopedia of Economic Sociology.* Routledge, New York, pp. 312–314.

Bird, B. 1988. Implementing entrepreneurial ideas: The case for intention. *Academy of Management Review*, 13(3): 442-453.

Blanchflower, D.G., Oswald, A.J., & Stutzer, A. 2001. Latent entrepreneurship across nations. *European Economic Review,* 45(4-6): 680-691.

Bowen, D. & Hisrich, R. 1986. The female entrepreneur: A career development perspective. *Academy of Management Review,* 11(2): 393-407.

Boyd, N.G. & Vozikis, G.S. 1994. The influence of self-efficacy on development of entrepreneurial intentions and actions. *Entrepreneurship Theory and Practice,* 14(3): 63-77.

Bugental, J. 1980. The far side of despair. *Journal of Humanistic Psychology*, 20: 49-68.

Busenitz, L.W. & Barney, J.B. 1997. Differences between entrepreneurs and managers in large organizations: Bias and heuristics in strategic decision-making. *Journal of Business Venturing*, 12(1): 9-30.

Busenitz, L.W. & Lau, C.-M. 1996. A cross-cultural cognitive model of new venture creation. *Entrepreneurship Theory and Practice,* 20(4): 25-39.

Byabashaija, W. and I. Katono, 2011, The impact of college entrepreneurial education on entrepreneurial attitudes and intention to start a business in Uganda, *Journal of Developmental Entrepreneurship,* 16:127-144.

Carr, J.C. and J.M. Sequeira. 2007. Prior family business exposure as intergenerational influence and entrepreneurial intent: a theory if planned behavior approach, *Journal of Business Research*, 60: 1090-1098.

Charness, N., Krampe, R., & Mayer, U. 1996. The role of practice and coaching in entrepreneurial skill domains: An international comparison of life-span chess skill acquisition. In: K.A. Ericsson (Ed.), *The Road to Excellence: The Acquisition of Expert Performance in the Arts and Sciences, Sports, and Games*. Lawrence Erlbaum Associates, Mahwah, NJ, 51-80.

Cho, M.H. 1998. Ownership structure, investment, and the corporate value: An empirical analysis. *Journal of Financial Economics,* 47(1): 103-121.

Ciavarella, M.A., Buchholtz, A.L., Riordan, C.M., Gatewood, R.D., & Stokes, G.S. 2004. The big five and venture survival: Is there a link? *Journal of Business Venturing*, 19(4): 465-483.

Cooper, A., Woo, C., & Dunkelberg, W.C. 1988. Entrepreneurs' perceived chances for success. *Journal of Business Venturing*, 3(2): 97-108.

Crant, J.M. 1996. The proactive personality scale as a predictor of entrepreneurial intentions. *Journal of Small Business Management*, 34(3): 42-50.

Crump, B.J., Logan, K.A., & McIlroy, A. 2007. Does gender still matter? A study of the views of women in the ICT industry in New Zealand. *Gender Work and Organization,* 14(4): 351-370.

Davidsson, P. 1995. Culture, structure and regional levels of entrepreneurship. *Entrepreneurship Regional Development* , 7(1): 41-62.

Donckels, R. 1991. Education and entrepreneurship experiences from secondary and university education in Belgium. *Journal of Small Business and Entrepreneurship*, 9(1): 35-42.

Dunn, T. & Holtz-Eakin, D. 2000. Financial capital, human capital, and the transition to self-employment. *Journal of Labor Economics*, 18(2): 282-305.

Carr, J.C. and J.M. Sequeira. 2007. Prior family business exposure as intergenerational influence and entrepreneurial intent: a theory if planned behavior approach, *Journal of Business Research*, 60: 1090-1098.

Dyer, W.G. and W. Handler.1994. Entrepreneurship and family business: exploring the connections, *Entrepreneurship Theory and Practice*, Fall: 71-83.

Eccles, J. 1994. Understanding women's educational and occupational choices. *Psychology of Women Quarterly*, 18: 589-609.

Elfving, J., Brännback, M. & Carsrud, A. 2009. Toward a contextual model of entrepreneurial intentions: understanding the entrepreneurial mind. *International Studies in Entrepreneurship,* 24(1): 23-33.

European Commission 2006. Entrepreneurship education in Europe: Fostering entrepreneurial mindsets through education and learning. In *Final Proceedings of the Conference on Entrepreneurship Education in Oslo.*

Fayolle, A. & Gailly, B. 2005. Using the theory of planned behaviour to assess entrepreneurship teaching programmes. *Working paper 05/2005, Center for Research in Change, Innovation and Strategy*, Louvain School of Management.

Fayolle, A., Gailly, B. & Lassa-Clerc, N., 2006. Assessing the impact of entrepreneurship education programmes: a new methodology. *Journal of European Industrial Training,* 30(9): 701-720.

Fishbein, M. & Ajzen, I. 1975. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Addison-Wesley, Reading, MA.

