Developing Innovation Capability:
The Case of Chinese Automobile Companies



BY

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THESIS

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This thesis is dedicated to my parents,
who have given me life, love, and light.

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LIST OF ABBREVIATIONS

EE Emerging Economy

SOE State Owned Enterprise

FDI Foreign Direct Investment

IJV International Joint Venture

FAW First Automobile Works

SAIC Shanghai Automotive Industry Corporation

BAIC Beijing Automotive Industry Corporation

GAC Guangzhou Automotive Group Corporation

BYD Build Your Dreams

GM General Motors

AC Absorptive Capacity

ABSTRACT

Innovation contributes to the firm's competitive advantage, and it also provides the engine for long-term economic growth. As the emerging markets transition from a centrally planned to a market-based system, understanding and promoting innovation during this process is of vital importance as to create value and achieve sustainable development. Therefore, this thesis contributes to a vibrant conversation in social sciences on the topic of innovation, with a special focus on emerging markets. Given that the firm is the primary actor in determining the effectuation of innovation and technological change, I have focused on the innovation capability of Chinese automobile assembly companies. More specifically, this thesis investigates one central research question: what are the critical factors that influence the innovation capability of Chinese automobile companies and how (both independent and joint effect)?

This thesis builds on multiple theories in the field of innovation, strategic management and international business (i.e., resource-based view, behavioral theory, and institution-based view), and employs a mixed-methods approach with the collection and analysis of both qualitative and quantitative data. The qualitative approach involves intensive literature reviews, personal interviews, field observation, company reports and etc.; and quantitative data includes an industry-wide survey and archival data. A four-paper structure has been adopted to address the research question in both depth and scope. Being explorative in nature, **Paper 1** explains the drivers and consequences of the innovation capability of Chinese automakers. Based on the resource-based view, five potential resources are examined regarding their independent effect on building innovation capability. Further considering the contingent value of organizational resources, ownership is studied as a

boundary condition shaping the effect of resources on the firm's innovation capability. Focusing on internal factors within the firm, **Paper 2** investigates the interaction effect of innovation incentives and workplace relationships on absorptive capacity, one type of innovation capabilities that emphasizes the process of searching, assimilating and exploiting valuable external knowledge. Specifically, vertical and horizontal relationships in the workplace are demonstrated to affect the effect of innovation incentives on absorptive capability differently. Acknowledging knowledge as the most important resource in innovation, **Paper 3** takes a structural approach towards knowledge search and absorption. It highlights two dimensions of external knowledge linkages, namely breadth and depth, and examines how the breadth and depth of knowledge linkages relate to innovation in the Chinese automobile sector. Shifting the attention to external factors, the last paper (**Paper 4**) stresses the impact of external institutions (i.e., the Chinese government) on firms and zooms in to study how one Chinese privately owned auto company (Geely) adapts and performs since its establishment in the early 2000s. The value of taking an integrated strategy that combines political, marketing and technological strategies is especially valuable in the Chinese institutional context with strong government resource dependence and policy uncertainty.

This thesis makes three major contributions to the existing literature. First, by focusing on the Chinese automobile assembly companies, it enhances the understanding of innovation in one of the biggest emerging markets, characterized by strong government intervention, complex knowledge networks, and the prospect of technology leapfrogging. Second, studying the innovation processes at the organizational level reveals the complex, dedicated nature of promoting innovation capability and performance. In particular, it speaks

to the conceptual models and empirical findings on the contingent value of different kinds of resources, the asymmetric role of vertical and horizontal and relationships in organizations, and the depth and breadth of knowledge linkage. Third, it sheds light on the relationships between micro and macro-level phenomenon, especially the firm-industry-government interaction. These findings are potentially applicable for policy makers in other emerging markets where there is a strong need for innovation capability and economic growth.

Chapter 1 INTRODUCTION

Contents

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1.1.1 Chinese automobile assembly companies 2
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1.1 Research background

Innovation not only contributes to firms' competitive advantage and superior performance but also drives long-term economic growth and sustainable prosperity in society (Stern, Common, & Barbier, 1996; Stern, 2004). With the rise of emerging economies (EEs) [1], such as the BRIC countries (i.e. Brazil, Russia, India and China), innovation in EE firms has attracted increasing attention from researchers, business practitioners, and policymakers (Guan, Yam, Tang, & Lau, 2009; Li & Kozhikode, 2009; Radas & Božić, 2009; Zhou, 2006).

Nevertheless, due to the absence of a commonly accepted definition of innovation, there are conflicting views concerning innovation in EEs. On the one hand, anecdotal evidence continues to suggest a dearth of innovation in EEs. EE firms are often conceived of as mere imitators that illicitly and illegitimately infringe a pioneer's intellectual property rights, such as brand, trademark, and patent. On the other hand, others highlight learning and creative imitation, arguing that EE firms have an edge in the cost and speed of innovation due to being able to effectively leverage resources, focus on process

[1] Hoskisson et al. (2000) defines an emerging economy as a country that satisfies two criteria: i) rapid economic development; and ii) government policies favouring economic liberalisation and the adoption of a free-market system.

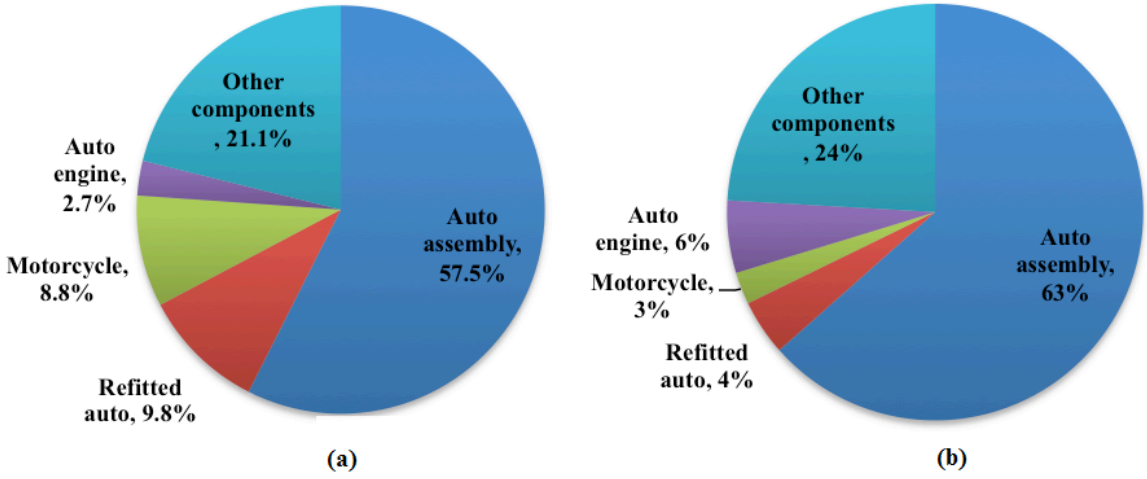
innovation and the novel recombination of existing technologies (Luo, Sun, & Wang, 2011). To reconcile the existing inconsistency, research on innovation in EE firms is much needed, especially given that existing innovation theories are based mainly on Western companies that do not share the unique characteristics of firms in EEs.

This thesis focuses on Chinese automobile assembly companies, which serve as a suitable context for an enquiry into innovation in emerging markets. First, as one of the largest emerging markets, China's institutional context contrasts sharply with those of developed economies (Wang, Qiu, & Kuang, 2009). Specifically, it is characterised by market heterogeneity, socio-political governance, a chronic shortage of resources, unbranded competition, and inadequate infrastructure (Sheth, 2011). Second, Chinese domestic automakers have an inglorious history of copying car designs from other manufacturers, from low-cost Mini lookalikes, cut-price BMW X5, and Range Rover Evoques to even an attempt at the grandeur of a Rolls-Royce. Nonetheless, there is no doubt that Chinese automobile companies have exhibited a rapid learning capability and are building up their knowledge base. For the production of complex product systems like automobiles, it takes time for latecomers to master the existing technologies, optimise the manufacturing processes, and gradually move to the technological frontier.

1.1.1 Chinese automobile assembly companies

Taking over half of the total industrial production value, Chinese automobile assembly firms are the dominant players in China's automobile industry (see Figure 1-1). China's automobile industry started in the 1950s when the country set up its first national auto plant, First Auto Works (FAW), and transferred Russian technology to produce trucks. Rapid modernisation and development began in the 1990s with the introduction of foreign technologies through international joint ventures. Along with the nation-wide

economic liberalisation, the demand for cars shifted from military/official usage to the mass market, resulting in a thriving automobile industry. In recent years, China has emerged as the world's largest automobile market and leading car manufacturing country. In 2015, the total production and sales of vehicles reached new heights, with both exceeding 24 million (see Figure 1-2). The market is predicted to be larger than the North American and European markets combined by 2020 (Wang, Liao, & Hein, 2013).



(a) (b)

Figure 1-1 China's automobile sub-sectors based on production values in 2002(a) and 20012(b)

Source: China Automotive Industry Yearbooks

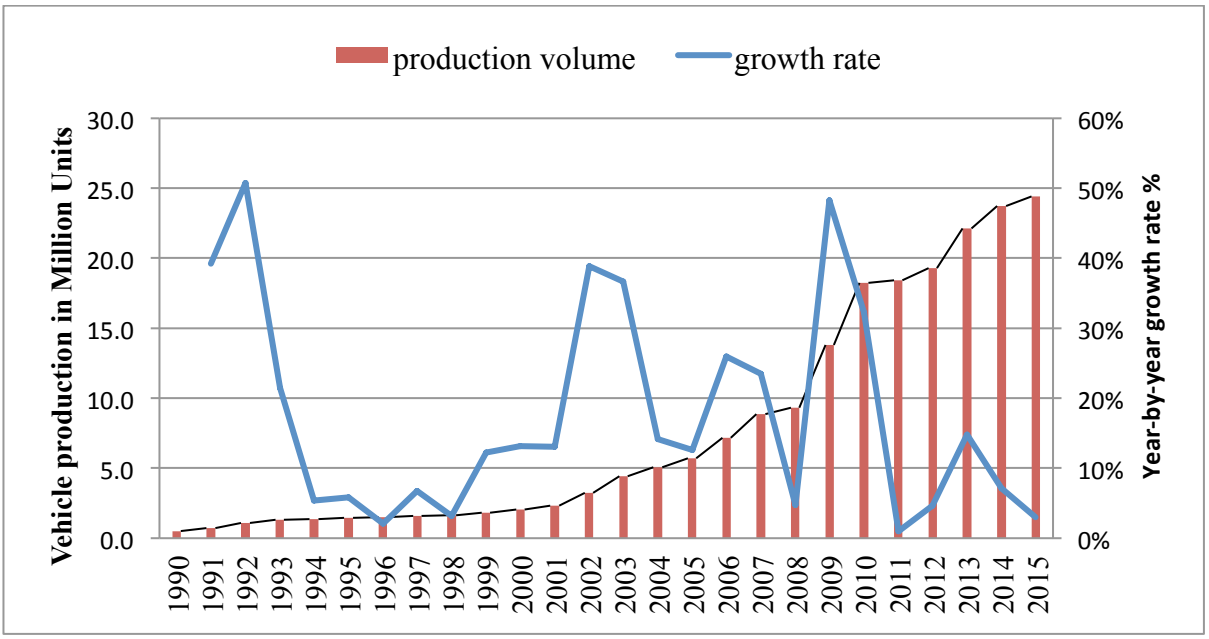


Figure 1-2 Annual vehicle production in China from 1990 to 2015
Source: China Association of Automobile Manufacturers (unless specified otherwise)

Chinese automobile assembly firms offer a wide range of products, including both passenger cars (i.e. sedans, SUV, MPV, and minivans[2]) and commercial vehicles (i.e. trucks, buses[3], and tractors). Passenger cars have dominated total vehicle sales for years, with a share of 86% in 2015 (see Figure 1-3). However, the passenger vehicle segment is largely dominated by foreign brands (see Table 1-I). Since foreign investment into the automotive sector is restricted, foreign automobile manufacturers have formed international joint ventures (IJVs) with domestic partners to produce automobiles with foreign brands in China. Until recently, the share of domestic brands has been on the rise, growing from 32.4% in 2010 to 38.4% in 2014 (EU SME Centre, 2015). By contrast, domestic automakers played the major role in the commercial vehicle segment, with over 90% of the market share (see Table 1-II). For a list of major auto IJVs in China, see Table 1-III.

[2] With a seating capacity of eight passengers and below.
[3] Light bus: up to 9 seats; medium bus: 10 to 29 seats; large bus: 30 seats or more.

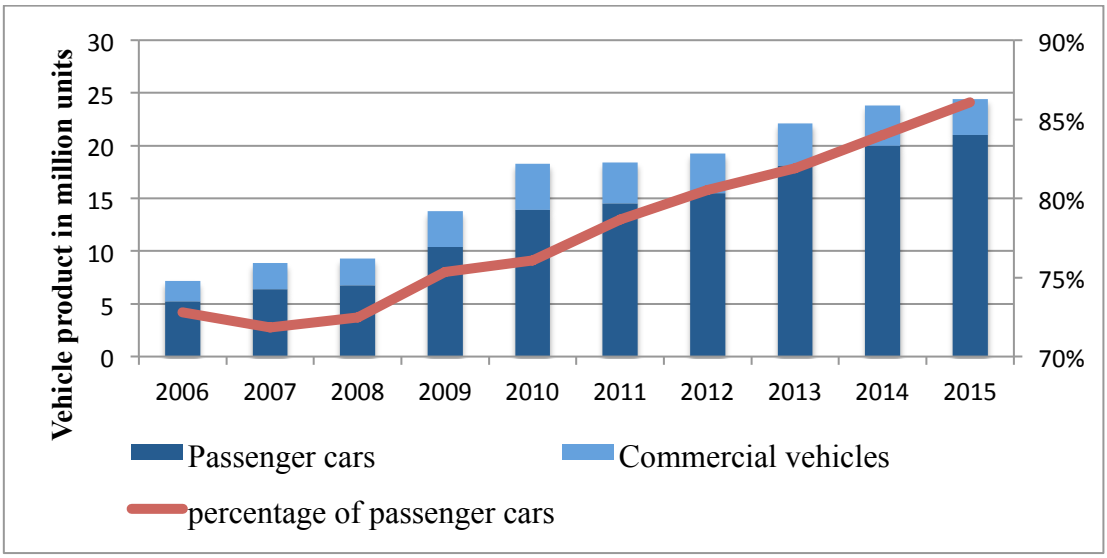


Figure 1-3 Passenger and commercial vehicles production from 2006 to 2015

Table 1-I Top 20 Chinese passenger cars assembly firms by annual sales in 2015

No.	Name	Headquarter	Sales (1000 Units)	Growth rate (%)	Market Share (%)	Type
1	SAIC-Volkswagen	Shanghai	1805.6	4.7	8.5	IJV
2	SAIC-GM	Shanghai	1725.0	0.1	8.2	IJV
3	FAW-Volkswagan	Jilin	1650.2	-7.3	7.8	IJV
4	SAIC-GM-Wuling	Guangxi	1181.8	26.7	5.6	IJV
5	BAIC-Hyhundai	Beijing	1062.8	-5.1	5.0	IJV
6	Dongfeng-Nissan	Guangzhou	1000.7	5.1	4.7	IJV
7	Chang'an	Chongqing	938.0	32.1	4.4	SOE
8	Chang'an-Ford	Chongqing	868.7	7.8	4.1	IJV
9	Changcheng Auto	Hebei	753.2	23	3.6	Private
10	Dongfeng-PCA	Hubei	704.8	0.1	3.3	IJV
11	Dongfeng-Kia	Jiangsu	616.1	-4.6	2.9	IJV
12	FAW-Toyota	Beijing	607.7	4.3	2.9	IJV
13	GAC-Honda	Guangdong	580.1	20.8	2.7	IJV
14	Geely	Zhejiang	542.7	27.5	2.6	Private
15	Chery	Anhui	458.8	-0.4	2.2	Private
16	BYD	Shenzhen	455.4	4	2.2	Private
17	Dongfeng-Honda	Hubei	406.5	31.9	1.9	IJV
18	GAC-Toyata	Guangdong	403.1	7.7	1.9	IJV
19	Jianghuai Auto	Anhui	346.2	76.8	1.6	SOE
20	BAIC	Beijing	293.6	39.7	1.4	SOE

Note: Top 20 passenger cars assembly firms have a total market share of 78%.

Table 1-II Top 10 Chinese commercial cars assembly firms by annual sales in 2015

No.	Name	Headquarter	Sales (1000 Units)	Market Share (%)	Type
1	BAIC Foton Motor	Beijing	473.0	13.7	SOE
2	Dongfeng Auto	Hubei	398.7	11.6	SOE
3	Huachen Jinbei Auto	Liaoning	252.6	7.3	SOE
4	SAIC-GM-Wuling	Guangxi	242.4	7.0	IJV
5	Jiangling Auto	Jiangxi	232.4	6.7	IJV
6	Jianghuai Auto	Anhui	231.8	6.7	SOE
7	FAW	Jilin	175.2	5.1	SOE
8	China National Heavy Duty Truck	Shandong	158.2	4.6	SOE
9	Chongqing Lifan	Chongqing	144.2	4.2	Private
10	Chang'an Auto	Chongqing	143.4	4.2	SOE

Note: Top 10 Chinese commercial cars assembly firms have a total market share of 71.04%.

Table 1-III Major auto assembly IJVs in China

Chinese partner	Foreign partner	Establishment	Headquarter	2012 Sales/ 1000 units
SAIC	Volkswagen	1985	Shanghai	1,280
BAIC	American Motor Corporation/Chrysler	1984/1987	Beijing	-
GAC	Peugeot Citroen	1985-1997	Guangdong	-
FAW	Volkswagen	1991	Jilin	1,369
Dongfeng Motor	Peugeot Citroen (PCA)	1992	Hubei	440
Chang'an Auto	Suzuki	1993	Chongqing	170
Nanjing Auto	Fiat	1996	Jiangsu	132
SAIC	General Motors	1997	Shanghai	1,393
GAC	Honda	1998	Guangdong	362
FAW	Toyota	2000	Beijing	495
SAIC	Volvo Bus	2000	Shanghai	3.3
Chang'an Auto	Ford	2001	Chongqing	418
BAIC	Hyhundai	2002	Beijing	860
Dongfeng Motor	Kia	2002	Jiangsu	481
Wuling & SAIC	General Motors	2002	Guangxi	1,458
Brilliance	BMW	2003	Liaoning	303
Dongfeng Motor	Nissan	2003	Guangdong	774
Dongfeng Motor	Honda	2003	Hubei	282
GAC	Toyota	2004	Guangdong	250
BAIC	Daimler AG	2005	Beijing	94
FAW	Mazda	2005	Jilin	114

Chang'an Auto	Mazda	2006	Nanjing	74
Chery Auto	Israel Corporation	2007	Shanghai	Less than 7 (in 2014)
Fujian Motors	Daimler Light Vehicle (HK)	2007	Fujian	7.5
BYD Auto	Daimler AG	2010	Guangdong	0.13 (in 2014)
GAC	Fiat Chrysler	2010	Hunan	13
Chang'an Auto	Peugeot Citroen (PCA)	2011	Guangdong	13
GAC	Mitsubishi	2012	Hunan	4.3 (in 2013)

Source: ChinaAutoWeb, http://chinaautoweb.com/auto-companies/

1.1.2 Sources of innovation pressure

While they may be the biggest beneficiaries of China's auto market boom, Chinese automobile assembly companies face enormous pressure to upgrade their capabilities and innovate. There are three major reasons for this: market competition, industrial evolution, and the social-political influence in China's automobile industry.

i) Heightened market competition

First, market competition has intensified considerably, being marked by frequent price wars, heavy advertising and diverse product alternatives. Heightened market competition can be attributed to both demand- and supply-side factors.

On the demand side, despite a relatively low car penetration rate and market growth potential, auto demand in China has been highly volatile (see the blue line in Figure 1-2). In emerging markets like China, auto market demand is subject to an array of influences, such as urbanisation, household income, and government policies. For instance, macroeconomic uncertainties are likely to have an impact on the pace of urbanisation and consumer spending. To influence vehicle sales, the Chinese government frequently leverages financial incentives, including offering direct subsidies, adjusting

purchase taxes, and the expansion of bank credit to encourage lending[4].

On the supply side, overcapacity and fragmentation in vehicle production pose further challenges for Chinese automakers. A number of provinces (cities) have become important vehicle production sites, such as Beijing, Shanghai, Hubei, Jilin, and Chongqing (see Table 1-I, II, & III). The dynamics of the spatial pattern in the Chinese auto industry can be mainly attributed to historical reasons, including the shift towards a market economy, the weakening central authority in economic decision-making, intensified provincial rivalry and local protectionism, and the inflow of FDI (Sit & Liu, 2000). In this sense, government-induced consolidation and structural changes are likely as a result of an overcrowded market (Chu, 2011). For example, the National Development and Reform Commission (NDRC), the key planning branch of the Chinese government, is pursuing the model of 'groupisation', which has facilitated the 2007 merger between Shanghai Automotive Industry Corporation (SAIC), the market leader, and Nanjing Auto, a much smaller rival (Yan, 2007).

In a competitive market, innovation serves as a viable strategy for firms (Porter, 1985). Through investing in R&D, product design, and brand building, innovative firms can differentiate themselves from competitors in the marketplace by providing unique and superior products – this means such firms can enjoy above-market prices. Firms can also focus on continuous improvements and cost control in the production, selling, and delivering processes, offering consumer value at lower costs. Further, as the domestic market gets saturated and more competitive, firms might search for opportunities in international markets and conduct market-seeking outward FDI, such as exports (Lu, Liu, & Wang, 2011). Innovation facilitates such processes by promoting technological

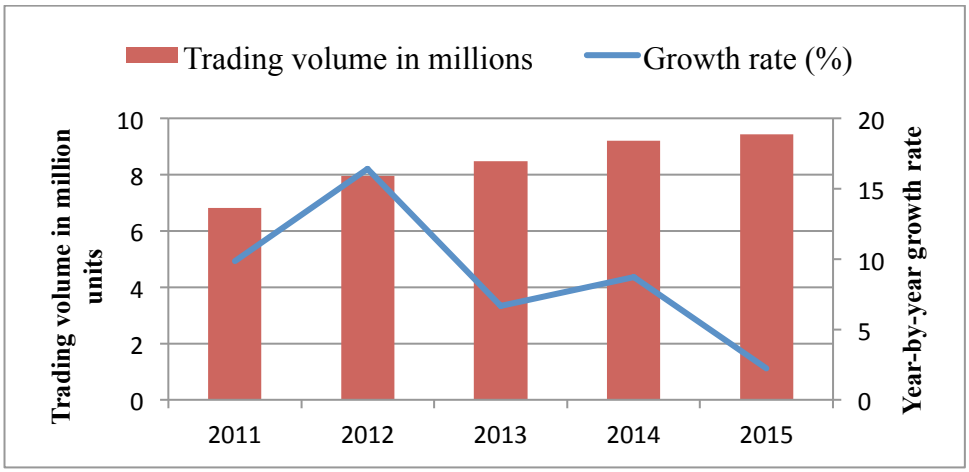
[4] To promote vehicle sales, sales tax on cars with engines of 1.6 litres or less was halved to 5% in 2009, and then raised to 7.5% in 2010; from September 2014, a subsidy of CNY 3,000 for cars purchased with an engine displacement of lower than 1.6L and a petrol consumption below 5.9L/100 kilometres. To promote new energy vehicles, the Chinese government has waived the vehicle purchase tax for selected new-energy vehicles from September 2014 onwards.

capabilities and ensuring a competitive advantage in the global market (Gao, Murray, Kotabe, & Lu, 2010).

ii) Evolving industrial environment

The second source of innovation pressure comes from the rapidly evolving domestic automobile industry. As time goes by, Chinese consumers become more sophisticated and they are placing an increased emphasis on quality and service. Vehicle owners, outgrowing their first entry-level cars, are getting ready to upgrade to better models with clearer expectations and better-articulated demands. A recent McKinsey report suggests that Chinese auto consumers increasingly prefer bigger and more expensive cars, and the sales growth rate of SUVs is forecast to top all segments (Wang et al., 2013).