Fiske, S.T. & Taylor, S.E. 1984. *Social Cognition.* Addison-Wesley, Reading, MA.

Galloway, L. & Brown, W. 2002. Entrepreneurship education at university: A driver in the creation of high growth firms? *Education Training,* 44(8/9): 398-405.

Garavan, T.N. & O'Cinneide, B. 1994. Entrepreneurship education and training programmes: A review and evaluation - Part 1. *Journal of European Industrial Training*, 18(8): 3-12.

Gatewood E.J., Shaver K.G., & Gartner W.B. 1995. A longitudinal study of cognitive factors influencing start-up behaviors and success at venture creation. J*ournal of Business Venturing,* 10(5): 371-391.

Gorman, G., Hanlon, D., & King, W. 1997. Some research perspectives on entrepreneurship education, enterprise education and education for small business management: A ten-year literature review. *International Small Business Journal,* 15(3): 56-77.

Grilo, I. & Irigoyen, J.-M. 2006. Entrepreneurship in the EU: To wish and not to be. *Small Business Economics,* 26(4): 305-318.

Guerrero, M., Rialp, J., & Urbano, D. 2008. The impact of desirability and feasibility on entrepreneurial intentions: A structural equation model. *International Entrepreneurship and Management Journal*, 4(1): 35-50.

Henderson, R. & Robertson, M. 2000. Who wants to be an entrepreneur? Young adult attitudes to entrepreneurship as a career. *Career Development International,* 5(6): 236-245.

Hout, M. & Rosen, H.S. 2000. Self-employment, family background, and race. *Journal of Human Resources,* 35(4): 670-692.

Hsu, D.H., Roberts, E.B. & Eesley, C.E. 2007. Entrepreneurs from technology-oriented universities: Evidence from MIT. *Research Policy,* 36(5): 768-788.

Hundley, G. 2006.Family background and the propensity for self-employment, *Industrial Relations,* 45: 377-392.

James, W.1890. *The Principles of Psychology*. New York: Holt.

James, W. 1950. *The Principles of Psychology*, Dover Publications.

Katz, J. & Gartner, W. 1986. Organization level perspectives on organization creation. *Working paper #619, University of Pennsylvania, Department of Management.* Wharton School, Philadelphia.

Kim, M. S., & Hunter, J. E. 1993. Relationships among attitudes, behavioral intentions, and behavior: A meta-analysis of past research, part 2. *Communication Research,* 20: 331–364.

Koh, H.C. 1995. Factors associated with entrepreneurial inclination: An empirical study of business undergraduates in Hong Kong. *Journal of Small Business Entrepreneurship, 1*2(2): 29-41.

Kolvereid, L. 1996a. Organizational employment versus self-employment: Reasons for career choice intentions. *Entrepreneurship Theory and Practice,* 20(3): 23-32.

Kolvereid, L. 1996b. Prediction of employment status choice intentions. *Entrepreneurship Theory and Practice*, 21(1): 47-57.

Kendall, D. 2011. Sociology in Our Times: The Essentials.Wadsworth.

Kipnis, A., 1997. *Producing Guanxi, Sentiment, Self, and Subculture in a North China Village.* Duke University Press, Durham, North Carolina.

Krueger, N. 1993. The impact of prior entrepreneurial exposure on perceptions of new venture feasibility and desirability. *Entrepreneurship Theory and Practice*, 18(1): 5-21.

Krueger, N.F. 2007. What lies beneath? The experiential essence of entrepreneurial thinking. *Entrepreneurship Theory and Practice*, 31(1): 123-138.

Krueger, N. 2009. Entrepreneurial intentions are dead: Long live entrepreneurial intentions. *International Studies in Entrepreneurship,* 24: 51-72.

Krueger, N.F. & Brazeal, D.V. 1994. Entrepreneurial potential and potential entrepreneurs. *Entrepreneurship Theory and Practice,* 18(3): 91-104.

Krueger, N.F. & Carsrud, A.L. 1993. Entrepreneurial intentions: Applying the theory of planned behaviour. *Entrepreneurship and Regional Development*, 5(4): 315-330.

Krueger, N. & Dickson, P.R. 1994. How believing in ourselves increases risk-taking: perceived self-efficacy and opportunity recognition. *Decision Sciences,* 25(3): 385-400.

Krueger, N.F., Reilly, M.D., & Carsrud, A.L. 2000. Competing models of entrepreneurial intentions. *Journal of Business Venturing,* 15: 411-432.

Kuratko, D.F. 2003. Coleman white paper: Entrepreneurship education – emerging trends and challenges for the 21st century. *Proceedings of the 17th United States Association of Small Business & Entrepreneurship Conference*. Hilton Head Island, January, 3-20.

Liñán, F. & Chen, Y.W. 2009. Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions. *Entrepreneurship Theory and Practice*, 33(3), 593-617.