Significant changes are happening not only in vehicle sales but also in the way that vehicles are managed throughout the product lifecycle (Williams, 2007). China's second-hand car market has recently demonstrated steady growth, reaching a trading volume of over 9 million in 2015 (see Figure 1-4). Correspondingly, the market layouts of used car trading markets, dealers, and online trading platforms are coming into shape. In 2014, used car e-commerce market saw a year-on-year surge of 58.4% in trading volume (350,000 vehicles) and 60.3% rise in amount (RMB19.26 billion). Other user-oriented services such as vehicle leasing, sharing or pooling are also becoming popular, causing significant changes in vehicle ownership structures and the business landscape.



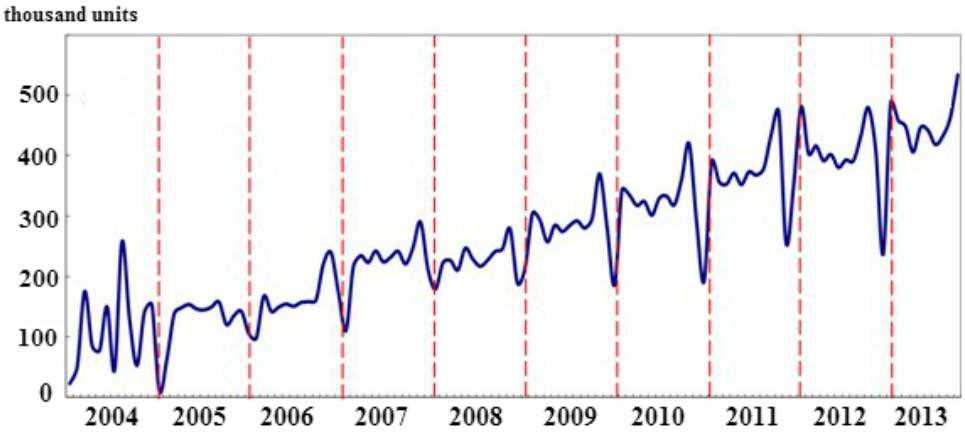


Figure 1-4 Annual trading volume of second-hand vehicles in China, 2004–2013

To succeed in this dynamic environment, auto assembly firms need innovation at the system level, transforming their business model from a simple form of 'production and sales' to the provision of a combination of products and services. This recognition of innovation can assist Chinese automakers to reconfigure their user interactions, assume greater responsibilities over the vehicle lifecycle management, and realise the new frontiers of competitive advantage. At the initial stage, auto producers can work more closely with the customers to introduce improved, customised, and radically new products (e.g. hybrid, electric vehicles) (Cui & Wu, 2015; Sheth, 2011). For instance, mass customisation and flexible production enable customers to become important decision makers in determining the design and production of vehicles. Life cycle assessment

(LCA) techniques can be used to identify novel design options. Examples include the consideration of end-of-life management options in 'design for recycling' initiatives (Williams, 2007). At more advanced stages, innovation involves taking the underlying product function as the starting point for discovering new ways to deliver this functionality (i.e. mobility). The manufacturer could retain ownership of the product and provide utility through the sale of functional 'service units'. In this case, automakers are required to collaborate with important stakeholders both within and outside their traditional sphere of influence.

iii) Socio-political influence: The Chinese government

In addition to the abovementioned market-based rationales, the unique institutional environment of China constitutes another source of motivation for firms to innovate. In China, the government is not only the initiator of laws, regulations, and industrial policies but also controls critical and scarce resources. Despite the pro-market reforms, Chinese governments at both the local and central levels are still unwilling or reluctant to privatise industries of strategic importance, such as energy, natural resources, and the financial services (Okhmatovskiy, 2010). For the automobile industry, its economic significance and political importance make it subject to constant interventions from the Chinese government. In an industry with well-known economies of scales features, auto assembly firms rely heavily on the government for favourable policies and essential resources, such as land and capital. Even after several rounds of privatisation, state-owned enterprises (SOEs) still play a significant role in the market. As a result, it is important for Chinese auto manufactures to cultivate government support though complying with the government (Shi, Markóczy, & Stan, 2014).

Clearly, technological upgrading and innovation are at the top of government policy agendas (Chu, 2011). To achieve this goal, the Chinese central government has

produced strategic industrial policy guidelines with the objective of building up competitive automakers. The central government has even led the negotiation with the industrial leaders and facilitated international technology transfer through joint ventures. Recently, some national programmes are directly targeted at bringing about cutting-edge innovations in the development of hybrid and electrical vehicles. In addition to the powerful influence of the central government, Chinese local authorities are also active in promoting local automakers. To a certain degree, local governments are even more directly involved due to thier providing preferential treatment in taxation, access to foreign currencies, government procurements, land-use grants, and low-interest bank loans (Chu, 2011; Tang, 2012).

Notwithstanding these efforts, the innovation capability of Chinese auto manufacturers is still in question, as the industry has been depicted as a passive receiver of technology transferred from foreign multinationals backed by home government favouritism. For Chinese auto manufacturers (including SOEs, IJVs, and private ones), there is a continued heavy reliance on their foreign partners and/or suppliers for vehicle platform development, engine technology, and other complex systems. It is evident that none of the foreign partners in China's auto joint ventures have shared with their Chinese partners the sophisticated environmental technologies that are currently used in vehicles in Japan, the United States, or Europe.

1.2 Prior research and key research questions

Against this backdrop, this thesis sets out to address the central research question: How can innovation capability be developed in Chinese automobile assembly firms?

The existing literature on innovation is exceptionally diverse. As a multi-level construct, innovation has been conceptualised and empirically analysed at various levels:

nation, region, industry, organisation, organisational subunits, and innovation itself (as a specific technology or product) (Gopalakrishnan & Damanpour, 1997). Moreover, innovation research has sparked the interest of scholars from many fields. Economists are mostly interested in how innovation drives economic growth and brings about changes at the societal level (Mowery & Rosenberg, 2000). Geographers observe the uneven distribution and patterns across regions, thus highlighting the role of 'spatial context' in innovation (i.e. space and time) (Howells, 2002; Morgan, 1997). Management scholars focus on innovation at the firm level and how innovation affects the firm's competitive advantages (Teece, Pisano, & Shuen, 1997). Studies based on psychological theories argue that the origin of innovation lies in individuals and underscore the role of creativity and motivation (Sauermann & Cohen, 2010) (see Chapter 2 for more discussion of these strands). More specifically, scholars have examined questions covering various aspects of innovation, including its conceptualisation, outcomes, locus, drivers, and processes[5].

Despite the fact that a strong unifying theory of innovation has yet to emerge (Crossan & Apaydin, 2010), there are a few key takeaways from the review of previous research. First, although innovation exists at multiple levels, the existing literature has highlighted the central role of the firm in determining the effectuation of innovation and technological change (Teece, 2010). Thus, this thesis takes the perspective of the firm and studies innovation at the organisational level. Second, prior research delineates the difference between innovation processes and outcomes (Crossan & Apaydin, 2010). As an outcome, innovation can be differentiated between product and process innovation,

[5]**Conceptualization** – The definition of innovation and measurement (Henderson & Clark, 1990; Maute & Locander, 1994; Utterback & Abernathy, 1975); **Outcomes** – The implications of innovation, or why is innovation important for individuals, firms, and the society? (Miller & Friesen, 1982; Rosenbusch, Brinckmann, & Bausch, 2011; Tushman & Anderson, 1986); **Locus** – where is innovation taking place, the individuals, firms, networks of firms, and/or clusters? (Audretsch & Feldman, 1996; Boschma, 2005; Etzkowitz & Leydesdorff, 2000; Powell, Koput, & Smith-Doerr, 1996); **Drivers** – How to manage and promote innovation (Becheikh, Landry, & Amara, 2006; Robert, 2000; Van De Ven, 1986)? **Processes** – how innovation is adopted and diffused in society (Damanpour & Gopalakrishnan, 2001; Ghoshal & Bartlett, 1988; Rogers, 1995)

between incremental and radical innovation, and among many others; as a process, innovation relates to the process of developing novel products and services – principally it can be a competitive strategy, a capability, and a social-political process. Following the resource-based view (RBV) of the firm (Barney, 1991; Wernerfelt, 1984), this thesis focuses on innovation capability in emerging market firms. Taking the empirical context into consideration, firms' innovation capability is defined as the capability to detect new market opportunities, adapt production processes and product features, establish market channels, implement technical support, analyse customer feedback, and absorb and integrate knowledge in order to introduce new products and services (Zhou & Li, 2008).

More specifically, this thesis asks:

- What are the critical factors, both internal and external to the firm, that influence the development of innovation capability in Chinese automobile assembly companies, and how?
- How does firm ownership (i.e. state-owned, private, and foreign) affect the process of developing innovation capability?
- How does external knowledge play a role in the firm's innovation process and outcomes?
- How does the institutional environment, espeically in relation to the Chinese government, have an impact on the adoption of innovation strategy and the development of innovation capability?
- What are the performance implications of a firm's innovation capability?

1.3 Research design and contributions

This thesis addresses the proposed research questions through four interrelated papers, presented in chapters 4, 5, 6, and 7, respectively. **Paper 1** (i.e. **Chapter 4**) is an

explorative study discussing the role of five important resources on the development of innovation capability. These resources include financial resources, human capital, transformational leadership, collaborative culture, and government support. Further considering the contingent value of organisational resources, ownership is studied as a boundary condition shaping the effect of resources on the firm's innovation capability. This chapter also investigates the impact of innovation capability on firm performance. Going into more depth, the next two papers (**Papers 2** and **3**, i.e. **Chapters 5** and **6**) reveal the complexity of cultivating innovation capability. Although innovation incentives promote the development of innovation capability, **Paper 2** examines whether and how workplace relationships (i.e. horizontal relationships and vertical relationships) may influence the impact of innovation incentives on absorptive capacity, a type of innovation capability. **Paper 3** considers the characteristics of the automobile industry and the Chinese institutional environment, and investigates how the depth and breadth of external knowledge affect innovation in Chinese automobile assembly firms. Complementing previous three studies, **Paper 4** (i.e. **Chapter 7**) focuses on the impact of external institutions on firms' innovation strategy through a case study of one indigenous auto company in China (i.e. Geely).

As such, this thesis advances the existing literature in three major ways. First, by focusing on the Chinese automobile assembly companies, it enhances our understanding of innovation in one of the world's biggest emerging markets, characterised by heightened competition, rapid industrial evolution, and arbitrary government intervention. Second, it contributes to the research on the drivers of firms' innovation capability. The RBV provides a theoretical lens for examining the effects of individual resources on innovation capability. Other theories complement RBV by suggesting the complexity of promoting innovation capability in firms. In particular, it relates to the conceptual models

and empirical findings on the contingent value of different kinds of resources, the asymmetric role of vertical and horizontal relationships in organisations, and the depth and breadth of knowledge linkages. Third, it sheds light on the relationships between micro- and macro-level phenomena, especially the interactions between the firm and the government. These findings are potentially applicable to both businss managers and policymakers in other EEs where there is a similarily strong need for innovation capability and economic growth.

1.4 Structure of the thesis

The rest of the thesis is organised as follows.

Chapter 2 sets the scene by providing a literature review on innovation. I will introduce four groups of innovation researchers from the fields of economics, geography, strategic management, and psychology. After discussions on the conceptualisation of innovation at the firm level, I will review three streams of literatures that form the cornerstone of the thesis, covering the RBV, behavioural theories, and the institution-based view.

Chapter 3 offers an overview of both quantitative and qualitative approaches in existing innovation research. I will outline the research design, empirical data sources, and analytical approaches employed in this thesis. In addition, I outline the structure of the subsequent four papers that comprise the central four chapters of the thesis.

Chapter 4 presents a study on the drivers and consequences of innovation capability in Chinese automobile assembly companies. The moderating role of firm ownership is also discussed.

Chapter 5 develops a framework investigating the interplay between innovation incentives and the relational contexts in the workplace, namely how they jointly influence

absorptive capacity, one type of firms' innovation capability.

Chapter 6 analyses the influence of the depth and breadth of external knowledge on Chinese automobile assembly firms' innovation and performance.

Chapter 7 provides a case study of Geely, one of the biggest Chinese private automakers. In particular, the impact of the Chinese government and the value of an integrated strategy is highlighted.

Finally, **Chapter 8** concludes with a general discussion of the research findings, recommendations for business managers and policymakers, some reflections on the limitations of this research, and suggestions for future research directions. References and appendices will be included at the end of this thesis.

Chapter 2 Literature Review and Theories

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Innovation is a broad term with multiple meanings and exists at various levels (Fagerberg, Mowery, and Nelson 2006). It has become almost axiomatic that innovation contributes to the success of individuals, teams, firms, regions, and nations. Partially due to its inclusiveness and wide applications, the study of innovation has gained enormous academic interest since Schumpeter's famous term 'destructive creation'[1]. Innovation research now spans a number of fields within the social sciences and humanities, including business management, economics, geography, sociology, policy studies, and psychology. In addition, the proliferation of innovation research features a multitude of perspectives based on or cutting across existing disciplines and theories, as well as a wide range of research methodologies.[2]

[1] The expression 'creative destruction' was popularised by and is most associated with Joseph Schumpeter, particularly in his book *Capitalism, Socialism and Democracy,* first published in 1942. In Schumpeter's vision of capitalism, innovative entry by entrepreneurs was the disruptive force that sustained economic growth, even as it destroyed the value of established companies and labourers that enjoyed some degree of monopoly, power derived from previous technological, organisational, regulatory, and economic paradigms.

[2] These include historical narratives, case studies, survey methods, economic modelling, agent-based

Although benefiting from a diversity of theories and empirical methods, the rapid expansion of innovation studies as a field and the simultaneous development of specialised areas of inquiry potentially raise serious problems. In particular, scholars from a range of disciplines have proposed numerous theories of innovation. While these theories share common elements, they have been developed for specialised audiences and tend to emphasise different phenomena. Different assumptions of theories, levels of analysis, and operationalisation of the core constructs might also result in conflicting arguments and inconsistent empirical results. Thus, innovation research remains rather fragmented.

This chapter aims to provide a brief overview of the existing work on innovation and lay the theoretical foundation of this thesis. It consists of three main sections. The first section introduces four groups of innovation researchers with distinctive intellectual roots, namely economics, geography, strategic management, and psychology. It focuses on the key ideas and concepts within each discipline, as it helps navigate the broader research landscape by identifying their respective research interest, the level of analysis, and the relevance to extant innovation literature. The second section offers a conceptualisation of innovation at the firm level. For the purposes of clarification, I first distinguish innovation from creativity, invention, and imitation. The nature of innovation processes is also discussed. Then, I present three major typologies of innovation, with connections made to the Chinese automobile industry. The third section reviews three streams of literature underpinning this thesis, i.e. the resource-based view and dynamic capability, behavioural theories and organisational learning, and the institution-based view. In essence, all the three streams of research have important implications for

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modelling, and etc.

innovation study at the firm level and complement each other to guide my empirical research.

2.1 Groups of innovation researchers

Different disciplines often address different research questions, and they have specific research interests and levels of analysis. Given the multi-disciplinary and multi-level nature of innovation, this section introduces four groups of researchers–from economics, geography, strategic management, and psychology–that have advanced the understanding of innovation.

2.1.1 Economic growth and technological change

The economics literature consists of the macro branch of innovation studies. Innovation is viewed at the aggregate level of the industry, region, or nation, as one factor that is closely related to productivity, industrial evolution, and economic growth (Dosi and Nelson 2010). In modern economies, production is carried out by firms, which compete in the chaotic market where prices for inputs and outputs cannot be determined as a priori. In this competitive environment, firms search for new ideas and innovate in order to survive and succeed. To a large extent, technological changes are initiated by the production of new knowledge, by the application of that knowledge, and by its diffusion throughout the economy. Notably, research interests are mostly placed in the economic process and its outcomes at the aggregate level, rather than in the individual firm's performance (Gopalakrishnan and Damanpour 1997).

For instance, economists have studied the impact of innovation on economic growth (Freeman 1997; Mensch 1983). The rate of introduction of a new technology and the characteristics of that technology exert critical controls on economic growth and on the demand for production inputs, such as labour and capital. Some regard the introduction of a new technology to the economy as a discrete event that can be dated and

located. They find that major or radical innovations tend to cluster in time, giving rise to periods of intense technological improvements, while other times are characterised by technological stagnation. The periodic clustering of innovations is therefore used to explain long waves of economic growth.

The patterns of innovation can also influence and interact with industrial dynamics. The processes of knowledge accumulation and innovation diffusion involve winners and losers, changing distributions of competitive abilities across different firms, and thus, changing the industrial structure. In each period, incumbent firms decide whether or not to remain in the industry and how much product/process R&D to conduct, which further determines the cost of standard products. Meanwhile, potential entrants decide whether or not to enter the industry (Klepper 1996). As a result, major product innovations tend to appear during the growth of the number of producers in the industry; over time, producers shift their focus from product innovation to new production processes, as firms increasingly adopt strategies aiming at cost controlling rather than demand shaping (Anderson and Tushman 1990; Utterback and Abernathy 1975). Overall, both the sector-specific characteristics of technologies and their degrees of maturity over their life cycles influence the patterns of industrial organisation—including size distributions, degrees of concentration, relative importance of incumbents and entrants, etc. (Dosi and Nelson 2010).

As economists try to understand the nature of competition and economic growth, research on the meaning of innovation and the processes of technological change have developed. Nevertheless, some have been criticised for putting too much emphasis on radical product innovation and the difficulty of identifying radical innovations in advance. Most importantly, the processes of innovation development and management inside the

firm remain a black box in this stream of work. A theory of how firms create value and innovate is largely missing from the standard economic literature.

2.1.2 Economic geography and regional studies

Traditionally, economists have viewed the economy in non-spatial terms; however, knowledge, human capital, economic development, and innovation activities are unevenly distributed in the spatial context (Storper and Scott 2009). Intriguing questions arise as for why Hollywood emerges as a world centre of motion pictures, the origins and development of Silicon Valley as the hotbed of high-technology entrepreneurial effort and innovation, as well as the city of London's position in financial services (Starr and Saxenian 1995; Storper and Christophersont 1987) .

Economic geographers have long recognised the role of geography and history as active ingredients in promoting economic development, regional competitiveness, entrepreneurship, and innovation (Martin 2008). A regional economy (also called cluster and agglomeration) is a geographically proximate group of interconnected agents, people, and firms, embedded within a set of organisational and institutional arrangements (Porter 2000). It could be a particular group of firms (i.e. the high-tech industry), a triple-helix of academic- industry-government relations (Etzkowitz and Leydesdorff 2000), regional/national innovation systems (Freeman 1995; Lundvall 1992), learning regions (Morgan 1997), and the like. Rarely frozen in time and space, localised clusters of firms and people are under joint forces, follow path-dependent evolutionary trajectories, and are replete with synergistic interactions all. It is the locus of extraordinarily complex learning processes and the repositories of both codified and tacit knowledge (Scott 2006).

There are two reasons why the attributes of geographic space influence innovation. First, innovation is an interactive process between individuals, between

different functions within the firm, between suppliers and buyers at the interfirm level, and between firms and specialised institutions such as universities, research centres, labour unions, or trade associations. Second, innovation is socially embedded. It is shaped by a variety of institutional routines and social conventions (Morgan 1997). Essential processes underpinning innovation, such as human interactions, socialisation, and the development of knowledge and culture, are bounded by place and constrained by distance (Howells 2002). Localised clusters provide channels of intense and recurrent interactions; and they are, by the same token, scenes of socialisation and culture development, that lead to the creation of social capital, networks, norms and trust. Thus, clusters facilitate the knowledge exchange, coordination, and cooperation that make learning and innovation possible. These ideas resonate with the fact that MNEs are increasingly establishing foreign R&D centres that have a special affinity for specific locations where they can tap into local expertise and then re-diffuse it through their intra-corporate networks (Belderbos, Lokshin, and Sadowski 2015; Gupta and Govindarajan 2000).

Despite the emphasis on proximity, localisation, and clustering, the forces of globalisation are also evident with the increased level of international movement of goods, capital, and people. Enabled by advances in communications and transportation, immigration, trade and foreign direct investment have played a role in shaping the regional economy (Huang, Liu, and Xu 2012; Javorcik 2004; Zhang, Xu, and Liu 2011). Critics highlight the destructive tendencies of globalisation through promoting regional disparity, engendering conflicts, and undermining social identity and cohesion. Proponents of globalisation frame it as a process of modernisation, emphasizing its developmental effects on the host regions (Sheppard 2002). Indeed, globalisation can act as the conduit for the flows of knowledge, which provides a critical stimuli for technological learning and catch-up (Storper 1992). Thus, globalisation and localisation

interweave in shaping the innovation clusters. This means that the clusters can constantly reinvent, differentiate, improve, and reconfigure themselves.

While economic geographers made a key contribution in conceptualising the nature of space and time, no consensus has been reached as to how 'regions' should be defined and measured (Garretsen and Martin 2010). It is difficult to discern the boundaries of a region, or where one region ends and another begins. Essentially, these notions of space imply that rather than being exogenous, geography becomes endogenous and thus a function of the processes. The spatial agglomeration of economic activity is not something that merely takes place at a point in space, but is a process that itself reshapes and redefines economic space. There is no doubt that local specificity and the role of historic-institutional factors matters in the development of those places. The question is, therefore, how to come up with a conceptual model of geography and history that can be convincingly and credibly apply to the actual real world? (Garretsen and Martin 2010; Krugman 2011)

2.1.3 Strategic management and innovation

The firm is the central actor in determining the effectuation of innovation and technological change (Teece 2010). Strategic management theorises about the difference between firms and how abnormal profits can be earned.[3] Innovation is a strategic decision made by firms; and innovation exists both as the process of development and the outcome that influence firm performance (Crossan and Apaydin 2010). Innovation strategy and entrepreneurial orientation is a reflection of a firm's commitment to developing something new to the firm and/or to the world (Li and Atuahene-gima 2001). It directs firms' attention and resources towards the pursuit of new opportunities, the adaptation

[3] Rumelt, Schendel, and Teece (1994) suggested four fundamental questions of business strategy: (1) Why do firms differ? (2) How do firms behave? (3) What determines the scope of the firm? (4) What determines the success and failure of firms?

and reconfiguration of the firms' capabilities according to external demands (Engelen et al. 2012; Guan et al. 2009). For instance, the R&D intensity of a firm, relative to its industry rivals, indicates the strategic importance of innovation to a firm (O'Brien 2003).

Nevertheless, large expenditures on R&D or mere intention do not guarantee that a firm will be a successful innovator. When devising an innovation strategy, a firm needs to take a balanced view between the exploration of new opportunities and the exploitation/improvement of existing capabilities (Bercovitz and Feldman 2007), between internal R&D and external knowledge acquisition (Cassiman, BrunoVeugelers 2006), and between innovation and imitation (Semadeni and Anderson 2010). Moreover, firms are heterogeneous in the ways they innovate, which affect the effective implementation and outcomes. Extant studies have explored the influence of structure, processes, and people in the development and marketing of new products (Foss, Laursen, and Pedersen 2011; Leiponen and Helfat 2011; Rosing, Frese, and Bausch 2011; Wan, Ong, and Lee 2005).

Lastly, the benefit of innovation depends on how much the firm can obtain economic returns from its innovation efforts (James, Leiblein, and Lu 2013; Teece 1986). Depending on the institutional, industrial, firm, and technologically specific conditions, firms strategically devise appropriability mechanisms – patents, secrecy, lead time, complementary assets – to capture value from innovation and achieve superior performance (Arundel 2001; Kultti, Takalo, and Toikka 2007; Leiponen and Byma 2009; Tripsas 1997). In addition, to capture a share of profit of the innovation (i.e. primary appropriability), recent literature suggests that innovators can build on the innovation and benefit from future innovations (i.e. generative appropriability) (Ahuja, Lampert, and Novelli 2013).

2.1.4 Organisational/social psychology and innovation

Organisational psychologists have made strides forward in shifting the level of analysis in innovation research from the macro-organisation level toward individual and work-group-level processes and effects (Anderson, De Dreu, and Nijstad 2004). They recognise creative employees as the key element in the creation of innovation and sustainable growth. Organisational innovation emerges from individuals who 'develop, carry, react, and modify ideas' (Van De Ven 1986:592). This stream of work has directed substantial efforts to the understanding of how the work environment might develop or stifle employees' creative behaviour (Amabile and Barsade 2005; Amabile, Conti, and Coon 1996). For example, job characteristics (including skill variety, task identity, task significance, feedback, and autonomy) affect the psychological states of employees (e.g. emotions, identity, engagement and identification), which in turn may have influence on their behaviour and the work outcomes, including creativity and innovation (Carmeli 2007; Christian, Garza, and Slaughter 2011; Zhang and Song 2014; Zhou, Hirst, and Shipton 2012).

In addition, organisations have become more reliant upon team-based structures, ad hoc project teams, and multidisciplinary design and development teams, because of increased specialisation and a corresponding need to integrate individual capabilities. Research advances in team-level innovation processes are particularly salient. In the workplace, individuals are integrated into a team acting as a leader or a member. An interdependent, interactive setting allows the group to complete tasks as a collective unit (Ellis et al. 2003). At the same time, it is very difficult to measure both the inputs and outputs of individual team members. Inspired by their interest in socially shared cognition and information-processing systems, organisational and social psychology have integrated individual and team-level research, explaining how and why team-level factors

drive individual behaviour, and how in turn, individual-level innovativeness and behaviour affect team-level innovation (Chen et al. 2007, 2013; Lam et al. 2011).

This thesis focuses on unravelling the mechanisms of how to promote innovation in Chinese automobile assembly firms. Consequently, it has taken the perspective of the firm as the main analytical level and set innovation as the strategic goal of firms. Therefore, theories from strategic management would be of particular interest (discussion and reviews on specific theories in section 2.3). At the same time, firms are situated within the wider geographic, social, cultural, and political environments, subject to various institutional forces; and multinationals are also playing a dramatic role in reshaping the world's economic geography. Studying innovation in a specific geographic space fosters the cross-fertilization of ideas between economic geography/regional studies and business management research (Beugelsdijk, McCann, and Mudambi 2010). At a more micro-level, organizational tasks are ultimately conducted by individual members and are influenced by the dynamics between individuals in the organizations. Research from organizational and social psychology contributes to the understanding of 'micro-foundations' of organizational phenomena by decomposing macro-level constructs in terms of how higher-level phenomena emerge from the interaction of these members and how relations between macro constructs are mediated by micro actions and interactions (Foss and Pedersen 2015).

2.2 The conceptualisation of innovation

An early definition of innovation originates from Joseph Schumpeter's seminal work on long-term economic growth and social change, which placed a crucial role in innovation. He defined innovation as '(1) the introduction of a new good, (2) the introduction of a

new method of production, (3) the opening of a new market, (4) the opening of a new source of supply, and (5) the carrying out of the new organisation'. Over the past several decades, research on innovation has expanded dramatically, however without a commonly accepted definition of innovation. Innovation itself can be viewed as either a discrete outcome embodied in 'a new idea, product or service' or a process of introducing something new (Crossan and Apaydin 2010).

Given the difficulty in formally defining innovation, it may be helpful to characterise innovation by clarifying what innovation is not. First, there is an important distinction between innovation and creativity (Anderson et al. 2004). Innovation researchers have acknowledged that innovation involves the 'intentional introduction and application' of new and improved ways of doing things; whereas creativity refers to the production of novel and useful ideas *alone* (Amabile and Barsade 2005; Baer 2012). Clearly, different personal and contextual forces may shape idea generation and implementation. Thus, innovation can be conceptualised as encompassing two different activities: the development of novel and useful ideas, and their effective implementation.

Similarly, it is worthwhile to distinguish invention from innovation. Invention refers to the discovery of new methods or materials, that is, to the discovery of new knowledge. Innovation refers to the attempts to commercialise an invention (Hill and Rothaermel 2003). The distinction between invention and innovation is important because according to the integrated approach, an invention is converted into successful innovation only through parallel, directed interactions among organisational, scientific, and market aspects. Invention is one step, but innovation is the whole business process that creates changes from invention, development, design, and production to marketing (Khilji, Mroczkowski, and Bernstein 2006).

The last counterpart of innovation is imitation, a key feature defining many emerging economy enterprises (Luo, Sun, and Wang 2011). In general, imitation is the replication of existing actions, products, processes, or managerial systems. Compared with innovation, imitation is often much less expensive, because imitators can free ride on information and resources provided by the innovators. Also, imitation tends to reduce the innovator's profits while generating broader gains in economic welfare. This is because imitation often leads to a fall in prices and costs. Furthermore, imitation does not necessarily entail a negative connotation; neither does it illicitly and illegitimately infringe a pioneer's intellectual and industrial property rights. Imitation can take different forms, from pure duplication to creative imitation (Schnaars 1994).[4] Given the causal ambiguity of innovation (i.e. uncertainty about the methods used by a leading firm to achieve innovation), imitation is tacit or complex, which is difficult and requires intelligence and imagination (Lieberman and Asaba 2006; Shenkar 2010). And imitation is closely related to external information search, learning, change, innovation adoption and diffusion. Growing research has begun to shed light on the multilevel decision-making process of imitation, and how imitation bolsters innovation (Semadeni and Anderson 2010).

Although being distinctive concepts, the processes of production of novel ideas and technology (i.e. creativity and invention), the implementation and commercialisation, and the spread of novelty in society (i.e. imitation) are often overlapping and indistinguishable. The 'linear sequence stages of innovation' is repeatedly criticised, as innovation is a complex process with multiple, cumulative progressions of convergent, parallel, and divergent activities. To conclude, one essential element of innovation is the 'relative novelty'. An innovation must be new to the 'relevant unit of adoption', an aspect

[4] Steven Schnaars (1994) categorised several distinct imitations: counterfeits (or pirate products), knock-offs (or clones), design copies, creative adaptations, technological leapfrogging, and adaptation to another industry.

that has been termed relative as opposed to absolute novelty in the innovation literature. Another common feature of innovation is its *intentionality* and it must be *implemented* for added value. Innovation is an intentional and collective achievement of translating novel ideas into value (Van De Ven 1986).

Returning to Schumpeter's definition of innovation, he clearly differentiated between product, process, and business model innovation (the type of innovation). Following this line of thought, innovation can be further conceptualised on the basis of innovation types, as described in the following Sections.

2.2.1 Product vs. process innovation

The distinction between product and process innovation relates to the areas and activities that an innovation affects. Product innovation is the introduction of new goods or services for the benefit of customers. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics. It targets at the market and is more visible to the organisation and to customers (Chang, Bai, and Li 2015). In contrast, process innovation is defined as the introduction of new elements (e.g. managerial approaches, production methods, and technologies) that mediate between inputs and outputs (Ettlie and Reza 1992). Examples of new production methods are the implementation of new automation equipment on a production line or the implementation of computer-assisted design for product development. Thus, process innovation involves an internal focus that reduces cost, increases efficiency, and improves product quality. Despite the fact that many observers emphasise product innovation, process innovations may have equal or even greater commercial importance and result in a high rate of productivity improvement (Abernathy and Utterback 1978).

Given their distinct characteristics, product and process innovation have been widely acknowledged. The Organisation for Economic Co-operation and Development (OECD)'s *Oslo Manual*, an authoritative document on providing guidelines for collecting and interpreting innovation data across countries, has distinguished between technological product and process innovations. A later version broadened the range by adding marketing and organisational innovations (OECD 2005). Marketing innovation involves 'significant changes in product design or packaging, product placement, product promotion or pricing'; therefore, it can be either product or process innovations according to the definition here. Organisational innovations are 'the implementation of a new organisational method in the firm's business practices, workplace organisation or external relations'. Both marketing and organisational innovation deal primarily with people and the organisation of work, which are more in line with the definition of process innovation.

2.2.2 Incremental vs. radical innovation

Innovation can also be differentiated between incremental and radical based on the degree of newness (Chandy and Tellis 2000; Ettlie, Bridges, and O'Keefe 1984). The latter is sometimes termed as discontinuous, disruptive, or breakthrough. By definition, incremental innovation introduces relatively minor change to the existing product, exploits the potential of the established design, and often reinforces the dominance of established firms. In contrast, radical innovation is based on totally different engineering and scientific principles and provides substantially higher customer benefits relative to previous products. For example, typewriters were once the dominant products, but now are virtually extinct and replaced by radical innovation in the form of digital word processors.

Radical innovations are often considered as the basis for the successful entry of new firms and even the redefinition of an industry (Christensen and Bower 1996;

Rosenbloom and Christensen 1994; Tushman and Anderson 1986). A typical dynamic process is described as initially radical innovations (i.e. technologies) underperform established ones in serving the mainstream market yet satisfy a niche market segment, and this values dimensions of performance in which the new technology does excel. Eventually radical innovations replace the established technologies, because over time research and development (R&D) investments are made and the technology gradually matures. During the process, entrant firms that supported the disruptive technology will gradually replace incumbent firms that supported the prior technology.

While the standard model predicts the decline of incumbent firms in the face of radical innovations, there are numerous counterexamples suggesting that this model might not be universal (Ahuja and Lampert 2001; Rothaermel 2001). Developing radical innovations is extremely risky, resource-consuming, and success is elusive. From Archimedes' eureka moment to Newton's otherworldly contemplation interrupted by the fall of an apple, luck may be one essential ingredient in facilitating breakthrough innovation (Azoulay, Graff Zivin, and Manso 2011). Seemly promising innovations often fail the test of market acceptance, and do not count as radical innovation.[5] Consequently, the dominant views hold that radical innovation has significant and disruptive influences, and firms should learn to manage and organise it (Junkunc 2007; McDermott and O'Connor 2002; O'Connor and DeMartino 2006; Robert 2000). This may be particularly important for established firms to exploit their advantages and overcome organisational inertia (Chandy and Tellis 1998; Hill and Rothaermel 2003; Leifer, O'Connor, and Rice 2001; Rothaermel 2001).

[5] The fact that radical innovation cannot be identified ex ante raises questions towards the definition of radical innovation itself. For instance, Danneels (2004) questioned the subjectiveness of radical innovation (i.e. whether a technology is inherently disruptive or if 'disruptiveness' is a function of the perspective of the companies subject to it) and the degree of radicalness (i.e. at what point can disruption be said to have occurred).

2.2.3 Architectural vs. component innovation

Seemingly minor or straightforward improvements in technological products could have dramatic consequences. Such minor adaptions can be distinguished between the components of a product and the way they are integrated into the system (i.e. architectural) (Henderson and Clark 1990; Ulrich 1995). A component is defined as a physically distinct portion of the product that embodies a core design concept, and architectural innovation refers to the reconfiguration of an established system to link together existing components in a new way (Henderson and Clark 1990:12). Architectural innovation is difficult to fit in the incremental/radical innovation framework. Architectural innovation is prevalent but hard to spot, as the core design concept behind most components remains untouched (Henderson and Clark 1990:17). Moreover, it might be triggered by a radical change in a component and generate recombinant opportunities across the entire system. The ideas on architectural innovation not only offer a richer characterisation of different types of innovation, but also open up new areas in understanding the connections between innovation and organisational capability, firm boundaries, and the evolution of industry structures (Fixson and Park 2008; Furlan, Cabigiosu, and Camuffo 2014; Galunic and Eisenhardt 2001; Zirpoli and Becker 2011).

In general, modularity of components boosts the speed and efficiency of innovation of subsystems by allowing concurrent and autonomous development. This is because under the condition of product architecture stability, standardised component interfaces in a modular product architecture provide a form of embedded coordination that greatly reduces the need for the overt exercise of managerial authority to achieve coordination of development processes (Baldwin and Clark 1997). However, researchers are debating about the relationship between component-specific and architectural knowledge and their contribution to architectural innovation. It is argued that component-

specific knowledge is a prerequisite for architectural knowledge, which enables architectural innovation (Zirpoli and Becker 2011). Moreover, architectural innovation poses a particular difficulty, since it is likely to get screened out by existing information-processing structures, organisational routines and communication channels (Argyres and Silverman 2004). Consequently, architectural innovation requires a great breadth of knowledge and coordination in innovation activities (Galunic and Eisenhardt 2001).

2.2.4 Innovation in Chinese automobile assembly firms

The above overview contributes to the understanding of innovation in the empirical context of this thesis: Chinese automobile assembly firms. An automobile is a complex product system with a relatively stable product architecture (Clark and Fujimoto 1991). The technologies of traditional auto manufacturing are well-developed and many components can be directly purchased via market transactions (Wang 2008). Nevertheless, auto manufacturing greatly benefits from economies of scale and requires a long time to master a range of capabilities, including supply chain management, design and development, manufacturing, marketing, and many others (Lockström et al. 2010; Xi, Lei, and Guisheng 2009).

In light of traditional auto manufacturing, Zhao et al.(2005) have suggested that innovation in the Chinese automobile industry is mainly incremental in nature. This is especially true for Chinese auto IJVs. With existing technology and managerial expertise developed elsewhere, R&D activities in IJVs are mostly at the end stage of the R&D cycle. The design adaptation and localisation process give rise to incremental innovations, ranging from extending the length of the car to re-designing the exterior and interior and fitting a new engine. SAIC-GM[6], for example, made 600 engineering changes to tailor the

[6] 'SAIC-GM' is short for SAIC General Motors Corporation Limited, which is a joint venture between SAIC Motor and General Motors Company that manufactures and sells Chevrolet, Buick, and Cadillac brand automobiles in Mainland China.

Buick Century to Chinese driving conditions and regulations. These changes included elevating the rear seat, enhancing legroom in the back, and fine-tuning the suspension for China's road conditions. The localisation-related engineering work that SAIC-GM did also includes validating the capabilities of local suppliers and certifying product designs to meet local quality, safety, and environmental requirements. By contrast, indigenous Chinese vehicle manufacturers, without direct access to existing foreign technologies, are more likely to take part in imitation, reverse engineering, and innovation in quasi-open product architecture (Wang and Kimble 2010; Wang 2008). Given a vast domestic car market, many indigenous Chinese automakers have taken a low-cost strategy and focused on quickly seizing the market share by developing good-enough products and expanding their production to a massive scale. At the same time, they are also engaging in the process of learning-by-doing and bringing out process innovation with enhanced product quality.

Moreover, environmental concerns, emerging concepts and new technologies are transforming the century-old automobile industry on a global scale. On the one hand, firms continue to put emphasis on improving vehicle performance and energy efficiency, resulting in a range of mechanical and electronic innovations on engine technologies, transmission technologies, and many others (e.g. tyres). On the other hand, the auto industry is expecting more radical changes, with the development of hybrid and electric-drive technologies, information and communication technologies (ICTs), and autonomous driving. In 2014, Dongfeng Auto has established the strategic partnership with Huawei, a Chinese technology company, to develop intelligent vehicles. Similar alliances are also seen between other Chinese automakers (e.g. SAIC, BAIC, and Changan Auto) and major Chinese technology companies (e.g. Huawei, Alibaba, Baidu). In this sense, it is possible

for Chinese automobile assembly companies to pursue radical innovation and achieve technology leapfrogging in the future (Chu 2011; Gallagher 2006).

2.3 Key theories

This section outlines three streams of theories that have significant implications for innovation studies at the organisational level, namely, (1) the resource-based view; (2) behavioural theories and organisational learning; and (3) the institution-based view. While these theories all advanced the understanding of how organisations develop innovation and achieve superior performance, they differ substantially in their specific focuses, assumptions, and logics. The resource-based view and its extensions focus on the resources and capabilities within the firms. The behavioural theory views decisions of the firm as the result of a sequence of behaviours, such as search, learning, and adaptation. The institution-based view underscores the impact of external institutions and theorises how institutions affect firms' strategic behaviours and performance. Next, I review the three streams of literature and discuss how they are relevant to this thesis.

2.3.1 The resource-based view and innovation

Although the importance of resources has long been recognised (Penrose 1959), the resource-based view (RBV) focuses research attention on resources as the internal sources of a firm's competitive advantage. Nowadays, RBV has become one of the most prominent theories in strategy and business management (Barney 2001; Newbert 2007). RBV regards the nature of firms as different bundles of resources that are heterogeneously distributed and imperfectly mobile across firm boundaries (Barney 1991; Wernerfelt 1984). Resources include all assets, capabilities, organisational processes, and knowledge, which are controlled by a firm and enable the firm to implement strategies. RBV further articulates four attributes of resources (i.e. valuable, rare, inimitable, and

nonsubstitutable) and links them to the firm's performance. The central proposition of RBV is that valuable, rare, inimitable, and nonsubstitutable resources would contribute to a firm's sustainable competitive advantage.

(1) **Valuable**. Resources are considered valuable when they can help exploit opportunities and/or neutralise threats in the external environment. In other words, the value of resources is determined by the external environment. (2) **Rare**. This attribute highlights the uniqueness of resources, as a firm can only create superior performance when it is implementing a value-creating strategy not simultaneously implemented by competitors at the same time. (3) **Inimitable**. Valuable and rare resources can be the source of competitive advantages as other firms lack relevant resources. Yet such advantages will be *sustained* only when firms that do not possess these resources cannot obtain them and imitate the strategy. Several conditions help in this, including (a) resources that are dependent upon unique historical conditions; (b) the link between resources and performance is causally ambiguous; and (c) socially complex.[7] (4) **Nonsubstitutable.** It means that there are no strategically equivalent resources that can be exploited to implement the same strategies. The idea of 'substitutes' resembles the 'substitutions' in Porter's five forces model of competitive advantages.

Despite its popularity and general empirical support, RBV has been extensively discussed, criticised, and developed (Kraaijenbrink, Spender, and Groen 2009). One important development of RBV is a departure from the static view of resources. The dynamic capabilities framework extends RBV by explaining how the heterogeneity of firm resources and capabilities arise (Helfat and Peteraf 2003; Zollo and Winter 2002), and how to create, develop, and protect resources in order to achieve competitive

[7] Unique historical conditions are circumstances such as the firm's founding, initial resource endowment, its development process, and etc. Resources interdependence often makes it difficult to clearly understand how each resource leads to performance. The examples of socially complex resources are organisational culture, a firm's reputation among business partners, and etc.

advantage over time (Teece, Pisano, and Shuen 1997; Teece 2007). Works on dynamic capabilities propose that the value of resources could change under different circumstances; thus the acquisition, accumulation, and reconfiguration of strategic resources become fundamental (Teece et al. 1997; Teece and Pisano 1994). In essence, dynamic capabilities imply change and adaptation. For instance, new product development that introduces changes to the products and routines is a prototypical example of a first-order dynamic capability (Winter 2003). Formally stated, dynamic capabilities are the meta-capabilities that can extend, modify, and/or create new forms of capabilities to address rapidly changing environments. The environmental context is regarded as the business ecosystem, including market, technological, and institutional environments (Teece 2007). Taken together, with dynamic capabilities, firms not only adapt to the business environment, but also shape it through innovation and collaboration with other actors.

Another stream of research suggests that possessing valuable, rare, inimitable, and nonsubstitutable resources is a necessary but insufficient condition for obtaining superior performance (Wang, He, and Mahoney 2009). Stated differently, resources themselves do not automatically translate into a competitive advantage, unless the firm appropriately bundles and deploys them. However, RBV is largely silent on how resources may be managed, leaving a process black box (Miller and Shamsie 1996:539). Thus, the knowledge-based view (KBV) treats knowledge as the primary resource of firms (Grant 1996; Kogut and Zander 1992; Lewin and Nonaka 1994). Knowledge resides with individuals, and the organisation provides a context for creative individuals to create, acquire, store, and deploy knowledge. Knowledge can be characterised along many dimensions. For instance, knowledge can vary from the explicit that can be easily articulated to tacit knowledge that is difficult to express. In addition, some recent studies

focus on the process of resource management in general. The resource management process includes the processes to structure the firm's resource portfolio, bundle the resources to build capabilities, and leverage those capabilities to ***realise*** a competitive advantage (Sirmon et al. 2010; Sirmon, Gove, and Hitt 2008; Sirmon, Hitt, and Ireland 2007).