Liñán, F., Urbano, D., & Guerrero, M. 2011. Regional variations in entrepreneurial cognitions: Start-up intentions of university students in Spain. *Entrepreneurship and Regional Development*, 23(3-4): 187-215.

Luthje, C., & Franke, N. 2003. The "making" of an entrepreneur: testing a model of entrepreneurial intent among engineering students at MIT. *R&D Management,* 33(2): 135-147.

Markham, G., Balkin, D., & Baron, R. 2002. Inventors and new venture formation: The effects of general self-efficacy and regretful thinking. *Entrepreneurship Theory and Practice,* 27(2): 149-165.

Marlow, S. & McAdam, M. 2011. Analyzing the influence of gender upon high-technology venturing within the context of business incubation. *Entrepreneurship Theory and Practice,* 36(4): 655-676.

Matthews, C.H. & Moser, S.B. 1996. A longitudinal investigation of the impact of family background and gender on interest in small firm ownership. *Journal of Small Business Management,* 34(2): 29-43.

McCall, M., Lombardo, M., & McCauley, N. 1988. *The Lessons of Experience: How Executives Develop on the Job*. Lexington Books, Lexington, MA.

Mclntyre, J. R. & Roche, M. 1999. University education for entrepreneurs in the United States: a critical and retrospective analysis of trends in the 1990s. Center for International Business Education and Research, *Georgia Institute of Technology, Working Paper Series, 99/00-021.*

McMullan, W.E., Chrisman, J.J., & Vesper, K.H. 2002. Lessons from successful innovations in entrepreneurial support programming. In J.J. Chrisman, J.A.D. Holbrook, & J.H. Chua (Eds.), *Innovation and Entrepreneurship in Western Canada: From Family Businesses to Multinationals.* University of Calgary Press, Calgary, Alberta.

Miller, B., Bell, J., Palmer, M., Gonzalez, A., & Petroleum, P. 2009. Predictors of entrepreneurial intentions: A quasi-experiment comparing students enrolled in introductory management and entrepreneurship classes. *Journal of Business Entrepreneurship,* 21(2): 39-62.

Mitchell, R.K. 1994. *The Composition, Classification, and Creation of New Venture Formation Expertise.* Unpublished doctoral dissertation, University of Utah.

Mitchell, R.K. 2005. Turning up the global value creation engine: The road to excellence in international entrepreneurship education. Advances in Entrepreneurship. *Firm Emergence and Growth*, 8: 185-248.

Mitchell, R.K., Busenitz, L.W., Morse, E.A., & Smith, J.B. 2007. The central question in entrepreneurial cognition research 2007. *Entrepreneurship Theory and Practice*, (SI): 1-27.

Mitchell, R.K., Smith, B., Seawright, K.W., & Morse, E.A. 2000. Cross-cultural cognitions and the venture creation decision. *Academy of Management Journal,* 43(5): 974-993.

Morris, M.H., & Jones, F.F. 1999. Entrepreneurship in established organizations: The case of the public sector. *Entrepreneurship Theory and Practice,* 24(1): 71-92.

Paço, A.M.F., Ferreira, J.M., Raposo, M., Rodrigues, R.G., & Dinis, A. 2011. Behaviours and entrepreneurial intention: Empirical findings about secondary students. *Journal of International Entrepreneurship*, 9(1): 20-38.

Peterman, N.E. & Kennedy, J. 2003. Enterprise education: Influencing students' perceptions of entrepreneurship. *Entrepreneurship Theory and Practice,* 28(2): 129-144.

Rivis, A. & Sheeran, P. 2003. Descriptive Norms as an Additional Predictor in the Theory of Planned. *Current Psychology,* 22 (3): 218-233.

Robinson, P.B., Stimpson, D., Huefner, J.C., & Hunt, H.K. 1991. An attitude approach to the prediction of entrepreneurship. *Entrepreneurship Theory and Practice,* 15(4): 13-31.

Robinson, P. B., & Sexton, E. A. 1994. The effect of education and experience on self-employment success. *Journal of Business Venturing,* 9(2):141-156.

Sanders, J.M. & Nee, V. 1996. Immigrant self-employment: The family as social capital and the value of human capital. *American Sociological Review,* 61(2): 231-249.

Sarasvathy, S.D. 2001a. Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of Management Review*, 26(2): 243-288.

Sarasvathy, S.D. 2001b. Entrepreneurship as economics with imagination. *Business Ethics Quarterly*, 3: 95-112.

Schwarz, E.J., Wdowiak, M.A., Almer-Jarz, D.A., & Breitenecker, R.J. 2009. The effects of attitudes and perceived environment conditions on students' entrepreneurial intent: An Austrian perspective. *Education +Training,* 51(4): 272-291.

Scott, M.G. & Twomey, D.F. 1988. The long-term supply of entrepreneurs: students career aspirations in relation to entrepreneurship, *Journal of Small Business Management,* 26(4): 5-13.

Shane, S. 2000. Prior knowledge and the discovery of entrepreneurial opportunity. *Organization Science,* 11(4): 448-469.

Shane, S. & Stuart, T. 2002. Organizational endowments and the performance of university start-ups. *Management Science*, 48(1): 154-170.

Shane, S. & Venkataraman, S. 2000. The promise of entrepreneurship as a field of research. *Academy of Management Review,* 25(1): 217-226.

Shapero, A. 1984. Why entrepreneurship? *Working paper, Babson College*.

Shapero, A. & Sokol, L. 1982. Social dimensions of entrepreneurship. In C.A. Kent, D.L. Sexton, & K.H. Vesper (Eds.), *Encyclopedia of Entrepreneurship*. Prentice-Hall, Englewood Cliffs, NJ, 72-90.

Smilor, R.W. & Gill, M.D. 1986. *The New Business Incubator: Linking Talent, Technology, Capital, and Know-How.* Lexington Books, Lexington, MA.

Souitaris, V., Zerbinati, S., & Allaham, A. 2007. Do entrepreneurship programs raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources*. Journal of Business Venturing*, 22(4): 566-591.

Tan, W.L., Long, A., & Robinson, P. 1996. Entrepreneurship attitude orientation and the intention to start a business. *Journal of Small Business Management,* 13(4): 50-61.

Tkachev, A. & Kolvereid, L. 1999. Self-employment intentions among Russian students. *Entrepreneurship and Regional Development*, 11(3): 269-280.

Tsui, A., Farh, L., Xin, K., 2000. Guanxi in the Chinese context. In: Li, J.T., Tsui, A., Weldon, E. (Eds.), *Management and Organization in the Chinese Context.* Macmillan, London, pp. 225– 244.

Tversky, A. & Kahneman, D. 1973. Availability: A heuristic for judging frequency and probability. *Cognitive Psychology,* 5(2): 207-232.

Tversky, A. & Kahneman, D. 1974. Judgment under uncertainty: Heuristics and biases. *Science,* 185: 1124-1131.

Veciana, J.M., Aponte, M., & Urbano, D. 2005. University students' attitudes towards entrepreneurship: A two countries comparison. *International Entrepreneurship and Management Journal*, 1(2): 165-182.

Verheul, I., Thurik, R., Grilo, I., & Van Der Zwan, P. 2011. Explaining preferences and actual involvement in self-employment: Gender and the entrepreneurial personality. *Journal of Economic Psychology*, 33(2): 345-341.

Verheul, I., Uhlaner, L., & Thurik, R. 2005. Business accomplishments, gender and entrepreneurial self-image. *Journal of Business Venturing,* 20: 483-518.

Verheul, I., Wennekers, S., Audretsch, D., & Thurik, R. 2002. An eclectic theory of entrepreneurship: Policies, institutions and culture. In D.B. Audretsch, R. Thurik, I. Verheul, & S. Wennekers (Eds.), *Entrepreneurship.* Kluwer Academic Publishers, 11-82.

Walstad, W. & Kourilsky, M. 1998. Entrepreneurial attitudes and knowledge of Black youth. *Entrepreneurship Theory and Practice*, 23(2): 5-18.

Wang, C.K. & Wong, P.K. 2004. Entrepreneurial interest of university students in Singapore. *Technovation,* 24: 163-172.

Wank, D., 1999. *Commodifying Communism: Business, Trust, and Politics in a Chinese City*. Cambridge University Press, NY.

Wilson, B.C. 2002. A study of factors promoting success in computer science including gender differences. *Computer Science Education*, 12(1-2): 141-164.

Wilson, F., Kickul, J., & Marlino, D. 2007. Gender, entrepreneurial self-efficacy, and entrepreneurial career intentions: Implications for entrepreneurship education. *Entrepreneurship Theory and Practice*, 31(3): 387-406.

World Bank 2008. *Doing Business 2008: Comparing Regulations in 178 Economies.* World Bank Group, Washington.

Wu, S. and L. Wu, 2008, The impact of higher education on entrepreneurial intentions of university students in China, *Journal of Small Business and Enterprise Development,* 15:752-774.

Zhang, Z., Zyphur, M.J., Narayanan, J., Arvey, R.D., Chaturvedi, S., Avolio, B.J., Lichtenstein, P., & Larsson, G. 2009. The genetic basis of entrepreneurship: Effects of gender and personality. *Organizational Behavior and Human Decision Processes,* 110: 93-107.

Zhao, H., Seibert, S.E., & Hills, G.E. 2005. The mediating role of self-efficacy in the development of entrepreneurial intentions. *Journal of Applied Psychology*, 90(6): 1265-1272.

Chapter 5

Abramovitz, M. 1986. Catching-up, forging ahead and lagging behind. *Journal of Economic History,* 46(2): 385-406.

Ajzen, I. 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2): 179-211.