Based on the above review, it is reasonable to conclude that RBV and its extensions (i.e. dynamic capabilities and KBV) could be an important theoretical framework for the study of innovation; and innovation studies in turn shed light on the discussion and future development of RBV.

First, it is of significant importance to understand what specific resources influence a firm's innovation capability and outcomes. While the four attributes, namely valuable, rare, inimitable, and nonsubstitutable, provide general guidance, the definition of resources in RBV suggests that anything associated with the firm can be a resource in innovation activities. As Priem and his colleagues commented (2001), the all-inclusive nature of resources in RBV could be both sources of its strength and weakness. In this circumstance, innovation studies could offer insights on how resources are important by describing the process of the task, which determines the properties of resources. As such, identifying specific resources that are particularly effective for innovation makes a contribution to both innovation studies and RBV.

Second, a contingent view of the resource-performance link can be further developed by considering the nature of innovation and the internal and external organisational contexts. Given that the different types of innovation may have conflicting requirements, resources that promote one type of innovation could be counter-productive for the other. In other words, the nature of innovation potentially moderates the effectiveness of resources on performance. Moreover, in emerging markets like China,

the external environment presents both opportunities and challenges. Both the external and internal organisational environment influence the nature of innovation, and put specific requirements on the resource bundles and configurations.

Third, from the RBV's perspective, innovation-related capabilities are valuable, rare, inimitable, and nonsubstitutable resources that contribute to a firm's competitive advantage. Clearly, not all firms are innovative, making innovation capability a valuable and rare asset. More importantly, the development of such capabilities is often path-dependent and socially complex. Moreover, innovation implies change, adaptation, and novelty. Thus, firms' innovation capability could be considered as dynamic capabilities, which assist the organisation to adjust itself to a dynamic business environment. As a result, studies are warranted on identifying the nature of innovation capabilities, and how innovation capabilities are accumulated, developed, and reconfigured in a dynamic and complex environment.

2.3.2 Behavioural theories/organisational learning and innovation

Behavioural theories of the firm (BTOF) have been extraordinarily influential. The seminal book 'A Behavioral Theory of the Firm' by Cyert and March (1963) has inspired and legitimated a new approach for studying organisations in management, economics, political science, and sociology (Argote and Greve 2007). Behavioural theories take an inherently process-oriented view, and the core assumption mirrors the actual psychology of decision makers, who intend to be rational yet lack perfect information. Thus, certain decision rules are applied in order to make important choices in an uncertain environment. More specifically, organisational decision-making is problem-driven, namely, when the organisation fails to satisfy certain goal(s) or expects an anticipated failure in the near future, problemistic search is initiated towards finding a solution. Search can be either based on simple rules (i.e. local search) or more complex ones (i.e.

distant search). The search will only stop when the problem is solved though discovering alternatives that satisfy the goals or by revising the goals to the levels that make an available alternative acceptable. Behaviour, both at the individual and organisational level, is driven by semi-automatic, habit-based decision processes and action patterns.

Organisational learning is one of the most direct descendants of BTOF (Cohen and Sproull 1991; Levitt and March 1988). In parallel to human learning, organisational learning reflects the fact that over time organisations exhibit adaptive behaviour in terms of their goals, attention rules, and search rules (Cyert and March 1963). Building on BTOF, later studies have developed organisational learning in much greater details. In close relation to KBV, theories on organisational learning have placed a special focus on knowledge and information, and the processes of knowledge creating, retaining, and transferring (Argote and Miron-Spektor 2011). Moreover, organisational learning is directly related to the concept of dynamic capabilities, as they are likely to coevolve over time (Zollo and Winter 2002).

According to Huber (1991), many organisational activities are intended to obtain information or knowledge. To provide a broad understanding of organisational learning, he articulated four learning-related constructs/processes, namely knowledge acquisition, information distribution, information interpretation, and organisational memory. In his framework, knowledge can be achieved through five subprocesses that can substitute for each other to some extent. These subprocesses are (1) congenital learning, largely inherited knowledge, (2) experimental learning, acquiring knowledge through direct experience; (3) vicarious learning, through second-hand experience; (4) grafting, acquiring new members or organisations with knowledge not previously available within the firm; (5) searching and noticing. Informational distribution determines the occurrence and breadth of organisational learning, given that knowledge is widely distributed within

the organisation and organisations often do not know what they know. Information interpretation concerns the process of translating events and developing sharing understanding.

Another widely used framework differentiates between knowledge creation, knowledge transfer, and knowledge retention (Argote and Miron-Spektor 2011). Unlike Huber's knowledge acquisition, knowledge creation is defined as the creation of new knowledge in the focal unit, more in line with the innovation literature. Knowledge transfer occurs when knowledge flows across a boundary. The boundary could be between occupational groups, between organisational units, or between geographic areas. Knowledge transfer includes the diffusion of knowledge with the organisation (i.e. information distribution) and vicarious learning, as well as unintended knowledge transfer to competitors that can be detrimental to the organisation (Pahnke et al. 2014). Knowledge retention focuses on both the stock and flow of knowledge in the organisation's memory, knowledge decay or depreciation.

The behavioural theories and organisational learning offer a good platform for understanding and developing innovation in organisations. The following discussion focuses on two central concepts and their roles in innovation, namely performance feedbacks and search.

Unlike RBV that focuses on resources and capabilities, behavioural theories have highlighted the impact of performance on firms' strategic behaviours. With regard to innovation, the temporal sequences should be noted, as innovation can spur superior future performance, and past performance has implications for innovation (Bowen, Rostami, and Steel 2010). Behavioural theories mainly focus on the latter, suggesting that innovation is more likely, when the firm performs below its aspiration level that triggers problemistic search and organisational change (Bolton 1993). A declining performance

also encourages risk-taking that stimulates innovation. In contrast, managers in organisations with satisfactory performance may find it unnecessary to innovate. The logic of BTOF has been empirically tested in various contexts, including corporate venturing (Gaba and Bhattacharya 2012), business group-affiliated firms (Vissa, Greve, and Chen 2010), family firms (Chrisman and Patel 2012), and across national cultures (O'Brien and David 2014).

Yet others argue that declining performance prevents innovation. In RBV's logic, good performance may generate abundant slack resources, which can be devoted to innovation. And at very low levels of performance, the ability to innovate may be further inhibited by limited resources and cognitive capability. Given the inconclusive theoretical positions on how past performance affects innovation, researchers have attempted to reconcile the paradox by identifying important moderators, including managers' subjective perceptions, interpretation, and experience, as well as objective environmental and organisational factors (Mone, Mckinley, and Barker 1998). Recent studies contribute to a deeper understanding by unravelling the performance evaluation, search and decision-making processes, which considers a wider range of factors. These include a cognitive image of the future (Chen 2008), the resource characteristics (Tyler and Caner 2015; Voss, Sirdeshmukh, and Voss 2008), the decision-making time horizons (Chrisman and Patel 2012), short and long-term performance feedback (Ben-Oz and Greve 2012), and feedback ambiguity (Joseph and Gaba 2015). Potentially, incorporating research on psychology and attention could greatly advance research in this stream.

'Search' is another concept central to BTOF and has important implications for innovation. Some scholars view search as a means to acquire information both internal and external to the firm, thereby treating it as an integral part of organisational learning and decision-making. In Huber (1991), performance monitoring is considered as the most

pervasive form of search, because firms need to gain relevant information to assess their performance, such as competitors' performance and stakeholder expectations.

It is generally agreed that search varies on multiple dimensions. Yet there is little consensus around its typology and the relationship between different types of search. In terms of motivation, search can be driven by performance shortfalls (i.e. problemistic search) and by organisational resources (i.e. slack search). The two are not mutually exclusive, as performance and slack do not necessarily covary (Greve 2003). In terms of the locus of search, search ranges from local to distant (Li-Ying, Wang, and Salomo 2014; March 1991). Accordingly, exploitation refers to learning via local search, experiential refinement, and selection; exploration stands for variation and learning via distant search. The scarcity of resources, and conflicts over mind-sets and organisational routines results in the fact that firms tend to emphasise one search strategy over the others at any particular time. In other words, they are fundamentally incompatible (Gupta, Smith, and Shalley 2006). Later studies add another dimension to the search space, as it can vary in terms of both scope and depth (Katila and Ahuja 2002; Laursen and Salter 2006; Liu, Chen, and Kittilaksanawong 2013; Wu and Wei 2013). Search scope is defined as the degree of new knowledge being explored; search depth is the degree to which search revisits prior knowledge. And the two are orthogonal rather than competing variables. In addition to the degree of search, recent work proposes the search target as another critical dimension focusing on 'what' to search (Jung and Lee 2015). The 'what' component differentiates between original knowledge and ordinary knowledge.

While some studies did not differentiate between internal or external-orientated search, others clearly underscore the value of external knowledge (Foss, Lyngsie, and Zahra 2013; Haas 2010; Laursen and Salter 2006; Li-Ying et al. 2014; Liu et al. 2013; Mina, Bascavusoglu-Moreau, and Hughes 2014), in line with the open innovation

literature (Chesbrough, Vanhaverbeke, and West 2006; Chesbrough 2003; West et al. 2014). Questions remain about the effectiveness of search on innovation (Kaplan and Vakili 2015), and how to search, assimilate, and utilise external knowledge to facilitate innovation, as well as how to avoid unintended knowledge spillover.

The notion of absorptive capacity (AC) offers a useful theoretical lens in addressing the first two questions. The process-based view defines AC as a firm's ability to recognise the value of new, external information, assimilate it, and apply it to commercial ends (Cohen and Levinthal 1990). Dynamic capability scholars reconceptualise AC as a dynamic capability relevant to knowledge creation and utilisation that enhances a firm's ability to gain and sustain a competitive advantage (Zahra and George 2002). Extant research has generally agreed on the positive influences of AC in innovation and performance, such as exploiting strategic opportunities (Foss et al. 2013), accelerating innovation process (Stock, Greis, and Fischer 2001), and facilitating organisational learning (Minbaeva et al. 2003) and knowledge creation (Matusik and Heeley 2005). Growing research interest centres on the antecedents of AC. Early literature has regarded AC as a natural *by-product* of a firm's prior R&D efforts (Cohen and Levinthal 1990); and operationalise AC using aggregated firm-level proxies, such as R&D intensity (Meeus, Oerlemans, and Hage 2001; Stock et al. 2001; Tsai 2001), patents (George et al. 2001; Mowery 1996), and new practices (Lenox and King 2004). Recent studies have begun to explore how AC can be *intentionally* managed (Lewin, Massini, and Peeters 2011). For instance, Jansen et al. (2005) argued that firms need combinative capabilities to enable themselves to synthesise and apply new knowledge; therefore organisational mechanisms associated with those combinative capabilities enhance AC. The list includes cross-functional interfaces, participation in decision-making, job rotation, connectedness and socialisation tactics, etc. Similarly, Schleimer and Pedersen

(2013a, 2013b) examined organisational mechanisms as determinant to AC in the context of multinational corporations. Given the extant focus on organisational factors, the possible impact of individual capacities and motivation, as well as relationships among individual organisation members is currently understudied (Ebers and Maurer 2014). Research in this stream seems a potentially fruitful avenue for future research.

The impacts of knowledge spillover and appropriation concerns are profound on innovation collaboration and performance. Opposite to the knowledge inflow via search, firms also need to take strategic actions to regulate its knowledge outflow. On one hand, firms might intentionally disclose some information to build reputation and attract collaboration (Alexy, George, and Salter 2013); on the other hand, firms also devise mechanisms to protect its valuable knowledge, including emphasise on property rights, trademarks, and other complex agreements (Laursen and Salter 2014). Research potential lies in understanding the impact of strong appropriability upon open innovation, and when (or why) firms waive such appropriability for their own advantage (Pacheco-de-Almeida and Zemsky 2012). Another theme of interest lies in nonpecuniary motivations, and the application of innovation in not for profit contexts.

2.3.3 An institution-based view and innovation

Although the role of the external environment has been frequently discussed, it primarily exerts influence on firms through economic forces such as market demand and technological changes (see the dynamic capabilities literature). With sufficient market-supporting institutions, theories originating from developed economies often treat institutions as part of the background. Challenging the fact of well-developed institutions, research with a focus on emerging economies leads to the emergence of an institution-based view (IBV) (Peng, Wang, and Jiang 2008; Peng 2002).

IBV draws insights from both the economic and sociological views of institutions (Peng et al. 2009). In institutional economics, institutions are defined as the 'humanly devised constraints that structure human interaction', and can be broadly classified as formal and informal ones (North 1990). Formal institutions refer to the constraints and incentives arising from laws, regulations, and government policies; whereas informal institutions are implicit, slowly changing, culturally transmitted, and socially constructed. Formal and informal institutions jointly determine the costs of exchange and production in the economy. The sociological version of institutions is 'regulative, normative, and cognitive structures and activities that provide stability and meanings to social behaviour' (Scott 1995). Regulative institutions are similar to formal institutions in institutional economics; in contrast, normative institutions describe social obligations and expectations about appropriate actions modelled on existing dominant practices or norms in a given culture, and cognitive institutions include the culturally shared understandings closely associated with cultural values. Institutions exert compliance pressures on social actors through expedience, social obligation or on a taken-for-granted basis.

Broadly speaking, institutions reduce uncertainties by conditioning the ruling norms of behaviours and defining the boundaries of what is legitimate. However in emerging markets, the complex and rapidly changing institutions can be a source of uncertainty and risk for organisations. Hence, IBV provides a conceptual framework for understanding how organisations make strategic choices during fundamental institutional transitions (Peng 2003:275). Treating institutions as the central component, IBV captures the emerging markets institutions with a two-phase model of market-oriented institutional transitions. The transition is described as when institutions move from a relationship-based, personalised transaction structure to a rule-based, impersonal exchange regime, consistent with the broad historical pattern associated with economic development around

the world. Furthermore, IBV studies the profound influence of institutions on organisations. It is assumed that when making strategic choices organisational decision makers are rational but only to a limited degree (i.e. bounded rationality), and various organisational forms exist within an institutional environment. Different organisations are likely to confront distinct institutional pressures, thus leading to various choices and interesting dynamics within and across different organisations. Some choices are made based on a cost-benefit analysis, but others may be because of inertia and/or inability. Inconsistent and conflicting institutions can confuse many firms making them unable to cope with institutional changes and complexities.

The institution-based view has emerged as a dominant perspective to explain organisational phenomena in emerging economies and international business in general. Although institutions matter, how institutions matter is still underdeveloped. A growing number of studies have contributed to addressing this question, summarised into three main areas: (1) the understanding of institutions; (2) the functioning mechanisms of institutions; (3) institutions as the boundary conditions.

First, the understanding of how institutions matter is built on the conceptualisation of institutions. Compared with developed markets, emerging market institutions are underdeveloped and in constant flux (Peng et al. 2009). Given the distinct features of emerging market institutions, significant advances are made through unbundling and elucidating the complexity of institutions (Taussig and Delios 2015). For instance, previous studies have proposed the existence of institutional void (Peng and Luo 2000), the varied level of institutional development (Chan, Isobe, and Makino 2008), and formal and informal institutional distances (Hernández and Nieto 2015; Sartor and Beamish 2014; Yang, Su, and Fam 2012). Scholars also disaggregate the institutional environment into its sub-dimensions, including the legal system and government (Estrin,

Korosteleva, and Mickiewicz 2013; Luo 2005; Shou et al. 2014; Slangen and Beugelsdijk 2010), the market-supporting and intermediate institutions (Cai, Jun, and Yang 2010; Doh et al. 2009; Gao et al. 2010; Taussig and Delios 2015), and various types of informal institutions (Holmes et al. 2011; Sartor and Beamish 2014; Stephan, Uhlaner, and Stride 2015). Furthermore, the dynamic aspect of emerging market institutions has inspired studies on institutional change. Researchers have examined the multi-stage model of market-oriented institutional transition (Kim, Kim, and Hoskisson 2010; Peng 2003), and suggested that changes could take place in terms of both scope and speed (Banalieva, Eddleston, and M.Zellweger 2015).

Second, the existing research has explored the functioning mechanisms of institutions on firm strategy-making processes. Institutions define, create, and limit business opportunities through regulating market entry and resources orchestration. For instance, governments could provide support to encourage firms to undertake initial internationalisation, such as the 'Open Door' and 'Go Global' policies in China (Lu, Liu, and Wang 2011). Government might also deter foreign entry if there is a corruption issue (Habib and Zurawicki 2002). Further, institutions influence the transaction costs, risk, and uncertainty of business operations through the establishment of strategic factor market, the provision of various public services (i.e. property rights protection and contract enforcement), as well as informal norms and values. Supportive institutions enhance market efficiency and firm performance, and hazardous institutions could lead to firm strategies with the aim of overcoming them. Empirical studies have demonstrated that development of free market mechanisms and intermediate institutions promote firm competence and export (Gao et al. 2010); whereas institutional voids result in a predominant reliance on network-based strategy with business partners and government officials (Pearce et al. 2011), and the absence of intermediate institutions and high

institutional risks encourage firms to engage in greater operational integration (Feinberg and Gupta 2009; Zhao 2006). Moreover, because institutions are multidimensional, complex, and polycentric; recent studies examined how different institutions can independently and jointly influence firm strategies and behaviours. Stephan et al. (2015) found the interaction effects between formal regulatory and informal cognitive/normative institutions on the level of social entrepreneurship.

The third type of contributions is made by integrating IBV with other theories to examine the interactive effect of institutions and other factors. Institutions often provide support for underlying assumptions of other theories, therefore enabling or constraining their logics. Based on optimal contracting theory and IBV, van Essen et al., (2012) argue that in better developed formal and informal institutions, there is a stronger relationship between executive compensation and corporate performance. Integrating IBV and transaction cost economics, researchers posit that weak institutions fail to provide the necessary level of credibility, stability and certainty to support the use of contracts and other legal governance mechanisms, therefore weaken the effectiveness of formal governance mechanisms on regulating strategic alliance (Bai, Sheng, and Juan 2016; Zhou and Poppo 2010). Informal institutions (e.g. culture) can also play a role, as they shape the preference and meaning of decision-making. For instance, Handley and Angst (2015) argue that contractual governance is more effective in individualistic cultures because members are more rational and calculative in their decision making thereby making them more responsive to extrinsic economic incentives. The joint consideration of RBV and IBV suggests that institutions could alter the value of specific resources on firm performance. The contingent effect of resource on firm performance is found, for example, the relationship-based resources (Sheng, Zhou, and Li 2011; Zhou et al. 2014),

local resources (Taussig and Delios 2015), and prior international experience (Lu et al. 2014).

Clearly, connecting institutions and innovation research in emerging markets opens up a rich and fascinating area for future investigation (Lu, Tsang, and Peng 2008). For example, an innovator's intellectual property right (IPR) for collecting revenue generated from an innovation must be protected by appropriate institutional arrangements, such as patent laws and copyright laws. Underdeveloped or improper institutional infrastructures may discourage or even stifle innovation. A main reason that piracy of intellectual products is rampant in Asia is because of the lack of enactment and/or enforcement of strong laws protecting IPR (Hill, 2007). As a result, substantial entrepreneurial energy is channelled toward making pirated and counterfeit products as opposed to toward legitimate entrepreneurship and innovation. Another example is that national and local governments in Asia played a more significant and direct role than their counterparts in Western countries in promoting knowledge transfer and innovation through government-corporation collaborations. How the role of government matters to firm innovation is a fruitful avenue for further research.

In summary, this chapter has endeavoured to provide an overview of the innovation literature. Acknowledging the richness and complexity of innovation-related studies, I have focused on clarifying the core dimensions of innovation, its processes, type, and the level of analysis. By reviewing three different and potentially complementary streams of theories, it is clear that prior theories can guide the current study, and studying innovation in the Chinese automobile assembly companies also develops new insights for both academic scholars and practitioners.

Chapter 3 Methodology and Data

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Studies of innovation have used a variety of research methods to deepen the empirical base, including historical narratives, case studies, statistical inferences, social network analysis, and agent-based modelling. Anchored in the social science methodological debate, it is suggested that there is a joint dominance of quantitative indicator-based research and ethnographic case studies in the field (Ametowobla, Baur, and Jungmann 2015). This chapter provides a short overview of both quantitative and qualitative research in existing innovation research, highlighting their advantages and disadvantages. Following a brief introduction on the mixed-methods approach, it describes the research design, empirical data sources, and analytical approaches employed in this thesis. Finally, it presents the structure of four papers in this thesis.

3.1 Quantitative and qualitative innovation research

3.1.1 Quantitative research approaches

Quantitative research uses abstractions and indicators from concrete processes to identify patterns and conduct statistical causal analyses. However, measuring innovation is no easy task. In early studies, R&D expenditure and total factor productivity (TFP) were often used as proxies for innovation. But R&D expenditure is a rather rough indicator for

innovation inputs; TFP is affected by factors other than innovation, along with other measurement problems. Currently, quantitative approaches to innovation studies are mostly based on two types of data, namely patent information and innovation surveys.

Patents provide rich information that is useful for measuring many innovation-relevant concepts, such as a firm's innovation output, the knowledge stock and structures, as well as knowledge flows (Nagaoka, Motohashi, and Goto 2010). One advantage of patent data is that it is systematic and covers a long period. However, patent-based indicators are not free from problems. Notably, patent systems are affected by the distinct features of a particular patent system of a nation at a given point in time,[1] thus causing the difficulty of matching it to other economic data. Moreover, not all patents represent innovation, nor are all innovations patented. Patent-based innovation indicators could be seriously biased. For instance, it is found that co-application, as found in the bibliographic information in the patent documents, significantly underestimates the actual extent of research collaborations.

Another popular empirical source is innovation surveys. Innovation surveys were first developed to increase knowledge about innovation in firms beyond what was already covered by R&D expenditures and patent data (OECD 2009). In these surveys, specific questions are designed to gain information about the firm's innovation inputs, outputs, and the behavioural and organisational dimensions of their innovative activities.[2] Innovation surveys have stimulated the scholarly analysis of various issues related to innovation (Arundel 2001). One primary advantage of a subject approach is that surveys

[1] There are a number of patent databases, including the National Bureau of Economic Research (NBER) patent database, USPTO, the EPO Worldwide Patent Statistical Database (PATSTAT), and the Institute of Intellectual Property (IIP) in Japan.

[2] For instance, the Community Innovation Survey (CIS) was formalised following the general guidelines of the Oslo Manual, a joint effort by the OECD and Eurostat. They were conducted every 4 years (1993, 1997, 2001, and 2005) and from 2007 are run at 2-year intervals. The CIS are now conducted in all European Union (EU) member states, but with differences across countries regarding the context, formulation, and ordering of the questions.

collect comprehensive data at the decision-making level of the firm, which is also the level of available for accounting and financial data that can be integrated to conduct richer analyses. An associated drawback is that it sacrifices information at lower levels, such as the individual project. Further, because of the huge costs, most innovation surveys are cross-sectional. The data are only collected at one specific point in time. And it is always problematic to address econometric endogeneity issues, and the difficulty of making statements about directions of causality with cross-sectional data.

3.1.2 Qualitative research approaches

Instead of attempting to find the perfect measurements, qualitative studies neglect such abstractions and set out to explore the processes in greater detail. They are often based on participant observation and qualitative interviews resulting from an ethnographic background. As a consequence, qualitative studies allow for fine-grained analysis, a more holistic interpretation, a detailed consideration of context, and the possibility of emergent insights (Chidlow, Plakoyiannaki, and Welch 2014). Rather than exploiting existing instruments, many qualitative studies explore radical new ideas and shift research trajectories. On the downside, these studies often result in thick descriptions of a single or a limited number of cases. As this approach tends to focus on singularities, they are likely to identify contingencies in processes but often lack focus on patterns and sufficient validity on generalisability. The results are more easily influenced by the researcher's personal biases and idiosyncrasies.

Research on architectural innovation nicely illustrates how a qualitative approach can contribute to the innovation literature. After six years of research on twenty auto companies in the late 1980s, Clark and colleagues suggested that minor changes can have significant competitive consequences, challenging the traditional view on radical and

incremental innovation (1991). They came up with the idea of architectural innovation and further explored its validity in a number of industries. One especially influential paper was written by Henderson and Clark (1990) based on a two-year, field study of the photolithographic alignment equipment industry (Henderson and Clark 1990). By collecting both primary and secondary information about each product-development project, they vividly illustrated the technologies and major technical changes, and how the industry incumbents failed at responding to new entrants' new product introduction. The idea of architectural innovation has opened up whole new areas for subsequent research. For example, Wang (2008) proposed the concept of quasi-open innovation architecture by studying the catching up" trajectory of Chinese carmakers.

3.1.3 A mixed-methods approach

As the advocates for quantitative and qualitative research have engaged in constant disputes, a mixed-methods approach acknowledges the value of both and attempts to bridge the two (Creswell 2009). Mixed-methods research is defined as "the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study" (Johnson and Onwuegbuzie 2004). Historical development of this research paradigm has been given many names, such as triangulation (Jick 1979), methodological pluralism (Sechrest and Sidani 1995), blended research (Thomas 2003), and integrative research (Johnson and Onwuegbuzie 2004). Mixed-methods research is now the most commonly used approach in social sciences.

There are many ways in which the research can be 'mixed'. Therefore, the design of mixed-methods research can vary substantially in terms of how qualitative and quantitative approaches are mixed within and across different stages of research (Johnson

and Onwuegbuzie 2004). Specifically, within each stage, the researcher decides the paradigm emphasis (whether the qualitative or quantitative approach take the dominant status) or the degree of mixture. Across the stages of research design, there is a concern with the time ordering of the qualitative and quantitative research, as different phases can be carried out sequentially or concurrently.

A mixed-methods approach combines strengths from both qualitative and quantitative research, as it helps refine and address the research questions in both breadth and depth, and it allows for better confidence and validity. It also provides a solid understanding of multiple methods used by scholars to facilitate communication and collaboration. A potential weakness of this approach can be the difficulty for one single researcher carrying out both qualitative and quantitative research, as mixed-methods approach tend to be more time consuming and problematic in data interpretation, and in its demands on researcher expertise.

3.2 Research design and methodology

This thesis employs a three-stage mixed-methods research design as outlined in Figure 3-1 below. Stage one has focused on refining the research questions through preliminary literature review and expert interviews, and thus is mainly dominated by a qualitative approach. Industry-level data was also collected and analysed to gain an overall understanding of the Chinese automobile industry, such as its structure, historical development, and current situations. Stage two is a mixture of quantitative and qualitative research, represented by the iterations between conceptual model development (qualitative) and statistical testing (quantitative). Data from a nation-wide innovation survey was obtained and heavily used in this stage. Stage three is again a qualitative-dominant phase with field observations and additional information collection (both

qualitative and quantitative). Next, I outline the processes of the research framework development, the empirical data sources, as well as the analytical methods.

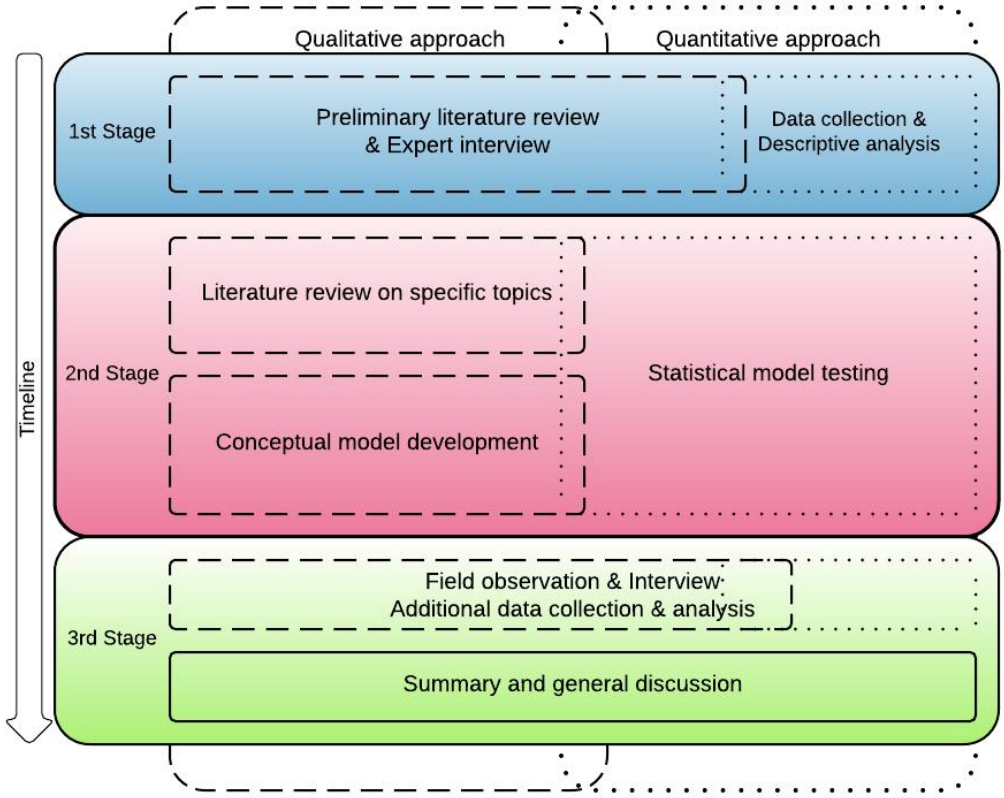


Figure 3-1 A three-stage mixed-methods research design

3.2.1 Research framework development

This DPhil study started with a comprehensive literature review that is qualitative in nature to explore the existing literature and refine the research questions. I searched for English journal articles in Web of Science Core Collection (Social Sciences Citation Index) with "innovation" as the topic between the year 2000 and 2014. The number of innovation studies published annually has grown steadily during this period (see Figure 3-2). Among the 39,751 records, over 3844 (9.7%) records were identified as "multidisciplinary/interdisciplinary" research in the Web of Science Categories. The top fields were Management (29.9%), Economics (18.9%), Business (18.3%), Planning Development (8.5%), Environmental Studies (7.2%), Geography (4.6%), Public Science

(2.3%), Sociology (1.9%), and Psychology (3.9%). Top ten journals publishing innovation research were *Research Policy*, *International Journal of Technology Management*, *Technological Forecasting and Social Change*, *Technovation*, *Journal of Product Innovation Management*, *European Planning Studies*, *Technology Analysis Strategic Management*, *Energy Policy*, *R&D Management*, and *Journal of Business Research*.

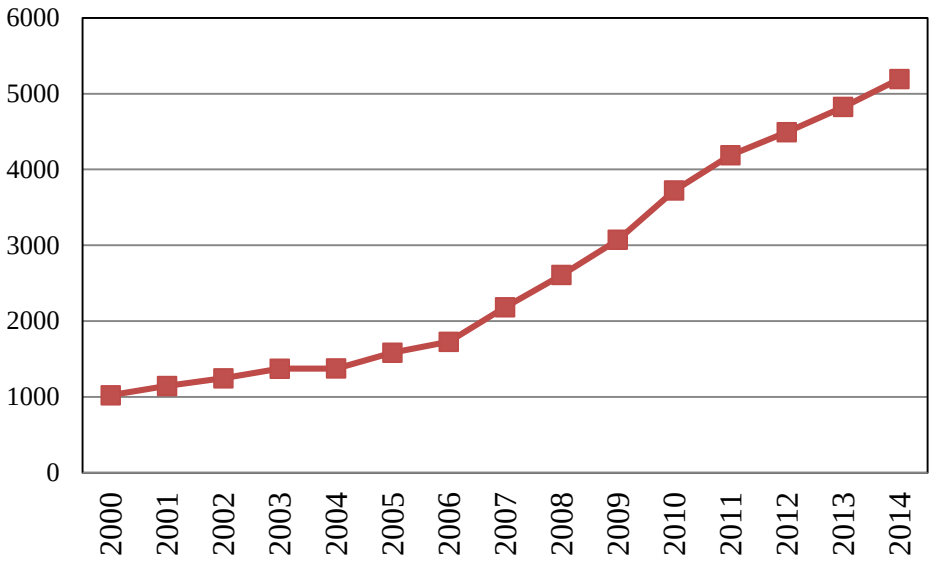


Figure 3-2 Growth pattern of journal articles on innovation in Web of Science Core Collection

Note: Data retrieved in October 2015.

To search for more relevant articles, different search strategies were employed. First, I developed a broad understanding of the field through reading books (mainly handbooks and textbooks) (Fagerberg, Mowery, and Nelson 2006; Lundvall 1992; Mairesse and Mohnen 2010), as well as several review articles (Anderson, De Dreu, and Nijstad 2004; Crossan and Apaydin 2010; Gopalakrishnan and Damanpour 1997). Second, with a particular interest in understanding innovation in China and the automobile sector, I identified key concepts in the existing literature for further investigation. These search terms include product/process innovation, architectural innovation and complex product systems, business model innovation, imitation and

reverse engineering, international collaboration, outsourcing, catching-up, absorptive capacity, the Chinese government and institutions. Third, for critical articles (relatively recent and with exceptionally high impact), I used a two-way "snowballing" technique to identify all relevant studies, namely backward-tracking all references cited in previously identified articles and forward-tracing all articles cited these articles using Google Scholar.

After getting a basic idea of the research context, I developed an interview guide to ask qualified informants questions about their opinion and experience in innovation in China and the Chinese automobile industry. The key questions are (1) What is your opinion about innovation in China? (2) What is the role of the firm, its external business network, the government, and wider society in the innovation process? (3) Does innovation matter for Chinese automakers? (4) Whether and how are Chinese automakers innovating? (5) What differentiates innovating firms from those who do not innovate? (6) What do you think is the five most important elements that contribute to innovation in Chinese automakers and how?

Since the research questions are quite general and broad, in order to gain a comprehensive view, I first attempted to get in touch with business school professors with expertise in innovation and the automobile industry in China, before consulting automobile industry experts for their direct experience. I got to know one professor when attending his talk on innovation in China in Cambridge Judge Business School in April 2013. He then referred me to two other professors in related areas. I assessed the professionals in the automobile industry through recommendation by friends or previous acquaintances. Table 3-I contains the demographic information of the ten interviewees.

To ensure the reliability and validity of the qualitative information, I relied on several strategies. First, I made sure that the interviewees were qualified respondents to

the focal questions. All four academics hold at least associate professorship in prestigious universities with an average of 20 published journal articles, indicating their considerable research experience. On average, the industrial insiders had about seven years of experience in new product development (NPD) related work. Second, I chose informants from various sources, across different regions and company types (both SOEs and privately-owned). Third, I emphasised the confidentiality of this study and conducted open-ended interviews, which allowed for interactive communication processes.

Table 3-I Descriptive information of the interviewees

Case ID	Position	Area/Expertise	Region	Industry	Forms of communication
1	Associate professor	School of Economics & Management, with research expertise in innovation and entrepreneurship	Beijing, China	Academic	Email, in person
2	Professor	School of Business, with research expertise in strategic orientation and product innovation in China	Hong Kong, China	Academic	Email, in person
3	Associate Professor	School of Business, with experience in the Chinese automobile industry and human resource management	USA	Academic	Email, in person
4	Associate Professor	School of Business, with expertise in marketing in emerging markets	USA	Academic	Email, in person
5	Senior consultant	5-year research experience in energy, automobile, and electrical equipment	Guangzhou, China	Consulting	Phone
6	R&D personnel	5-year research experience in power electronics and power system, with the focus on electric machine design and control	USA	Industry	Phone
7	R&D personnel	3-year research experience in automobile safety research	Shenzhen, China	Industry	In person
8	R&D manager	10-year experience in automobile engineering	Shenzhen, China	Industry	In person
9	Senior manager	10-year experience in current company	Shanghai, China	Industry	Phone
10	R&D manager	9-year experience in automobile engineering	Shanghai, China	Industry	Phone

The preliminary literature review revealed the diversity of extant innovation literature; it also offers several theoretical lenses and directions that could guide subsequent empirical research. Special research interest was placed on understanding the nature of innovation in China's automobile assembly firms, how to promote innovation capability in these firms, and the performance implications of firms' innovation capability. Conversations with scholars and industrial professionals confirmed the significant importance of innovation in the Chinese automobile industry. They also shed light on the nature of innovation in this current context as mainly associated with organisational learning and incremental improvements. Jointly, they have suggested a variety of internal and external factors that could play a role in promoting innovation in firms. These common factors include firms' resource endowment, access to foreign technology, government policies, and market competition. Yet they emphasised the sharp differences between SOEs, IJVs, and privately owned automakers on the abovementioned dimensions. Moreover, managers underscored the impact of corporate strategy and the wider business and institutional environments on innovation; whereas R&D personnel focused more on personal education, training, and wages, which impact their ability and motivation to engage in innovation.

Based on the literature review and interviews, I developed the research framework as presented in Figure 3-3. The overall research framework focuses on the firm's innovation capability. Taking the characteristics of the firm and its external environments into consideration, this research aims at studying the impact of external and internal factors on firms' innovation capability, and subsequent outcomes.

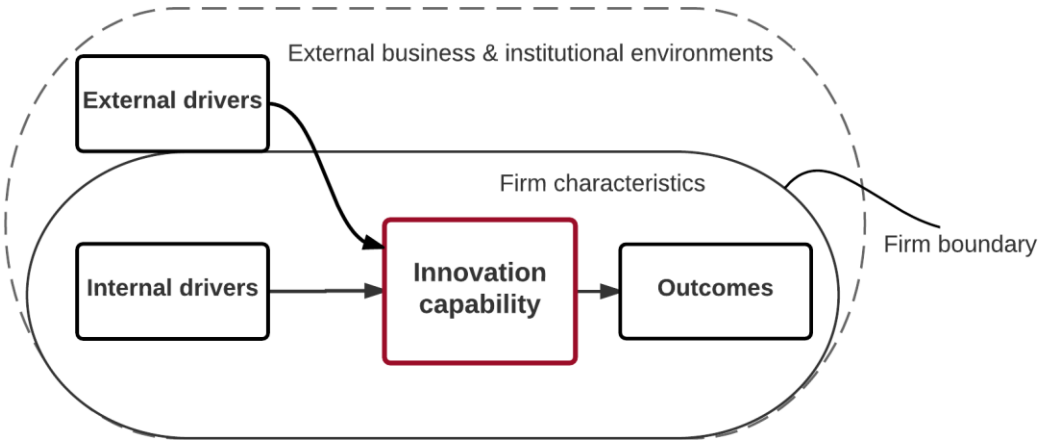


Figure 3-3 The overall research framework

3.2.2 Empirical data sources

To investigate the proposed relationships in the research framework, I have gained access to a couple of important data sources. One is the Chinese Automotive Industry Yearbook, the most comprehensive, authoritative, statistical reference on the Chinese automotive industry. It is currently published annually by China Automotive Technology & Research Centre. The data has been extensively used in journal articles and theses (Chu 2011; Wang 2008; Xi, Lei, and Guisheng 2009; Zhao, Anand, and Mitchell 2005; Zhao and Anand 2009). It classifies the whole industry into five sub-sectors, namely automobile assembly, adjusted automobile, motorcycle, auto engine, and other auto components. The yearbook mainly covers information on the Chinese automotive industry at the national level, including the number of firms, annual sales, total assets, tax, energy consumption, total employment, total R&D investments and personnel. I have been able to access the yearbooks published between the year 1990 and 2014.

While the automotive yearbook provides abundant information at the aggregate level, it lacks fine-grained information on specific firms – such as business strategy, operation activities, and organisational dynamics. The information availability of a specific target depends on its public disclosure, media coverage, business analysis and

research attention, and more directly through onsite observation and direct contacts. Zhengjiang Geely Holding Group is a case in point. As the first Chinese indigenous automotive manufacturing group currently listed on the HK stock exchange market, it is subject to various sources of information disclosure. Firm-level data is widely available in the form of company annual reports, business news, research articles, and autobiographies and books (in English and Chinese). The Geely Group official website[3] and its founder's personal website[4] offer further information on the history of its corporate development, current product, recent activities, and etc. Since the year of 2012, Geely has published its annual social responsibility report.

In addition to the information on the industry and specific firms, a wider scale firm-level data is still warranted. Notwithstanding its inherent limits, patent data is potentially useful; yet the Chinese patent system is frequently criticised as lacking in reliability. In this circumstance, industry-wide innovation surveys at the firm level are necessary to provide an in-depth and systematic understanding. Given the time and budget constraints, I made use of the 2007 national innovation survey on Chinese automobile assembly companies. Although the survey data is a bit dated, it is the most comprehensive dataset available covering all Chinese automobile assembly firms on a variety of aspects. For reasons of confidentiality, the specific questions and structure of the innovation survey cannot be disclosed; but I will describe its sampling methods, survey contents, as well as comment on its quality in detail.

The nation-wide innovation survey was conducted under the sponsorship of the National Development and Reform Commission of China (i.e. the key planning branch of the Chinese government), and Chinese Society of Automotive Engineering (i.e. a national-wide non-profit organisation in the fields of automobile and related industries).

[3] See http://www.geely.com/welcome/index.html
[4] See http://www.shufuli.com/

The questionnaire was designed to collect information on Chinese automobile assembly companies and offer advice for industrial policy making. Questionnaires were sent to all 105 automobile assembly companies in the industry in 2007 and received 100 percent response rate. For each company, four respondents were surveyed, namely the top manager (QA), HR manager (QB), R&D manager (QC), and one key R&D engineer (QD). All surveys start with the background information of the respondents and then turn to more specific questions. Depending on the target respondent, the questionnaire covers different areas throughout the innovation/NPD processes, including the resource factors of innovation, managerial factors of innovation, the external environment, innovation performance, innovation capability, and economic performance. Most questions were anchored by a 5-point Likert-style ranging from 1 (i.e. strongly disagree) to 5 (i.e. strongly agree).

Given that a 100% response rate is extremely rare for survey research and raises potential issues of social desirability, I checked the quality of the data through directly contact with the survey developer and further conducted a number of analytical methods. (1) Government-sponsored surveys tend to have a higher response rate in general and in China specifically. 100% response rate pertains to the fact that all firms have returned the original survey, yet there are still a number of missing data. (2) Great care was taken to ensure the quality of the survey questions. The questionnaire was initially developed in English and then translated into Chinese. To ensure conceptual equivalence, the Chinese version of the survey was back-translated into English. In-depth interviews were held focusing on the content and face validity of the measurements. (3) During the survey process, anonymity and confidentiality were ensured to all respondents; and the sponsors only had access to the results in the aggregated form. (4) All respondents were demonstrated to be qualified informants, as they held over ten years of experience in the

auto industry and the firm (see Table 3-II). (5) Survey data demonstrates adequate normal distribution. And the correlations of the same construct between different respondents from the same company are highly significant (between 0.6-0.8, $p < 0.01$). (6) The dataset has been used in a top-ranking business strategy journal article published recently (Zhao and Chadwick 2014).

Table 3-II The multi-respondents innovation survey

	No. Page	Target respondents	Experience (Years)		
			in the auto industry	with the firm	in current position
Questionnaire A (QA)	10	Top managers/ CEOs	16.5	12.3	5.0
Questionnaire B (QB)	4	HR managers	15.7	13.1	4.5
Questionnaire C (QC)	16	R&D managers	16.9	12.5	4.5
Questionnaire D (QD)	12	Key R&D engineers	14.7	10.7	4.9

3.2.3 Survey data analytical processes

i) Data preparation

Data preparation pertains to the work on the raw materials contained in the questionnaires, including questionnaire checking, editing, coding, transcribing and cleaning of data. The data-preparation processes directly relate to the quality of subsequent statistical results, and inadequacies can lead to biased findings and incorrect interpretation.

Out of the 105 cases (i.e. companies), two were deleted from the final sample due to excessive missing data. However, casewise deletion can result in a much smaller sample that seriously biases the results. Given the limited sample size of the original survey and the fact that many respondents had some missing responses, other missing or out-of-range data were substituted with industrial mean values. Complementing the survey data, archival data on firm age, firm size, return on assets, R&D spending, and foreign equity shares was collected from the China Automotive Technology and Research Centre.

Upon checking the data, some raw data were transformed to create new variables. For instance, R&D intensity was created as the ratio of R&D spending and total sales. Log transformation was applied to the variables representing the firm size (two alternative measures using both annual sales and the number of employees). The original categorical variable, ownership, takes the value from 1 to 9, representing nine official types of Chinese firms (i.e. state-owned companies, collective-owned companies, privately-owned companies, associated companies, stock corporation, international joint ventures with Hong Kong/Taiwan companies and with other foreign companies, wholly owned Hong Kong/Taiwan and other foreign companies). As there are in fact no wholly owned foreign automobile companies in China, nor are there any documented collective-owned or associated companies, I further classified the firms into three major types, namely SOEs, privately-owned/operated, and international joint ventures. I referred to both the information in the survey and each individual companies' official website to identify its operation type.

ii) Basic data analysis

Basic data analysis is used to describe the main features of the data, such as the frequency distribution, descriptive statistics for each variable, and cross-tabulations.

Basic data analysis can detect possible flaws in the data (as in the data preparation stage), and provides a summary that can be displayed through tables and graphs. It also provides guidance and forms the foundation for further analysis.