Cooper, A., Woo, C., & Dunkelberg, W.C. 1988. Entrepreneurs' perceived chances for success. *Journal of Business Venturing*, 3(2): 97-108.

GEM Global Report. 2008. http://www.gemconsortium.org/

Huang, Y. 2010. Debating China's economic growth: The Beijing consensus or the Washington consensus. *Academy of Management Perspectives,* 24(2): 31-47.

Krueger, N. 1993. The impact of prior entrepreneurial exposure on perceptions of new venture feasibility and desirability. *Entrepreneurship Theory and Practice*, 18(1): 5-21.

Krueger, N.F., Reilly, M.D., & Carsrud, A.L. 2000. Competing models of entrepreneurial intentions. *Journal of Business Venturing*, 15: 411-432.

Mitchell, R.K., Busenitz, L.W., Morse, E.A., & Smith, J.B. 2007. Cognition research 2007. *Entrepreneurship Theory and Practice,* (SI): 1-27.

Shane, S. 2012. Reflections on the 2010 AMR decade award: Delivering on the promise of entrepreneurship as a field of research. *Academy of Management Review*, 37(1): 10-20.

Shane, S. & Venkataraman, S. 2000. The promise of entrepreneurship as a field of research. *Academy of Management Review,* 25: 217-226.

Shapero, A. & Sokol, L. 1982. Social dimensions of entrepreneurship. In C.A. Kent, D.L. Sexton, & K.H. Vesper (Eds.), *Encyclopedia of Entrepreneurship.* Prentice-Hall: Englewood Cliffs, NJ, 72-90.

Appendix

Appendix I

(For Chapter 3)

This interview is in support of a research project on entrepreneurship development in China, sponsored by the United Nations University and the Eindhoven University of Technology. The research is in part about the technological catching-up of Chinese firms, and Huawei Technologies Co., Ltd. is representative of enterprises that have successfully achieved this. This interview will collect information for this research. We guarantee that if necessary the information provided will be kept confidential and not published in international management journals or presented at international conferences. The goal of this interview is to hear from Huawei about how it formalizes its technological catching-up via its strategic network within and outside the company. We greatly appreciate your participation in this research.

(This interview can be undertaken in Chinese, because the interviewer can be Chinese.)

1. According to our study of Huawei's internationalization, Huawei's development can be divided into three phases: the pre-catching-up phase (1988–1995); the catching-up phase (1996–2003), and the post-catching-up phase (2004–present). Do you agree with this division? If not, what is your opinion? Please briefly discuss Huawei's development with regard to its corporate performance (in terms of marketing and technological capacity, e.g., R&D).

2. It is well known that Huawei is the most geographically spread multinational company. It has multiple collaborators in different countries and industries. These collaborations occur at three levels: intrafirm, interfirm, and industrial

district. Please discuss these three types of networks. How did they evolve over time?

3. We have some questions about Huawei's intrafirm network in the last twenty years.
    a. Does Huawei have frequent employee transfers among different departments and subsidiaries? What is the level of employee turnover in the whole organization? How does headquarters work with different subsidiaries? Has headquarters decentralized its authority to subsidiaries?
    b. How does Huawei ensure that its employees share the same vision and collective goals? How does it accommodate local cultural differences?
    c. Were there any cases of mistrust between different departments/subsidiaries? How did Huawei cope with it? Does it have clear reward criteria to reduce intrafirm mistrust?
    d. Did interdepartmental or intersubsidiary learning occur? How did Huawei use the intrafirm network to improve its performance?

4. We have some questions about Huawei's network of strategic alliances in the last twenty years.
    a. How many different contacts did Huawei have? Were these with suppliers, customers, universities, or competitors? Could you please describe its communication with external partners: How? How often? What about? How did these contacts change over time? What was Huawei's position in the strategic-alliance network over time? How many contacts were close and repeated? How many contacts were weak collaborations? Did the external partners know one another? Were some of Huawei's close partners also close partners of Huawei's other partners or competitors? Were there multiple knowledge exchanges between partners? How did Huawei manage the exchange of knowledge/information? Did it use a noncompetitive approach to transfer knowledge among partners?

b. What was the collaboration culture in which Huawei and its partners operated? Did they share similar goals or a similar corporate culture? If not, how did Huawei manage the collaborations: In a compatible way? Via sharing? Or in some other way?

c. Did Huawei establish trust with its collaborators? Was the behavior of each partner transparent? Were interactions repeated? Was there any risk of opportunism? Was there mutual trust? Was the trust long-term? Was it institution-, behavior-, or process-based? Did Huawei sense any bias against Chinese firms?

d. Was there any risk? For instance, Huawei transferred information to others, but by using this information, a partner could become a direct competitor. If so, are there any norms or rules (formal or informal) to reduce this risk? If not, how did Huawei cope with the risk associated with giving and receiving information?

e. How would you describe the purpose and business logic underlying the relationship between Huawei and its collaborators (from Huawei's point of view/from its partners' point of view)? Did Huawei learn something from its collaborators? How did the learning process evolve over time?

f. Huawei emphasized collaborations with universities and research institutes. Could you please discuss the learning strategy that Huawei used to collaborate with universities? What did it learn from these collaborations? How did it evaluate this type of collaboration? How did Huawei maintain its relationship with universities?

5. Huawei has many overseas subsidiaries, and it chooses the location of these carefully. We have some questions about Huawei's industrial-district network.

a. When did Huawei enter this type of network? Why and how? Please discuss the number of members, the frequency of communication, and the stability of the relationship. How did these collaborations evolve over time? What makes these relationships work? How does every partner know what

to do? What is Huawei's position in the network? How does the telecommunication-industry network compare to others in the communications industry? Is the network stable?

b. Did Huawei locate close to other network members? Did it have assistance to connect with organizations in other cliques? Did it have stable relationships with other cliques?

c. How would you describe the purpose and business logic underlying the relationship between Huawei and its collaborators (from Huawei's point of view/from its partners' point of view)? Does Huawei share its technology and knowledge with other members when they work together to solve problems? What has Huawei learned from them? Are there any fixed rules for the process of joint cooperation technologically, economically, and culturally? What are they?

d. Was there any risk? For instance, Huawei transferred information to others, but by using this information, a partner could become a direct competitor. If so, are there any norms or rules (formal or informal) to reduce this risk? If not, how did Huawei cope with the risk associated with giving and receiving information?

6. In your opinion, does Huawei favor using the network approach to improve its performance? Please discuss how it successfully combines these three types of network.

Appendix II

(For Chapter 4-Survey Questionnaire)

个人信息	
性别: A 男 B 女	年龄： A. 22 岁以下 B.22-26 岁 C.27-30 岁 D. 30 以上
教育水平： A. 本科在读 B. 硕士在读 C. 博士在读 D. 工作	所在或毕业学校：
专业背景：	

1. 创业经验

1.1 你的父母曾经有创业经验吗？他们的创业成功吗？

A. 有， 成功
B. 有，不成功
C. 没有创业经验
D. 其他_____

1.2 你的亲戚朋友曾经有创业经验吗？他们的创业成功吗？

A. 有， 都很成功
B. 有，部分人一定程度上的成功
C. 有，完全不成功
D. 没有创业经验

1.3 你自己曾经有创业经验吗？你的创业成功吗？

A. 有， 成功
B. 有，不成功
C. 没有创业经验
D. 正在创业当中，预期成功
E. 正在创业当中，预期不成功

1.4 你曾经在小型企业/公司工作过吗？这些公司企业成功吗？

A. 有， 成功

B. 有，不成功

C. 没有工作过

1.5 如果你有工作经验，请注明是什么行业？

A. 政府部门

B. 公共组织

C. 国有企业

D. 合资企业

E. 外企

F. 私营企业

G. 上市持股公司

H. 学校

2. 创业教育

2.1 你曾经参加过创业培训或者创业课程、创业活动吗？如果你曾经参加过创业培训或创业活动， 请注明是哪所学校或单位承办的？

A. 有，_____

B. 没有， 但是打算参加

C. 没兴趣参加

D. 对创业培训课程没概念

2.2 你的创业知识是从哪里得来的？（多选）

A. 创业培训、创业课程、创业活动

B. 父母及亲戚朋友的创业经验和（或）自己的创业或者工作经验

C. 没有创业知识

D. 其他途径，_____

2.3 如果你自身有创业知识， 你有意愿去创业吗？

A. 有， 打算在毕业以后马上创业

B. 有， 但是可能在毕业几年以后等有了足够的资金和经验再选择创业

C. 没有这个意愿

D. 有，在上学时候就创业

2.4 如果你有创业意愿， 你目前有具体的创业方案吗？

A. 有

B. 目前没有具体方案，但是正在思考方案

C. 没有方案

3. 创业意向

3.1 你想过自己将来要创业吗？

A. 想过

B. 没想过

3.2 你是否愿意拥有自己的事业？

A. 非常愿意

B. 愿意

C. 相对愿意

D. 不太愿意

E. 非常不愿意

3.3 你对压力敏感吗？

A. 非常敏感

B. 敏感

C. 一般敏感

D. 有点敏感

E. 完全不敏感

3.4 你对自己创业是否有热情？

A. 非常有热情

B. 有热情

C. 一般热情

D. 热情低

E. 没有热情

3.5 你认为创业难吗？

A. 非常难

B. 难

C. 一般难

D. 不太难

E. 不难

3.6 你对自己创业的成功有多大把握？

A. 非常有把握

B. 有把握

C. 一般有把握

D. 把握不太大

E. 没把握

3.7 你对自己的能力有多大自信？

A. 非常有自信

B. 有自信

C. 一般有自信

D. 不太有自信

E. 没有自信

Summary (English)