For instance, considering measuring innovation performance, top managers were asked to assess the company innovation performance on a five-point Likert scale ranging from 1 (falling behind) to 5 (greatly improved). The specific questions include (1) the ratio of new product value on total value; (2) new product to market cycle; and (3) the number of new products. The descriptive analysis results are shown in Table 3-III. There are less than 10 (9%) missing data in each innovation performance measure. The mean value ranges from 3.65 to 3.89 out of 5. The data generally follows a normal distribution (see Table 3-IV, Table 3-V, and

Table 3-VI). F-testing between different ownership groups further suggests that there is no significant difference in these innovation performance dimensions across different ownership types (see Table 3-VII). In contrast, different types of firms vary in their modes of innovation development (see Table 3-VIII). Specifically, privately owned companies rely heavily on autonomous development and outsourcing, both of which are significantly higher than the other two groups. As expected, IJVs depend more on technology transfer than both SOEs and POEs.

Table 3-III Descriptive analysis on three innovation performance items

Question: On the scale of 1 to 5, how do you evaluate your firm's innovation performance on the basis of		Innovation Performance (1) the ratio of new product value on total value	Innovation Performance (2) the new product to market cycle	Innovation Performance (3) the number of new products
N	Valid	96	93	94
	Missing	6	9	8
Mean		3.89	3.65	3.81

Median		4	4	4
Mode		4	4	4
Variance		0.566	0.797	0.63
Skewness		-0.717	-0.732	-0.961
Std. Error of Skewness		0.246	0.25	0.249
Kurtosis		0.748	0.148	1.516
Std. Error of Kurtosis		0.488	0.495	0.493
Range		3	4	4
Minimum		2	1	1
Maximum		5	5	5

Table 3-IV Frequency table of innovation performance measurement (1)

Innovation performance (1)		Freq	%	Valid %	Cum %
Valid	2	6	5.9	6.3	6.3
	3	15	14.7	15.6	21.9
	4	59	57.8	61.5	83.3
	5	16	15.7	16.7	100.0
	Total	96	94.1	100.0	
Missing		6	5.9		
Total		102	100.0		

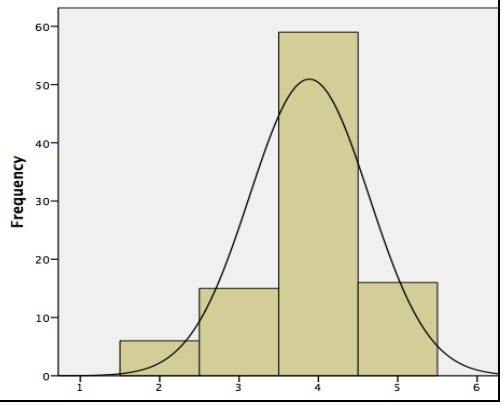


Table 3-V Frequency table of innovation performance measurement (2)

Innovation performance (2)		Freq	%	Valid %	Cum %
Valid	1	1	1.0	1.1	1.1
	2	12	11.8	12.9	14.0
	3	17	16.7	18.3	32.3
	4	52	51.0	55.9	88.2
	5	11	10.8	11.8	100.0
	Total	93	91.2	100.0	
Missing		9	8.8		
Total		102	100.0		

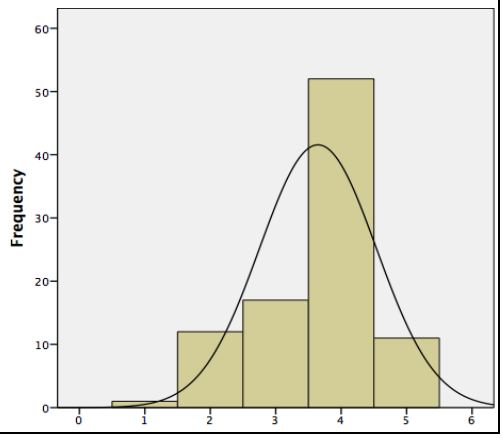


Table 3-VI Frequency table of innovation performance measurement (3)

Innovation performance (3)		Freq	%	Valid %	Cum %
Valid	1	1	1.0	1.1	1.1
	2	6	5.9	6.4	7.4
	3	16	15.7	17.0	24.5
	4	58	56.9	61.7	86.2
	5	13	12.7	13.8	100.0
	Total	94	92.2	100.0	
Missing		8	7.8		
Total		102	100.0		

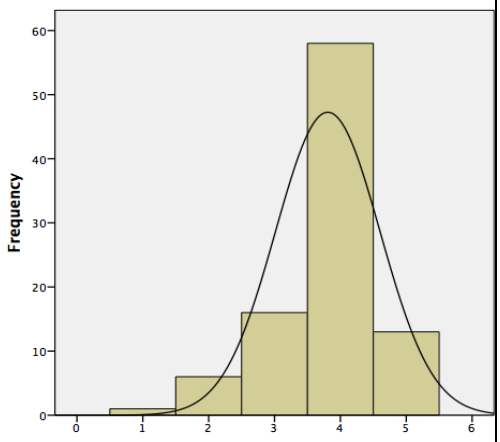


Table 3-VII Comparing innovation performances across ownership types

	SOE: 1	POE: 2	IJV: 3	F-Test
Innovation performance (1)	3.94	3.78	3.85	0.372
Innovation performance (2)	3.65	3.65	3.64	0.001
Innovation performance (3)	3.87	3.60	3.81	0.884
Innovation performance	3.82	3.68	3.77	0.373

Notes 1: Overall Innovation performance = (Innovation performance (1) + Innovation performance (2) + Innovation performance (3))/3
2: SOE (N=57); POE (N=18); IJV (N=27)

Table 3-VIII Comparing innovation development modes across ownership types

Innovation development mode	SOE: 1	POE: 2	IJV: 3	F-Test	1-2	T-test	1-3	T-test	2-3	T-test
Autonomous development	4.54	**4.67**	4.09	3.15**	-0.12	-0.66	0.45	1.76†	0.58	**2.00***
Collaborative development	3.39	3.43	3.36	0.02	-0.04	-0.13	0.03	0.11	0.07	0.20
Outsourcing	2.43	**3.24**	2.75	4.09**	-0.80	**-3.08****	-0.31	-1.14	0.49	1.33
Technological transfer and re-development	3.02	3.31	**3.88**	5.36**	-0.30	-0.95	-0.87	**-3.15****	-0.57	-1.83†

iii) Inferential statistics

In most cases, the key task for the researcher to make theoretical contributions and draw a deeper understanding of the empirical data is **model development and specification** (Allen 1997). Theoretical models outline testable hypotheses for empirical testing. Model specification determines which independent variables should be included in or excluded from a regression equation. And the development and specification of a model should be based primarily on theoretical considerations rather than empirical or methodological ones. Here I clarify the methods employed to test the validity of construct measurements, as well as the hypothesis testing methods using multiple regression analysis.

Measurement validation

Most constructs were measured by more than one item/question (as the construct of 'innovation performance' mentioned above). As reflective measurements, they are latent variables acting as the common cause of multiple highly correlated items. Therefore, the value of reflective constructs is determined by the mean value of multiple items. To establish whether these instruments truly measure the construct that they are intended to measure, four different types of validity of reflective measures need to be evaluated: content validity, convergent validity, discriminant validity, and criterion validity (Bagozzi and Yi 1988).

Content validity was normally assessed at the first stage of the new scale development process: specify the domain of the construct. As noted earlier, these constructs were developed from an intensive literature review and solid theoretical arguments. Moreover, the item pool of the measures was assessed through pre-test with industrial insiders when designing the questionnaires. Hence, the content validity of these reflective measures can be guaranteed.

Convergent validity refers to the degree to which multiple attempts, methods, and sources to measure the same construct resulted in agreement. In other words, convergent validity requires that 'two or more measures of the same thing should covary highly if they are valid measures of the concept'.

Discriminant validity refers to "the extent to which the measure is indeed novel and not simply a reflection of some other variable". In this case, discriminant validity is satisfied when measures were sufficiently different from each other.

In this research, I used confirmatory factor analysis (CFA) conducted in structural equation modelling (SEM) by AMOS to assess the convergent validity of the measures (Gerbing and Anderson 1988). For illustration, the measurement model of **Paper 2** is presented in Figure 3-4. Innovation incentives, teamwork, and leadership are first-order variables, measured by three, four, and six items, respectively; and absorptive capacity is a second-order latent variable composed of three sub-dimensions and a total number of eight items. Results from the CFA revealed that all indicators were significantly loaded on the factor that they were supposed to measure. The measurement model fit indices are acceptable.

After the unidimensionality had been reasonably established, I calculated the reliability of these measures, ensuring that the composite score is not determined primarily by measurement errors. Reliability can be defined broadly as "the degree to which measures are free from error and therefore yield consistent results". Following previous research, I calculated the internal consistency reliability by using Cronbach's alpha (Price and Mueller, 1986) and the criterion of alpha bigger than 0.70 threshold.

Discriminant validity is assessed based on (1) the pair-wise Chi square comparison; and (2) comparing the square correlation between a pair of variables with the average variance extracted (AVE) for each individual variable. It was suggested that the

AVE should be greater than 0.50 (the suggested cut-off value) and the discriminant validity will be achieved if the AVE is bigger than the squared terms of the variable-level correlations (Fornell and Larcker 1981).

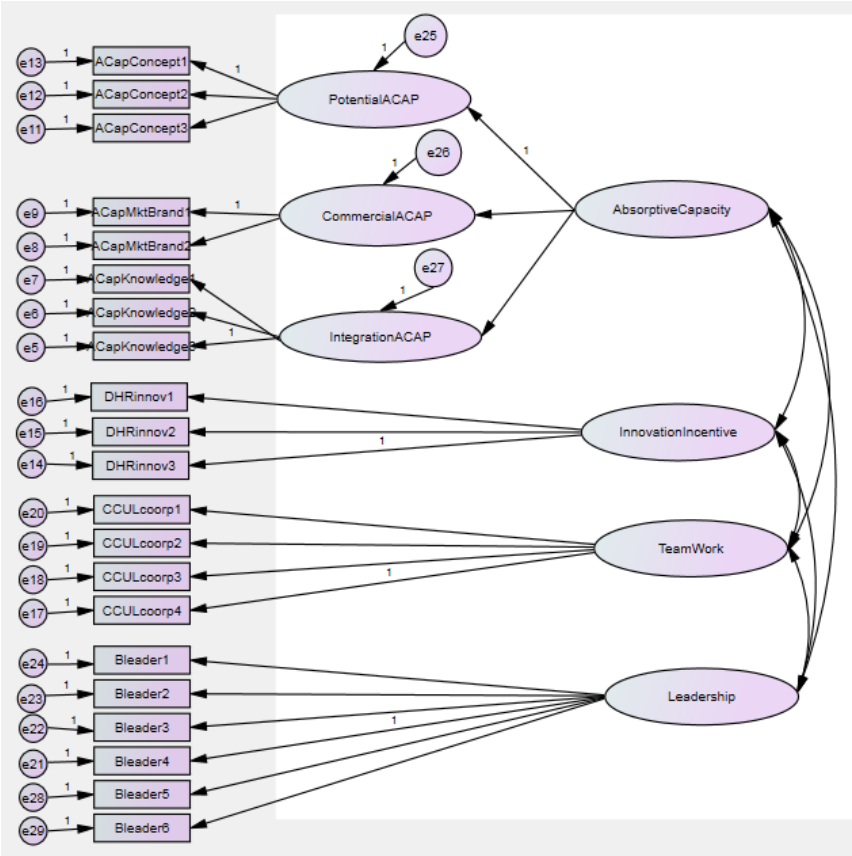


Figure 3-4 Construct measurement model of **Paper 2**

Mediation and moderation models

Based on established theories and the existing literature, mediation/moderation models were proposed and tested to explain the complex relationship between explanatory and dependent variables.

Mediation is the mechanism that explains how the antecedent influences the consequence through the intermediate role of mediator. It implies a causal relation between both the predictor **X** and mediator **M** and the mediator **M** and outcome **Y**. In complete mediation (see Figure 3-5(a)), **M = *f* (X), Y = *f* (M).** And in partial mediation (see Figure 3-5(b)), **Y = *f* (M, X).**

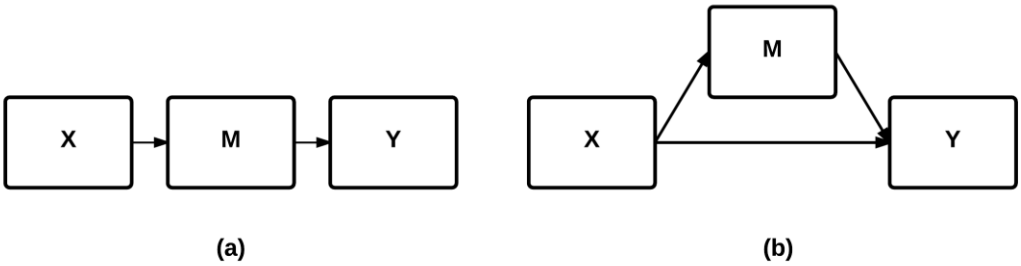
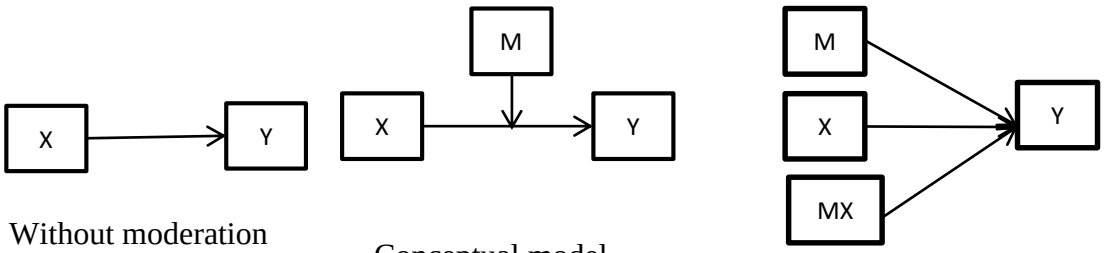


Figure 3-5 The complete (a) vs. partial (b) mediation models

Moderation is the most prevalent tool used to analyse contingency studies (Ketchen, Boyd, and Bergh 2007). A moderator is either a qualitative or quantitative variable that affects the direction and/or strength of the relation between an independent variable and a dependent variable. In other words, the effect of predictor **X** on criterion **Y** is influenced by the function of **M**. Typically this function is assumed to be linear and also assuming that **Y** is a linear function of **X**, thus $\mathbf{Y= i + b_1X + b_2M + b_3MX + E}$. The interaction of **X** and **M** or coefficient $\mathbf{b_3}$ measures the moderation effect; and the effect of **X** on **Y** is $b_1 + b_3M$, implying that the effect of **X** on **Y** depends on the value of **M** (see Figure 3-6)**.**



Without moderation
Linear relation assumed
$\mathbf{Y= i + b_1X + E}$ (1)

Conceptual model
$\mathbf{Y = i + \mathit{f}(M)X + b_2M + E}$ (2)

Statistical model when assuming that: $f(M) = b_1 + b_3M$
$\mathbf{Y= i + b_1X + b_2M + b_3MX + E}$ (3)

Figure 3-6 Conceptual /statistical moderation model and equations under linear relation assumption

With regard to the research framework outlines in Figure 3-3, the core construct, innovation capability, can act as the mediator between the external/internal drivers and organisational outcomes. Moreover, specific characteristics of the organisation and its external environment could moderate the effect of drivers on innovation capability. A brief comparison between mediation and moderation is provided in Table 3-IXbelow.

Table 3-IX Comparisons between mediation and moderation models

	Moderation	Mediation
Concept	A moderation analysis is an exercise of ***external*** validity in that the question is how universal is the causal effect of **X** on **Y**. Address the question of "when", "for whom"	A mediation analysis is testing the ***internal*** mechanism of how **X** influences **Y**. Address the question of "how" and "why"
Process	Contingence analysis, strong interest in the predictor variable per se. And the choice of moderator depends on the interest of researcher. For a given value of **M**, the effect of **X** on **Y** is referred as the *simple effect* **X** on **Y.**	Process analysis, **M** represents the Internal mechanism. At the individual level, it is most likely to represent properties of the person in terms of its cognitive process, emotion. It could also exist in group-level or a broader level. It depends strongly on the theory. With a fixed the level of **M**, there could be no effect of **X** on **Y**.
Objective	Enhance predictability (specify the boundary conditions of theories)	Enhance explanatory power
Causal relation	If **X** is not manipulated, the researcher needs to justify the choice of causal direction based on theory or common sense. There is no necessary correlation between **M** and **X** then that correlation has no special interpretation. However, if **M** and **X** are too highly correlated, there can be estimation problems.	Causal relation between **M** and **X**, and **M** and **Y**, with a causal order
Measurement timing	Ideally, **M** should be measured prior to **X**. If **M** is a variable that does not change (e.g. gender and race), the timing of its measurement is less problematic.	Ideally, **X** should be measured prior to **M,** and **M** measured prior to **Y**.

IV or DV	**M** as the IV, Y = *f*(X,M)	**M** as the IV and DV, M = *f*(X), Y = f(M) in complete mediation or Y = *f*(X,M) in partial mediation
Level of measurement	**M, X** could be either categorical or continuous.	
Strategic	Moderator variables are typically induced when there is an unexpected ***weak*** or ***inconsistent*** relation between the predictor and the outcome.	Mediation analysis is best done in the case of a ***strong*** relation between the predictor and outcome.

To test the mediation/moderation research models, a series of hierarchical linear regression analyses can be used. During the processes, I followed well-established procedures to detect whether the four assumptions for linear regression analysis were met: linearity, homoscedasticity, independence, and normality; and used remedies accordingly. As for the potential problem in linear regression analysis, I relied on the variance inflation factor (VIF) to detect whether the independent variables had serious multi-collinearity in the regression models. The widely accepted cut-off value of 10 was employed. Moreover, in order to reduce the potential multicollinearity, I mean centered all the variables in the interaction terms (Aiken and West 1991).

3.3 The four-study structure

Building on multiple theories and the available empirical data, this thesis adopts a four-paper structure to address the proposed research framework (see Figure 3-7). **Paper 1** develops a comprehensive model explaining the drivers and consequences of innovation capability of Chinese automakers with different ownership types. In this case, firms' ownership type is the moderator changing the impact of different resources on innovation capability. Focusing on internal drivers of innovation capability, **Paper 2** proposes that the relational contexts in the workplace could moderate the effectiveness of innovation incentives on absorptive capacity. Shifting the attention to external influences of the firm,

Paper 3 examines how the configuration of external knowledge affects innovation performance, which leads to better financial performance. Beyond the proposed research framework, **Paper 4** challenges the direction of effect of drivers on innovation capability by raising the interesting question of whether a reverse effect could also exist, reflecting the potential synergy between firm's market and nonmarket activities.

In terms of methodological approaches, the first three papers develop theoretical models and test the hypotheses employing statistical analyses based on data from the industrial-wide innovation survey and the Chinese automobile yearbook. It represents a mixed-method research that combines the theoretical development based on prior literature and statistical model testing. Structured research processes provide more rigorous tests of hypotheses, yet potentially run the risk of the evolving narrowness within the existing boundaries and tend to make more incremental contributions (Daft and Lewin 2008). Being more explorative in nature, **Paper 4** employs a case study on one Chinese indigenous automobile company so that preliminary evidence on the value of integrated strategy can be offered. Through more diverse information sources, it generates novel ideas about how innovation capability contributes to greater political influence for the firm, thereby complementing the previous three papers. The following four chapters contain the four stand-alone papers, with their respective literature gaps, focused literature review, methodology and empirical results, and discussions.

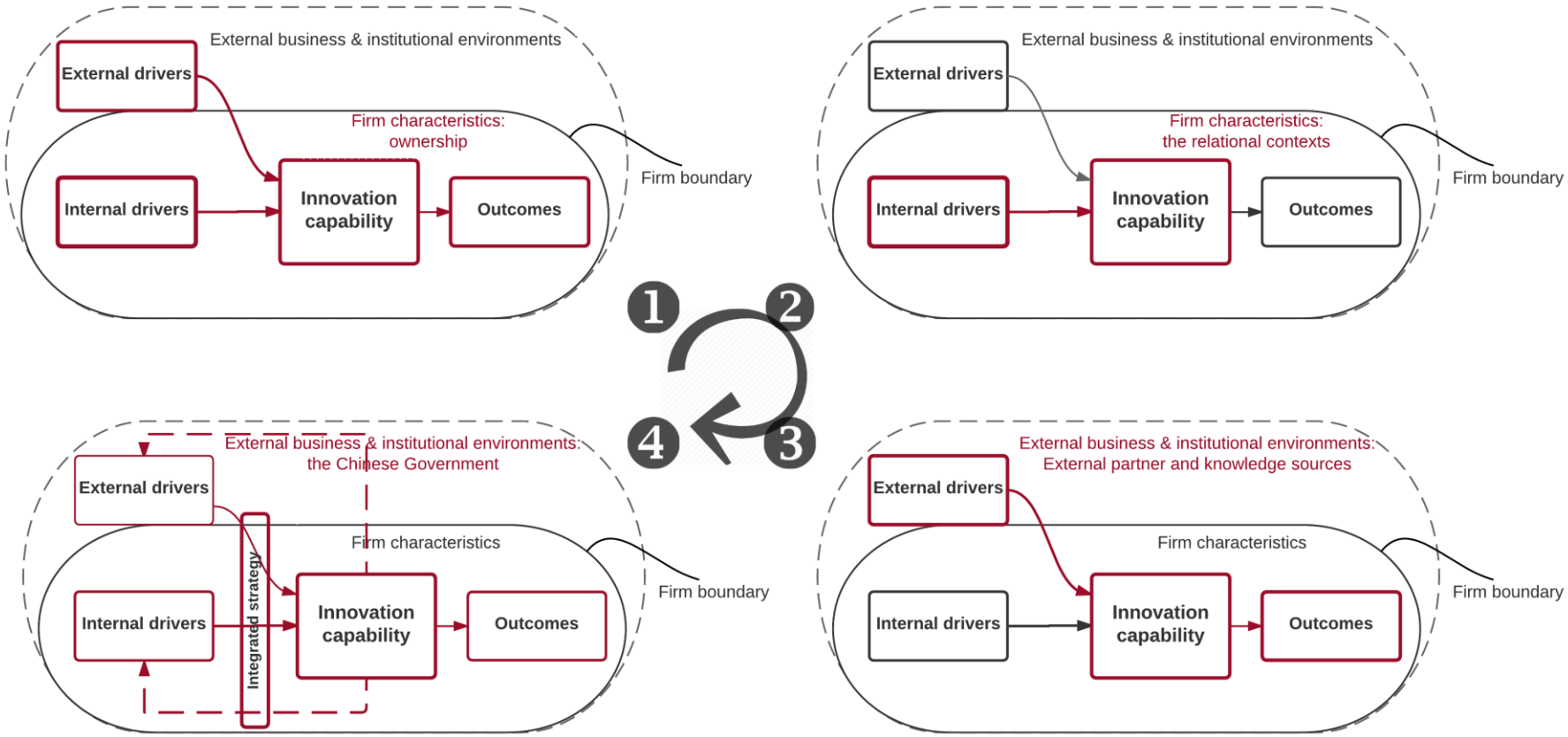


Figure 3-7 The four paper structure of the thesis

Note: Each paper focuses on its highlighted section (in red) of the overall framework.