Studies of entrepreneurship focus on one of three areas: entrepreneurship as an engine to drive national economic growth, CE as an instrument to facilitate corporate performance, and individual EI as the source of entrepreneurial behavior. There has been rapid development and corporate catching-up in emerging economies, such as BRIC, but there are few studies of entrepreneurship in this environment. In the context of China, the largest emerging country in the world, this dissertation addresses the research question: *How does entrepreneurship develop in China at the national, corporate, and individual levels?*

Entrepreneurship has played a significant role in China's rapid growth; Huang (2010) presented evidence for this. However, China's entrepreneurship development cannot be isolated from its transitional environment, which has involved political and economic reforms. To explore entrepreneurship development in the recent economic transition stage, in chapter 2, I first asked: what stage has entrepreneurship in China reached? To answer this question, one must select the transitional pillars that are important in the context of Chinese reform. As explained in Chapter 2, I chose four: GDP per capita to reflect the standard of living and poverty reduction, educational resources to reflect reform in the national institutional system (the heavy investment in higher education), FDI to reflect the open economy, and the unemployment rate to reflect the consequences of reform in state-owned sectors.

Before evaluating the impact of these four factors on entrepreneurial activities in China, I discussed the Chinese entrepreneurship environment, beginning at the start of the economic reform at the end of the 1970s. I then showed the evolution of entrepreneurial development, with its lower-case-v shape. GDP per capita increased from 1996 (the year that private entrepreneurship was formally acknowledged) to 2008. This corresponds to China's economic

transition: from the factor-driven phase to a transitional stage between the factor-driven and efficiency-driven phases, and then to the efficiency-driven stage. Taking this into account, I focused on the most recent transition stage (the efficiency-driven stage) and analyzed the impact of economic transition (in terms of the four pillars) on entrepreneurship development. The results reveal the positive impact of China's economic transition on entrepreneurship development. Typically, GDP per capita has a significant inverted-U-shaped impact on entrepreneurship, which reflects the government's focus on state sectors and urban infrastructure since 2007 (to reduce the marginal rate of increase in self-employment). Educational resources and economic openness are positively related to entrepreneurship (and have a positive interactive impact economic growth), corresponding to GEM's report (GEM Global Report, 2008), which states that Chinese entrepreneurs are likely to be highly educated. Unemployment has a positive push effect and a negative interactive effect on GDP per capita, demonstrating that China's entrepreneurship had developed (by 2008) into a transitional phase between necessity-based and opportunity-based. Unemployed people are likely to prefer wage employment to self-employment, which is consistent with the efficiency-driven development stage of that time.

This study contributes to empirical studies on the relationship between the economic-development stage and entrepreneurship development. It provides another view of entrepreneurship development in a transitional economy. Moreover, this study contributes to the debate on the Beijing consensus versus the Washington consensus. In terms of the former, this study indicates that entrepreneurship development in China is government-led and owes much to the governmental initiation of institutional transition. However, the results suggest that the *ex ante* dimensions of entrepreneurship development correspond to the requirements of the Washington consensus (at least in terms of economic openness). Hence, I take a middle position in this lively debate: I believe that China's development is driven by both scenarios. At the political

level, which I argue is the framework level, China follows the Beijing consensus, because it has long-term political decision-making (by a single political party) and experimentation-based policy development (defined by Deng Xiaoping). At the micro level however, economic development is driven by the Washington consensus. China is trying to build up a formal institutional framework that supports private property rights, economic openness, financial reforms, macroeconomic stability, and political liberalization. There is a contradiction between the political liberalization defined by the Washington consensus and the current situation in China. However, I still argue that, as a result of the government's proactive behavior, quiet progress is being made on every disputed issue (including liberalization).

Chapter 2 investigated Chinese entrepreneurship development at the macro level. I explored corporate entrepreneurial development and its impact on corporate catching-up. The catching-up concept originated in the economics field at the national level. The investigation of corporate catching-up, especially for emerging countries, is challenging because there is a theoretical deficit. National catching-up theory indicates that innovation is essential for catching-up and social advance is a necessary precondition for catching-up (Abramovitz, 1986). I assumed that similar arguments would apply to corporate catching-up, and I wanted to explore the underlying mechanism. I used CE theory, resource-based theory, dynamic-capability theory, and network theory to explain my corporate catching-up framework. I tested the framework in chapter 3 with a case study of Huawei Technologies Co., Ltd. The results show that social capability helps a firm to acquire social capital, diffuse technology and knowledge, improve its social status, address resource gaps, and explore opportunities. Moreover, the results indicate that catching-up firms are similar to entrepreneurial firms in terms of growth-orientation, innovation, and alertness. CE strategies, particularly collaboration-based networks, facilitate corporate catching-up. Huawei's growth indicates that networking improves

social capability and allows a company to exploit and explore new technologies and new opportunities.