Chapter 4
A Resource-based View of Developing Innovation Capability of Chinese Automakers: Comparing IJVs, SOEs and POEs

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Abstract

Innovation capability is important for firms in emerging markets. Based on the resource-based view (RBV), this paper investigates the effects of financial resources, human capital, transformational leadership, collaborative culture and government support on a firm's innovation capability. Utilizing data on 102 Chinese automobile assembly companies, this study found that they all contribute to the development of innovation capability, which consequently enhances the firm's new product development performance. Moreover, the firm's ownership type serves as a boundary condition for the resource-innovation capability relationship. In particular, financial resources are important for privately owned firms (POEs) to develop innovation capability, and to a less extent, state-owned ones (SOEs). Human capital and government support is crucial for international joint ventures (IJVs), but not for either POEs or SOEs. Transformational leadership plays a critical role in both SOEs and POEs. Collaborative culture promotes innovation capability in IJVs and SOEs.

4.1 Introduction

The development and diffusion of innovation have a vital impact on the competitiveness of nations, regions, and firms (Guan et al., 2009). At the national level, the Chinese government has promoted innovation through a top-down approach, such as science & technology (S&T) policies, publicly funded R&D centres, and R&D subsidies (Ruan et al., 2014). At the firm level, adopting an innovation strategy, compared with pure imitation, creates better performance for Chinese manufacturing firms (Lee and Zhou, 2012; Zhou, 2006) and new technology ventures (Li and Atuahene-gima, 2001). In contrast to developed economies, innovation in China, and many other emerging markets, mainly consists of incremental improvements to products and processes, rather than technological breakthroughs (Wooldridge, 2010). Huge market opportunities and challenges highlight the power of innovation by commercialization (Leibowitz and Roth, 2012). Therefore, it warrants the study of how to build innovation capability of firms in China (Luo et al., 2011).

Extant research with diverse theoretical backgrounds has studied the drivers of innovation. Researchers on organisational behaviours have emphasized the role of individuals, highlighting the influence of individual creativity, motivation and capability on promoting innovation (Anderson et al., 2004; Franke et al., 2013). Strategy scholars concern more with organisational factors, such as innovation strategy (Griffiths and Webster, 2010; Wan et al., 2005), R&D and resource commitment (Leiblein and Madsen, 2009; O'Brien, 2003; Parthasarthy and Hammond, 2002; Raymond and St-Pierre, 2010), organisational structure (Amabile et al., 1996; Zien and Buckler, 1997) as important antecedents of innovation. Prior research also uncovers antecedents beyond a firm's boundary, including inter-organisational collaboration (Alexiev et al., 2015; Coviello and Joseph, 2012; Cui and O'Connor, 2012; Love et al., 2014), as well as institutional factors

(Etzkowitz and Leydesdorff, 2000; Lederman, 2010). Given the rich body of literature, a systematic analysis is lacking regarding how different factors jointly influence Chinese firms' innovation capability.

According to the resource-based view (RBV), these abovementioned factors provide essential resources that enable the firm to engage in innovation activities and determine their efficiency and effectiveness (Barney, 1991; Galbreath, 2005). Moreover, a contingency view of resources suggests that different resources contribute to innovation capability in specific circumstances. Previous studies have also underscored the fit between the external environment and internal resource configurations (Sirmon et al., 2007; Teece et al., 1997). Therefore, this paper emphasises an important internal context of the firm, namely its ownership types. The pro-market reforms in China have made the property right structure especially complex. Ownership is one salient institutional factor, signalling firms' distinct identity and the unique organisational context (Lee and Zhou, 2012). Specifically, firms with different ownership types vary substantially in terms of their strategic intent and organisational incentives to develop innovation capability (Guan et al., 2009; Lee and Zhou, 2012; Zhao et al., 2005). They also have different obstacles to overcome when conducting innovative activities (Zhou, 2013). As such, this study investigates whether and how ownership types act as a boundary condition for the impact of resources on innovation capability. To sum up, the research framework contains five potentially important factors (i.e. financial resources, human resources, transformational leadership, collaborative culture, and government support) as the drivers of a firm's innovation capability, which consequently enhance its new product performance; further, it compares firms of different ownership types, whose innovation capability may be influenced by distinct resource factors (see Figure 4-1).

The Chinese automobile industry offers an excellent context to test the proposed framework. First, auto manufacturing plays a significant role in facilitating national economic development due to its multiplier effects on other sectors. Thus, the Chinese government has treated the automobile industry as strategic and are now emphasising on developing indigenous innovation. Second, innovation in the auto sector includes both product and process innovations. While innovations in the traditional auto sector are mostly incremental in nature, emerging concepts, such as autonomous driving, and recent calls for "green" transportation have sparked research with the potential of bringing about more radical innovations. Furthermore, the historical legacy of the central planning and a gradual approach to the pro-market reform has resulted in numerous rounds of large-scale industrial restructuring and a complex ownership structure in the Chinese auto sector (Chu, 2011; Sit and Liu, 2000). Currently, there are three major types of auto producers in China, namely state-owned (SOE), international joint ventures (IJV), and privately-owned (POE). SOEs enjoy a preferential access to government-controlled resources, but their governance structure makes them conservative and less risk-taking. IJVs possess the advanced technologies from the foreign partners, but the transfer and development of innovation capability hinge on many other factors, such as IJV's absorptive capacity and partner cooperation. POEs are more entrepreneurial yet often lack sufficient resources. Although starting to enjoy growing institutional support in recent years, they are facing an increased pressure in the continuous development of innovation capability.

The remainder of the paper is structured as follows. The next section reviews the theoretical background and develops the hypotheses. Following is the methodology and empirical data section. The results and findings are presented afterward. The last two sections discuss and conclude the paper.

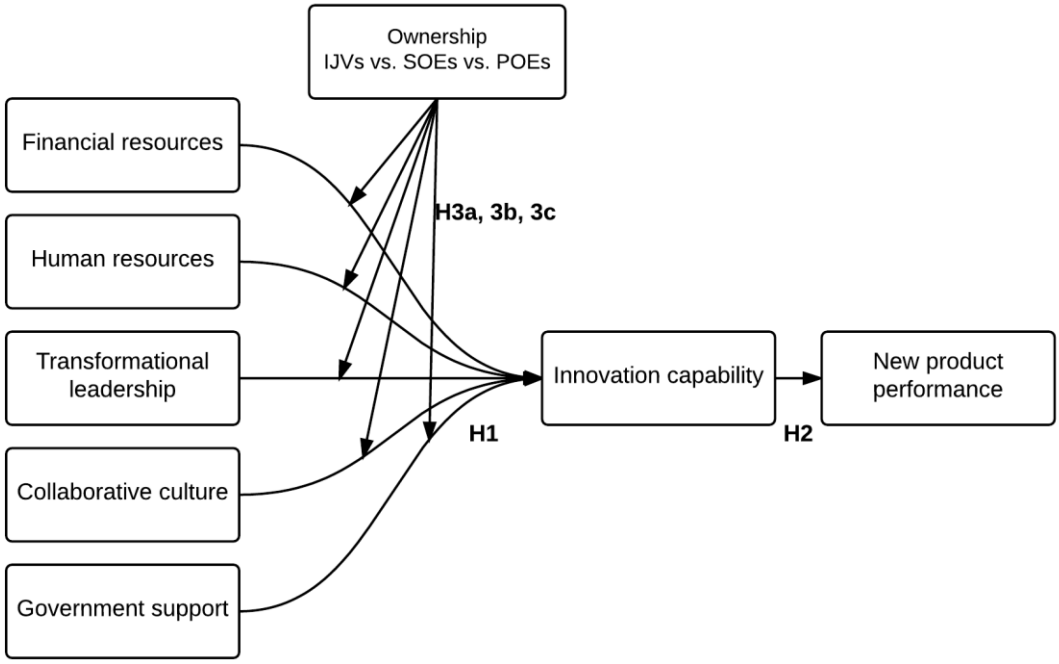


Figure 4-1 The conceptual model of Paper 1

4.2 Literature review and hypotheses

4.2.1 Innovation capability and the contributing factors

By definition, innovation is the development and commercialization of novel ideas that bring new products, services, and processes that benefit the organisation (Van De Ven, 1986). Albeit various conceptualizations exist, a process and multi-dimensional view of innovation is particularly useful for the study of innovation in China (Wan et al., 2005). This definition has encompassed different innovation outcomes, including technological versus administrative innovation, and incremental versus radical innovation. And it emphasises the relative newness of innovation -- it is considered as an innovation as long as it is perceived as new to the focal organisation, even it might appear as an "imitation" that already exists elsewhere. Consequently, innovation capability refers to the capability of detecting new market opportunities, adapting production processes and product features, establishing market channels, implementing technical support, analysing

customer feedback, and absorbing and integrating knowledge in order to introduce new products (Zhou and Li, 2008).

Prior research has identified three defining characteristics of the innovation process. (1) It is a trial-and-error process that is inherently risky, and the chance of success is small (Leiponen and Helfat, 2010). In most cases, rational planning cannot provide all the details of developing innovation. Many ideas, concepts, and prototypes have to be tested before one proves to be useful, constructive, and profitable, thus counts as innovation. (2) It is a collective endeavour (Atuahene-Gima and Evangelista, 2000; Van De Ven, 1986). A proliferation of people and cross-functional units are often needed to bring out innovations. The complexity and interdependence have placed a significant requirement for collaboration, as well as a balance of flexibility and cooperation. (3) It is often a social-political process (Maute and Locander, 1994). Within the organisation, organisational actors with incompatible new product objectives and ideas compete for scarce resources. At the collective level, organisations battle for competing technologies and new designs. Successful innovation warrants the support from the larger external environment.

These characteristics of innovation create requirements to be fulfilled in order for the process to unfold, and consequently the firm's innovation capability to be effectively developed. Innovation capability is accumulated and gradually developed through the implementation of innovative activities, processes, and routines (Perdomo-Ortiz et al., 2006). A stronger capability implies more effective and efficient organisational processes, thereby enhancing the firm's new product development (NPD) performance. Based on the resource-based view (RBV), resource heterogeneity and immobility explains the performance differentiation among organisations (Barney, 1991). RBV scholars posit that valuable, rare, inimitable and non-substitutable (VRIN) resources enable the firm to

achieve sustained competitive advantages. Resources encompass all physical, human, and organisational ones, which can be tangible and intangible (Galbreath, 2005; Nason and Wiklund, 2015).

As a result, the provision of specific resources to support innovation activities is critical for developing innovation capability, and consequently NPD performance. Organisations allocate scarce resources among various activities. Since it is difficult to predetermine the exact estimates of the scope and extent of innovation, the on-going access to essential resources is vital. Moreover, innovations are based on numerous failed experiments. Human beings are mostly inclined to repetitive actions, have limited psychological capability, and lack the motivation in the face of failure. Hence, innovation depends on creative employees, as well as the maintenance of employee motivation and collaboration. Innovation also requires institutional support, which provides the necessary infrastructure and legitimacy. Taken together, this paper considers five key resources as the potential determinants of firms' innovation capability, which consequently contributes to their new product performance.

Financial resources. Financial resources are one type of generic resources that are required for a number of reasons (Voss et al., 2008). For instance, financial resources support the upgrading of equipment, foreign acquisition, hiring star employees, promoting the market position, and investing in radical product innovation. Well-functioning financial systems better mobilize and allocate greater stock of financial resources to firms with greatest growth potential (Taussig and Delios, 2015). In China, the government controls all the major financial institutions and align financial resources fully with its directives (Lin, 2011). As a result, the underdeveloped financial system

poses difficulty to gain access to financial resources, making it a valuable and rare resource.

We expect financial resources to support innovation processes and facilitate firms' innovation capability. Because innovation entails unpredictable investments and uncertain returns, abundant financial resources can protect the organisation from potential depletion of resources if innovation efforts fail. Therefore, firms with financial resources are more willing to take risks and innovate. In contrast, a low level of financial resources increases the pressure to conserve and ensure its availability for on-going activities, instead of devoting it to risky innovation projects. Consequently, less attention and resources would be spent on innovation, leading to lower innovation capability.

Human resources. Human resources are valuable organisational assets that originate in individual-level employee KSAOs (i.e. knowledge, skills, abilities, and other characteristics), and are transformed and amplified to the organisational level (Ployhart and Moliterno, 2011; Ployhart et al., 2014). Human resources play a fundamental role in affecting the capability of an organisation to perform and achieve desirable results. This is because organisational knowledge, skills, and capabilities ultimately reside within its people. A higher level of human resources reflects that employees as a whole are with greater ability and motivation to achieve organisational goals. While individual employees are free to take their human capital to alternative employers, the accumulation of organisational-level human capital involves complex social processes, and it is tightly tied up with current organisation arrangements (Voss et al., 2008). Hence, organisational-level human resources can be treated as a valuable, rare, and inimitable resource that contributes to sustainable competitive advantages.

We argue that human resources can enhance a firm's innovation capability, and consequently its new product development performance. Strong human resources imply that individual employees have better knowledge, skills, and abilities in specialized areas. It not only increases the productivity of firms but also equips the firm with a knowledge base that is capable of apprehending external information and knowledge, such as customer feedbacks and new technologies. In other words, human resources enable the organisation to engage in constantly learning and renewal. As a result, the firm is more responsive to market opportunities and keep abreast with the latest technology. Employees' information sharing behaviours further facilitate the creation of novel ideas. Moreover, with higher employee KSAOs, the development of innovation is more efficient and effective, resulting in more innovative products.

Transformational leadership. The roles and behaviour of organisation top leaders affect almost every aspect of firms, from strategic planning and decision-making to activity prioritization, resource allocation, and daily operations (Vera and Crossan, 2004). Transformational leadership (TFL) is a leadership style that is charismatic, inspirational, intellectually stimulating, and individually considerate (Bass, 1991; Dvir et al., 2002). In sharp contrast with transactional leadership, which is based on the exchange relationship between leader and followers, TFL is generally considered as more effectively in promoting individual and organisational innovation (Birasnav, 2014).

Transformational leaders are often change-oriented and encourage risk-taking in uncertain environments (Waldman et al., 2001). At the organisational level, they are likely to devise more challenging targets, design structures that facilitate group work, and allocate resources to innovation-related activities. At the individual level, TFL motivates employees to be innovative and provides them with the confidence to perform beyond

expectations. TFL involves an underlying influence process that motivates followers by encouraging them to transcend their self-interests for the sake of the team and organisation. Employees are likely to feel trusted, motivated and satisfied. Thus, it is expected that TFL will have a positive effect on innovation capabilities, and consequently performance.

Collaborative culture. Organisational culture refers to a complex set of values, beliefs, assumptions and symbols that define how a firm conducts its business (Barney, 1986). Collaborative culture can be a valuable resource of the firm as it facilitates interactions among organisational members, reducing communication and cooperation costs. It is rare and imperfectly inimitable, as it is one attribute that differentiates one firm from another, reflecting a firm's unique experiences.

Collaborative culture plays a significant role in developing innovation capability. Innovation requires collaborative problem solving due to the ambiguity and complexity of tasks (Li et al., 2007; Love and Roper, 2009). Collaborative culture promotes individual members' willingness to contribute and work toward collective goals. Individuals are likely to conduct honest and open discussions instead of involving constant personal conflicts. Collaborative culture enhances the cross-functional cooperation of functional groups (e.g. R&D, marketing, and other groups), and it avoids bargaining and conflicts in the product development process (Chang et al., 2013). Increased communication and cooperative planning reduce product development downstream rework and significantly improve new product performance (Mitchell and Nault, 2007). In addition, collaborative culture enhances psychological safety by creating a sense of responsibility sharing. It encourages risk-taking that fosters creativity, change, and innovation. As a result,

collaborative culture generates a synergistic effect that combines individual efforts in developing innovation capability.

Government support. The government is a major actor in the institutional environment. In emerging markets, and China specifically, the government controls valuable resources and is actively involved in the business sector (Lu et al., 2010). Government support can be provided through a variety of means, such as provisions of business support services, technical and managerial training programs, the cutting of administrative costs and burdens, provisions for financial incentives and assistance, and legal framework enforcement (Doh and Kim, 2014; Sheng et al., 2011). On one hand, government support varies considerably across regions in China, due to the discretion of local governments in developing local policies that apply to their local business environments (Cai et al., 2010). On the other, firms differ in their capability of securing benefits and support from the government. As such, sustained variance in government support exists across firms.

Government support affects firms' innovation capability and performance for several reasons. First, public institutions play a key function in shaping public attitudes and motivations in engaging in innovation. By providing innovation subsidies and other financial incentives, government support contributes to innovation inputs and innovation capability building efforts. Government support further affects the demand for innovation through government procurement, customer purchase incentives and export policies. For instance, China's government spends as much as 200 billion Yuan annually on vehicle purchases and maintenance, but it recently changed its purchase rules to support new-energy[1] vehicles and exclusion of foreign brands (Bloomberg, 2014; John Sudworth,

[1] A term that China uses to refer to electric vehicles, plug-in hybrids and fuel-cell autos.

2014; Shirouzu, 2011). Government support could shape the perception of intellectual property protection that enhances firms' motivation in innovation development (Doh and Kim, 2014). Third, the governments provide immediate technical and managerial training programs to promote innovation, and to foster competitiveness and productivity. Lastly, government support can facilitate the creation of innovation networks and alliances across sectors and national borders. For example, the Chinese government led the IJV contract negotiation in transferring foreign technology to the Chinese auto industry (Zhao et al., 2005).

Hypothesis 1*: There is a positive effect of financial resources, human capital, transformational leadership, collaborative culture, and government support on firms' innovation capability.*

Hypothesis 2*: A firm's innovation capability enhances its new product performance.*

4.2.2 Ownership

Ownership matters. Ownership gives an investor—an individual or a collective body that invests in an asset—the legitimate rights to claim the returns from its investment as well as the power to monitor and control the management of that asset (Li, 2004). In modern corporations, the dominant shareholder could exert significant power to control the corporate strategic decisions. Different types of shareholder often have distinct social identities, resource endowments, investment preferences, and incentives. Previous research indicates that ownership shapes innovation strategies (Hoskisson and Hitt, 2002; Xu and Zhang, 2008), growth dynamics (Mata and Portugal, 2002), diversification and internationalization (Du and Boateng, 2015; Xia et al., 2014), and corporate social responsibility (Oh et al., 2011). Thus, firm ownership constitutes one influential organisational context that affects how different resources affect innovation capability.

This paper specifies firms' ownership forms as IJVs, SOEs, and POEs, representing three primary ownership types in the Chinese automobile assembly companies.

i) Foreign ownership: IJVs

International joint ventures (IJVs) are legally independent entities established by two or more partners from different countries that share equity investment and consequent returns (Chen et al., 2009). In the Chinese auto sector, establishing IJVs is the only way for foreign automakers to enter the Chinese market, with a share up to 50%. At the same time, it has also been considered as an important vehicle for the Chinese government to bring in foreign technologies and promote national competitiveness.

An IJV is a hybrid of two independent firms. IJVs have an easy access to both advanced foreign technology and local resources, yet they could also encounter problems caused by partner dissimilarities (Park and Ungson, 1997). Divergent objectives, cultures, and values between the foreign and local partners often cause control conflicts and opportunistic behaviours. Relational conflicts can be a huge barrier to collaborative efforts in developing innovation capability in IJVs, because they increase the tension between partners and divert the attention from pursuing economic goals. In addition, while foreign technology could facilitate IJV innovation capability building, technology transfer requires the necessary absorptive capacity of IJVs (Zhao and Anand, 2009). Absorptive capacity is the ability of a firm to acquire and assimilate knowledge from the source organisation. It largely depends on the quality of human resources in IJVs.

Furthermore, IJVs are often a temporary organisational form, carrying a certain level of instability (Steensma et al., 2007). Foreign ownership makes it especially sensitive to government policy changes. In many cases, IJV foreign partners are motivated to exploit the local market and reap short-term benefits rather than developing innovation, which is riskier and more long-term oriented. The weak local intellectual

protection imposes concerns for potential knowledge leakage, reducing the incentives to introduce or develop the state-of-art technologies. Thus, government support is important for IJVs, as it ensures a facilitative external environment that encourages the development of innovation capability. As such,

> ***Hypothesis 3a****: Collaborative culture, human resources, and government support will play a key role in developing IJVs' innovation capability.*

ii) State ownership: SOEs

In China, state-owned firms are partially owned by regional and central governments, and they are subjected to strong intervention from the Communist Party. On the one hand, distinctive connections to the government offer SOEs resource and power advantages. SOEs tend to face fewer constraints when introducing innovation. Heightened legitimacy and protection from the government agencies further provide them with the power over other business actors (Xia et al., 2014). On the other hand, SOEs are often less efficient and market-oriented. This is because SOEs tend to fulfil political and social objectives rather than economic ones (Sit and Liu, 2000). SOEs might also experience severe conventional agency problems caused by the goal misalignment between the owner and the manager, as well as a unique agency problem between the State (often as a majority owner) and the minority shareholders (Dharwadkar et al., 2000).

SOEs are the legitimate actors in the Chinese business arena, and they tend to value rules, policies, and formalized procedures (Shi et al., 2014). Most SOEs emphasise a top-down management approach. And SOE managers are sometimes selected not according to their technical expertise or administrative capabilities, but their ability to follow executive orders (Zhou et al., 2006). Moreover, SOEs often establish formalized job divisions, which could present barriers for cross-functional communication and collaboration. As a result, developing innovation capability in SOEs needs to be

motivated and supported by the organisational leadership, it also requires overcoming the problem of coordination and communication. Nevertheless, financial resources and human resources could play a much minor role in promoting innovation capability in SOEs, because SOEs' risk-adverse nature might interfere with the effective utilization of resources. Government support would also be redundant as SOEs already enjoy wide institutional legitimacy and support. Therefore,

> ***Hypothesis 3b****: Transformational leadership and collaborative culture will play a key role in developing SOEs' innovation capability.*

iii) Private ownership: POEs

The pro-market reforms have created both opportunities and challenges for private owners and entrepreneurs in China. The first Chinese privately owned automaker, Geely, was officially registered in 2001. Most POEs are focusing on the low-end auto market, avoiding direct competition with IJVs and SOEs. POEs develop its innovation capability mainly through independent learning and imitation (Balcet et al., 2012; Wang, 2008). In recent years, the central industrial policies have gradually shifted to support the indigenous development and privately owned firms in particular (Chu, 2011).