I also made peripheral findings. For instance, the integration of the three network layers is an overall approach for corporate catching-up. This is because of the structural, relational, and cognitive social capital gained from networks for knowledge acquisition, transfer, sharing, and creation internally and externally. Structurally, a sparse interfirm network with increased network composition and strong ties can coexist with a cohesive intrafirm network. This facilitates external opportunity exploration and internal opportunity exploitation. Moreover, the industrial-district network provides a snapshot of intrafirm and interfirm networks in a particular location. Theoretically, this work supports corporate catching-up theory, enriches social network theory, and provides support for the aggregation of strategic alliances, M&As and corporate venturing in an open-innovation paradigm. This study provides empirical evidence for the process by which people exploit opportunities within existing organizations (Shane, 2012). Practically, this work has many strategic implications for latecomer catching-up firms.

Chapters 2 and 3 presented a partial picture of China's entrepreneurship development. Chapter 2 indicated that China's entrepreneurship is moving from necessity-based to opportunity-based, and higher education now plays a role. Chapter 3 showed that corporate catching-up is closely associated with individual EI and behavior. Any entrepreneurial behavior can be traced down to the individual level. Krueger (1993) indicates that intentionality is a predictor of entrepreneurial behavior. Therefore, it is important to understand the determinants of EI endogenously and exogenously.

Given the results of chapters 2 and 3 and the observation that the emerging generation of entrepreneurs has more education, I predicted that there would be several influential factors. These are the perceived desirability, the perceived feasibility, and the entrepreneurship cognition developed through

education or exposure to entrepreneurial activity. Therefore, chapter 4 aimed to identify the role of education in shaping individual entrepreneurial intention. It indirectly contributes to the discussion about whether entrepreneurs are born or made. I used a conceptual framework (Fig. 4.1) based on Ajzen's TPB and Shapero's EEM. The data were collected via a survey of ten Chinese universities. The results show that education is the major source of entrepreneurship knowledge and has a significant positive impact on EI. However, exposure to entrepreneurial activity has a negative impact on EI in China. More interestingly, the results show that males and students with technological backgrounds have higher EI than females and those without this background. These results are strengthened by the moderate impact of entrepreneurship education, which indicates that such education is more likely to have positive consequences for technological universities and majors than for other universities and majors.

This work makes contributions in two areas. (1) By adapting the TPB (Ajzen, 1991) and the EEM (Shapero & Sokol, 1982), this study contributes theoretically by integrating the two streams of theory. I have shown the role of entrepreneurial knowledge in the EI model and compared the impact of different variables on EI. (2) This study contributes to empirical knowledge by providing supporting evidence. Entrepreneurship research should focus (Mitchell et al., 2007) on person, situation, cognition, and motivation. This study provides evidence for the source of individual entrepreneurial cognition in the Chinese context.

Shane and Venkataraman (2000) argue that entrepreneurship should be seen as a process and not as the embodiment of a type of person. Following this, I argue that in terms of opportunity identification, evaluation, and exploitation this process is important not only at the individual level but also at the corporate and national levels. Recently, Shane (2012) has claimed that existing studies of entrepreneurship do not provide a sufficient understanding of how

the context influences the identification and exploitation of opportunities. However, we do have a better understanding of the process by which people exploit opportunities within existing organizations. I have provided evidence for and insight into this topic in the context of emerging and transitional economies.

Regarding the process perspective of entrepreneurship (Shane, 2012), the three core chapters of this dissertation loop as a *reciprocal process* between (1) the EI-formation process, which can be the *ex ante* step of identifying and exploiting high-potential opportunities (Chapter 4), (2) the process of identifying and exploiting catching-up opportunities in existing organizations (Chapter 3), and (3) the process of understanding the impact of institutions and corporate characteristics on entrepreneurship (Chapter 2). This loop can be explained as follows: first, process (2) cannot work without process (1), because corporate identification and exploration are carried out by individuals. Secondly, process (1) depends on process (2), because process (2) involves actors in process (1). The relationship between process (3) and process (2) is similar, meaning that if process (3) at the national level is entrepreneur-friendly, the development of process (2) is facilitated, and this leads to more efficient entrepreneurial progress. Meanwhile, process (2) helps to drive process (3) at an aggregate level.

About the Author

Ying Zhang was born on January 19, 1982 in Shaanxi province, P.R. China. In 2004, she graduated from Northwest University (China) in the major of information systems and information management (cum lauder). In the same year, she was granted China national graduated award to pursue the M.Phil. at the same university (in the field of technological economics and technological management). In 2006, Ying started her second master program in innovation management at Eindhoven University of Technology (the Netherlands) and graduated in 2008. From September 2008 to August 2012, Ying worked on her Ph.D. research at the United Nations University-MERIT and Eindhoven University of Technology, sponsored by the United Nations and by Huygens Fund from the Dutch Ministry of Education, Culture, and Science.

From August 2012 onwards, Ying is working as an Assistant Professor in the field of entrepreneurship, innovation, and Chinese economy & business, at Rotterdam School of Management, Erasmus University.