POEs tend to be more entrepreneurial and highly motivated to survive and grow. The controlling shareholders, often the founder, of private firms often act as the manager with strong power in shaping the development of firms. Strong human resource should contribute to innovation capability, as employees are better at conducting innovation relevant activities. Smaller sizes further offer an advantage of flexibility and coordination in innovation activities. However, POEs are often associated with less well-established brands, focusing on price sensitive customers. Facing high competition pressure, price wars are frequently launched to expand market share, which reduce the profit margins. A strong need for firm growth place serious constraints on financial resources (Child &

Rodrigues, 2005). The continuous development of innovation capabilities requires strategic leadership, human resources, and on-going financial resources. Thus, we propose that,

> ***Hypothesis 3c****: Transformational leadership, human resources and financial resources will play a key role in developing POEs' innovation capability.*

4.3 Methods

4.3.1 Sampling and data collection

To test our hypotheses, we used a combination of primary survey data and secondary archival data on 102 automotive assembly companies in China. An English version of questionnaire was initially developed based on a thorough literature review. Because the data was collected in China, the conventional method of back-translation was adopted to ensure the conceptual equivalence. These items were translated and back translated into Chinese by two researchers who are competent in both languages and have substantial experience in the area. To ensure content validity of the survey instrument, four academic scholars have assessed whether the scale items are representative of our underlying constructs. The questionnaire was further refined through in-depth interviews with 12 experienced executives to evaluate the appropriateness of the measures in the Chinese context. Drawing on feedback from the academic researchers and managers, the ambiguous or inaccurate items were revised to finalize the survey.

Given that obtaining primary data in emerging markets is very difficult, gaining assistance from local institutions is critical to enhance the reliability and quality of the data (Hoskisson et al., 2000). Specifically, the innovation survey was conducted together with the two major regulators in China's automobile sector, namely National Development and Reform Commission of China and the Chinese Society of Automotive Engineering. The list of these companies was obtained from the Chinese Society of

Automotive Engineering. In 2007, information was collected through on-site interviews, which allow for the assessment of the appropriateness of the respondents and are critical for ensuring the quality and reliability of the sample data (Li and Atuahene-Gima, 2001). On-site interviews also offer the opportunities to clarify the questions under investigation. Respondents provide the data which they are familiar with and have relevant information.

A major concern is that the independent and dependent variables come from the same source, which could expose the data to the threat of common method bias (Podsakoff et al., 2003). To reduce the risk of common method bias in the research design stage, data was collected from multiple sources for the focal constructs to ensure the reliability and validity of the measures. In particular, four respondents were interviewed in each firm, namely the top manager, human resource (HR) manager, R&D manager, and one key R&D engineer. The measurements were divided into different sections that were completed by different managers understanding about the information in the company. This procedure help mitigate common method bias because the information is from different individuals. To overcome potential social desirability bias, all respondents were promised anonymity and that only aggregate results would be reported. Respondents were also assured that there were no right or wrong answers, increasing their willingness to answer all questions frankly.

In sum, the data collection generated responses from 105 firms. I deleted three firms that had missing information. Thus, The final sample is composed of 102 useful responses. Of the responding firms, the average age of these firms was 17.45 years. Average sales in the previous year were RMB 7,634 million (~US$1,017 million). Furthermore, 54% of the sampled firms were state-owned enterprises, 18% of the firms were private-owned enterprises, and the remaining 28% were IJVs.

To verify the appropriateness of the selected respondents, information was gathered regarding the tenure of the respondents. The top managers of these 102 firms had an average industry experience of 16.72 years and company tenure of 12.97 years. The HR managers had been with the industry for 15.59 years and their current firm for 12.21 years. On average, the R&D managers had worked for 15.99 years in the industry, 11.74 years with their company, and 4.41 years in their position. Key R&D engineers had 10.68 years of experience in their companies and 14.80 years of experience working in this industry. Collectively, the information indicates that the selected respondents were well experienced and informed about the firms and knowledgeable about the relevant constructs under study, increasing our confidence about the quality of the data.

4.3.2 Measures

For all constructs, we adapted the measures from prior studies when available. Some items were revised to reflect the research context of this study. Unless stated otherwise, the respondents responded on a five-point Likert scale. See a summary of variable definition and source in Table 4-I. The relevant measurement items used to operationalize our theoretical constructs can be found in the **Appendix**.

Because of the difficulty to obtain objective performance indicators in emerging markets (Hosikission et al., 2000), we relied on key informants to assess the firms' performance. Subjective measures are generally more accessible and have been shown to exhibit adequate reliability and validity. Thus, **New product performance** was measured by two items (Cronbach's alpha= 0.72) that asked respondents to evaluate the extent to which the firm has achieved the important outcome of new products: the number and market share of new products (Tsai and Ghoshal, 1998). The construct was responded by the top managers.

Innovation capability was measured with a six-item scale (α = 0.92) (Jansen et al., 2005; Wang et al., 2008; Zhao and Chadwick, 2014). The items captured the extent to which the firms had developed the capability of information acquisition, product design, product test, product marketing and building managing. This construct was rated by the top managers.

Financial resources were measured with a four-item scale (Cronbach's alpha= 0.90) to evaluate the extent to which the firms have the capital to improve existing products, develop new products, invest in fixed assets and human training (Li and Calantone, 1998). This construct was rated by top managers.

Human resources were measured with two items (Cronbach's alpha = 0.76) to evaluate the extent to which the firms have the human capitals to support the current product design task and develop future products (Youndt, Subramaniam, and Snell, 2004). This construct was rated by HR managers.

Transformational leadership (Cronbach's alpha = 0.94) was measured by nine items adapted from Awamleh and Gardner (1999) and Zhou et al. (2008)to evaluate the envisioning and energizing qualities of firm leaders. This construct was rated by R&D managers.

Collaborative culture (Cronbach's alpha = 0.94) was measured by four items about the extent to which a firm' value and norms emphasize collective goal and teamwork climate (Brinckmann and Hoegl, 2011; Hoegl and Gemuenden, 2001). This construct was rated by key R&D engineers.

Government support was measured with a four-item scale (Cronbach's alpha = 0.85) from Li and Atuahene-Gima (2001) to evaluate the extent to which firm get beneficial policies and programs from the government. The construct was rated by the top managers.

We used two dummy variables to define the ownership of firms (Sheng et al., 2011). One dummy variable (**Ownership-IJV**) equals 1 if the firm is an IJV and 0 if otherwise. The other dummy variable (**Ownership-POE**) equals 1 if the firm is private-owned and 0 if otherwise. If both dummy variables equal 0, it represents a state-owned firm.

In line with previous studies, we controlled for firm characteristics and external environment that might be related to the above theoretical variables. **Firm age** was measured by the number of years since the firm was founded. **Firm size** was measured by annual sales in the previous year which was log transformed for normality. **R&D intensity** was measured as the percentage of research and development expenditure on the annual sales (Zhang et al., 2015). The external environment characterized by changes competition and customer demand could influence the willingness and ability of a firm to develop innovation capability. **Environment dynamism** was measured by a four-item scale adapted from Jansen et al. (2006).

Table 4-I Variables definition and sources of Paper 1

Variable	Definition	Source/respondents
DVs		
New product performance	the extent to which the firm has achieved the important outcome of new product (Tsai and Ghoshal, 1998)	Innovation survey: top managers
Innovation capability	the capability of information acquisition, product design, product test, product marketing and building managing (Jansen et al., 2005; Wang et al., 2008; Zhao and Chadwick, 2014).	Innovation survey: top managers
IVs		
Financial resources	The capital to improve existing products, develop new product, invest in fixed assets and human training (Li and Calantone, 1998)	Innovation survey: top managers
Human resources	human capital to support the current product design task and develop future products (Youndt, Subramaniam, and Snell, 2004)	Innovation survey: HR managers
Transformational leadership	the envisioning and energizing qualities of firm leaders (Awamleh and Gardner, 1999;	Innovation survey: R&D managers

	Zhou et al., 2008)	
Collaborative culture	The extent to which a firm' value and norms emphasize collective goal and teamwork climate (Brinckmann and Hoegl, 2011; Hoegl and Gemuenden, 2001)	Innovation survey: key R&D engineers
Government support	the extent to which firm get beneficial policies and programs from the government (Li and Atuahene-gima, 2001)	Innovation survey: top managers
Moderators		
Ownership-IJV	dummy variable	Survey and archival data
Ownership-POE	dummy variable	Survey and archival data
Controls		
Firm age	the number of years since the firm was founded	Archival data from the China Automotive Technology and Research Centre
Firm size	annual sales in the previous year which was log transformed for normality	Archival data from the China Automotive Technology and Research Centre
R&D intensity	the percentage of research and development expenditure on the sale (Zhang et al., 2015).	Archival data from the China Automotive Technology and Research Centre
Environment dynamism	The degree of changes in competition and customer demand (Jansen et al., 2006)	Innovation survey:: top managers

Reliability and validity

Before testing the hypotheses, we used exploratory (EFA) and confirmatory factor analysis (CFA) to assess the reliability and validity of our focal constructs. For all multi-item variables, we ran exploratory factor analysis using principal component factor analysis to determine the unidimensionality, which resulted in the seven factor solutions as theoretically expected. The results of the exploratory factor analysis are reported in Table 4-II. The results reveal that seven factors with eigenvalues greater than one account for 74.56 per cent of the total variance, and the first factor explains 19.83% per cent. Thus, no single factor emerges, nor did one factor explain most of the variance.

Table 4-II Rotated component matrix of Paper 1

	Component						
	1	2	3	4	5	6	7
New product performance 1	.118	.370	-.039	.132	.164	-.027	**.749**
New product performance 2	.114	.159	.066	.188	.144	.148	**.836**
Innovation capability 1	.250	**.725**	.228	.177	.131	.077	.134
Innovation capability 2	.189	**.749**	.246	.261	.175	.021	.067
Innovation capability 3	.163	**.704**	.154	.273	.242	.248	.065
Innovation capability 4	.249	**.737**	.160	.147	.095	.135	.111
Innovation capability 5	.238	**.754**	.103	.148	.205	.150	.058
Innovation capability 6	.216	**.683**	.126	.088	.054	-.127	.271
Financial resources 1	.209	.189	.087	**.821**	.153	.046	.054
Financial resources 2	.075	.135	.054	**.825**	.170	.069	.051
Financial resources 3	.149	.228	.065	**.825**	.110	.078	.125
Financial resources 4	.179	.197	-.002	**.796**	.145	-.070	.124
Human resources 1	.102	.101	.175	.050	.015	**.849**	.115
Human resources 2	.120	.147	.036	.047	-.016	**.859**	-.006
Transformational leadership 1	**.780**	.184	.051	.047	.083	.043	-.002
Transformational leadership 2	**.783**	.272	.115	.009	-.042	.153	-.003
Transformational leadership 3	**.822**	.240	.118	.026	.076	.153	.037
Transformational leadership 4	**.813**	.217	-.025	.043	.011	.081	.074
Transformational leadership 5	**.751**	.157	.045	.175	.046	.024	.031
Transformational leadership 6	**.815**	.177	.183	.143	.072	.051	.045
Transformational leadership 7	**.777**	.132	.070	.269	.023	-.066	-.004
Transformational leadership 8	**.800**	-.058	-.009	.073	.198	.010	.100
Transformational leadership 9	**.758**	.055	.135	.102	.134	-.019	.125
Collaborative culture 1	.099	.259	**.874**	.119	.013	.074	.018
Collaborative culture 2	.075	.153	**.917**	.092	-.035	.056	-.018
Collaborative culture 3	.112	.137	**.900**	-.002	-.063	.127	.036
Collaborative culture 4	.158	.136	**.882**	-.001	-.045	-.006	.019
Government support 1	.113	.131	-.121	.177	**.832**	.144	.031
Government support 2	.119	.200	.104	.211	**.726**	-.275	.101
Government support 3	.074	.062	.002	.083	**.813**	.009	.104
Government support 4	.116	.284	-.113	.138	**.749**	.042	.084
Eigenvalue	6.148	4.060	3.561	3.220	2.821	1.810	1.493
% of variance	19.83%	13.10%	11.49%	10.39%	9.10%	5.84%	4.82%
Cumulative % of variance	19.83%	32.93%	44.42%	54.81%	63.90%	69.74%	74.56%

All the measurement items are loaded on their respective theoretical constructs in the CFA model. As shown in Table 4-II, the fit indexes of CFA models are adequate: $\chi^2(413) = 574.01$, $p < .01$, root mean squared error of approximation (RMSEA) = 0.06;

comparative fit index (CFI) = 0.96, incremental fit index (IFI) = 0.93, indicating a good fit between the estimated model and the sample data. Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) for our main constructs indicate sufficient reliability and convergent validity. In particular, all Cronbach's alpha and CRs are well above the recommended threshold of 0.70 (Bagozzi and Yi, 1988), suggesting a high level of reliability. The values of the average variance extracted are higher than 0.5, demonstrating the variance captured by the construct is greater than the variance due to measurement error.

We follow the guidelines from Anderson and Gerbing (1988) to assess the validity of our focal constructs. All the standardized factor loadings on the corresponding underlying factors are significantly greater than 0.5 ($p<0.001$), providing support for the convergent validity of the respective scales. The coefficients among the items belonging to the same construct range from 0.50 to 0.87, and the coefficients among the items belonging to different constructs vary between -0.12 and 0.46, providing initial evidence of high levels of convergent and discriminant validity.

None of 99.9% confidence intervals of the correlations for all the latent constructs contain a value of one, indicating the discriminant validity of the focal constructs. To demonstrate whether all the constructs are distinct from each other, we run pairwise $\chi 2$-difference tests for all the multi-item constructs (Fornell and Larcker, 1981). We compare the unconstrained model with the constrained model (the correlation between the construct was fixed at 1). The significant chi-square difference for each pair of constructs demonstrates that there is discriminant validity among the constructs. Further, following the procedure Fornell and Larcker (1981) suggested, we found that the amount of variance extracted by each multi-item construct (within-construct variance) was greater than the squared correlation between the construct with all other constructs (between-

construct variance), lending further support to the discriminant validity among the constructs. Overall, these measures in our study demonstrate satisfactory reliability and validity.

4.4 Analysis and empirical results

Table 4-III presents the means, standard deviations, and correlations of all the constructs. As shown in table, most correlations between the independent variables are less than 0.5: hence multicollinearity presented a low threat to the coefficient estimates. Furthermore, the five resource factors are all significantly correlated with innovation capability, and new product performance (except for collaborative culture). Among the five types of resources, positive correlations are largely observed; yet government support is not correlated with human resources or collaborative culture. In terms of ownership, IJVs reported a lack of sufficient human resources and POEs were high in collaborative culture. Regarding the control variables, R&D intensity is positively related with financial resources and new product performance, yet negatively with collaborative culture. Firm age and size is also significantly correlated, indicating that older firms tend to be larger in size.

We used multiple hierarchical regression analyses to test our hypotheses. Model 1 is the baseline model that includes the control variables. Model 2 tests the direct effect of various resources on innovation capability. Model 3 examines the effect of innovation capability on new product performance. The results are shown in table 4. We propose that various resources have a positive influence on the development of innovation capability. According to Table 4-IV, model 2, we can find all the resources relate positively to innovation capability. Financial resources ($b = 0.22$, $p < 0.05$), human resources ($b = 0.16$, $p < 0.05$), transformational leadership ($b = 0.24$, $p < 0.01$), collaboration culture ($b = 0.27$, $p < 0.05$), and government support ($b = 0.27$, $p < 0.05$) have significant and positive

effects on innovation capability. Thus, these results support hypothesis 1. H2 predicted the positive relationship between innovation capability and new product performance. According to Table 4, model 3, innovation capability relates positively to new product performance ($b = 0.41$, $p < 0.01$), supporting hypothesis 2.

We used the subgroup samples to examine the moderation effects of ownership in model 4-6. Hypothesis 3a-c predicted that different resources have distinct influences on innovation capability in different types of firms. As Table 4-V indicates, for IJVs, human resources ($b = 0.33$, $p < 0.05$), collaboration culture ($b = 0.33$, $p < 0.05$) and government support ($b = 0.60$, $p < 0.05$) have significant and positive effects on innovation capability. However, when the firms are private-owned, only financial resources ($b = 0.47$, $p < 0.01$) and transformational leadership ($b = 0.53$, $p < 0.01$) have positive effects on innovation capability. In addition, when the firms are state-owned, financial resources ($b = 0.31$, $p < 0.05$), transformational leadership ($b = 0.23$, $p < 0.05$) and collaborative culture ($b = 0.31$, $p < 0.01$) have positive effects on innovation capability. These results provide full support for H3a and 3b. But H3c is only partial supported, as there is no significant relationship between human resources and POEs' innovation capability. This might because that other factors constrained the effectiveness of human resources on innovation capability (Siemsen et al., 2008), such as financial resources and transformational leadership. In other words, when financial resources being the constraining factors in developing innovation capability, they reduce the effect of human resources to zero. We offer more discussion on these findings in the next section.

Table 4-III Descriptive statistics of the constructs in Paper 1

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. New product performance													
2. Innovation capability	0.50**												
3. Financial resources	0.34**	0.50**											
4. Human resources	0.19†	0.30**	0.15										
5. Transformation leadership	0.26**	0.49**	0.35**	0.22*									
6. Collaboration culture	0.12	0.41**	0.17†	0.22*	0.25*								
7. Government support	0.33**	0.43**	0.40**	0.04	0.26**	-0.01							
8. Ownership-IJV	-0.01	-0.04	-0.08	-0.31**	-0.09	0.03	-0.07						
9. Ownership-POE	-0.08	0.11	0.09	0.14	0.12	0.25*	-0.07	-0.28**					
10. Environment dynamism	0.01	0.11	0.06	-0.03	0.10	0.08	0.03	-0.09	-0.05				
11. R&D intensity	0.24*	0.10	0.20*	-0.04	0.05	-0.21*	0.17†	-0.10	-0.19†	0.04			
12. Firm size	-0.00	0.08	0.04	0.00	-0.05	0.05	-0.07	0.14	-0.13	0.05	-0.08		
13. Firm age	-0.03	0.09	0.00	0.01	-0.07	0.07	-0.02	0.09	0.07	-0.09	-0.05	0.30**	
Mean	3.78	3.63	3.28	3.88	2.66	4.35	3.84	0.26	0.18	3.52	0.03	11.23	17.45
S.D.	0.62	0.77	0.84	0.80	0.80	0.59	0.81	0.44	0.38	0.70	0.05	2.55	16.70

N=102. †p<0.10, *p<0.05, **p<0.01 (2-tailed).

Table 4-IV Standardized regression results

Variables	DV: Innovative capability		DV: Innovative capability		DV: New product performance	
	Model 1: baseline		Model 2: **H1**		Model 3: **H2**	
	b	t-value	b	t-value	b	t-value
Age	0.07	0.66	0.07	0.93	-0.05	0.50
Size	0.09	0.82	0.07	0.88	-0.02	-0.22
R&D intensity	0.13	0.29	0.08	1.00	0.15	1.58
Environment dynamism	0.12	1.15	0.06	0.76	-0.05	-0.58
Ownership-POE	0.00	0.04	0.06	0.75	0.03	0.32
Ownership-IJV	0.15	1.35	0.03	0.33	-0.09	-0.95
Financial resources			0.22*	2.60	0.06	0.59
Human resources			0.16*	1.99	0.08	0.80
Transformation leadership			0.24**	2.92	0.01	0.09
Collaboration culture			0.27**	3.35	-0.01	-0.11
Government support			0.27**	3.26	0.10	0.92
Innovative capability					0.41**	3.26
R^2	0.06		0.53		0.32	
F	0.93		9.05**		3.48**	

Table 4-V Subgroup analysis

Variables	DV: Innovation capability					
	IJV Group		SOE Group		POE Group	
	Model 4: **H3a**		Model 5: **H3b**		Model 6: **H3c**	
	b	t-value	b	t-value	b	t-value
Age	-0.37*	-2.54	0.14	1.20	-0.37**	-3.15
Size	0.05	0.29	0.02	0.19	0.17	1.73
R&D intensity	-0.04	-0.20	0.16	1.37	-0.26*	-2.03
Environment dynamism	-0.03	-0.16	0.15	1.38	-0.06	-0.67
Financial resources	0.02	0.10	**0.31***	2.42	**0.47****	2.84
Human resources	**0.33***	2.41	0.08	0.68	0.01	0.07
Transformation leadership	0.26	1.67	**0.23***	2.00	**0.53****	3.39
Collaboration culture	**0.33***	2.16	**0.31****	2.65	0.09	0.57
Government support	**0.60***	2.36	0.09	0.67	0.09	0.70
N%	28%		54%		18%	
R^2	0.55		0.38		0.87	
F	4.57**		4.73**		13.94**	
Percentage	28%		54%		18%	

N=102. †p<0.10, *p<0.05, **p<0.01 (2-tailed).
DV: dependent variable; IJV= international joint ventures; POE= private-owned enterprises; SOE=state-owned enterprise.

Subgroup analysis (Foreign firms VS domestic firms)

Variables	DV: Innovative capability			
	FE Group		NON-FE Group	
	Model 1		Model 2	
	b	t-value	b	t-value
Age	-0.04*	-2.54	0.00	1.16
Size	0.03	0.05	0.00	0.65
R&D intensity	-0.00	-0.04	0.00	0.76
Environment dynamism	-0.03	-0.16	0.12	1.30
Financial resources	0.02	0.10	**0.34****	3.47
Human resources	**0.32***	2.42	0.08	0.94
Transformation leadership	0.30	1.69	**0.31***	2.46
Collaboration culture	**0.34***	2.16	**0.25****	2.90
Government support	**0.55***	3.36	0.12	1.45
N%	28%		72%	
R^2	0.71		0.50	
F	4.57**		9.12**	

N=102. †p<0.10, *p<0.05, **p<0.01 (2-tailed).
DV= dependent variable; FE= foreign enterprises

Subgroup analysis (State-owned firms VS private-owned firms)

	SOE Group		NON_SOE Group	
	Model 4		Model 5	
	b	t-value	b	t-value
Age	0.14	1.20	-0.02**	-2.91
Size	0.02	0.19	0.00*	2.26
R&D intensity	0.16	1.37	0.00	0.06
Environment dynamism	0.15	1.38	-0.15	-1.16
Financial resources	**0.28***	2.42	**0.20†**	1.89
Human resources	0.07	0.68	**0.21***	2.34
Transformation leadership	**0.29**†	2.00	**0.39****	2.77
Collaboration culture	**0.26****	2.65	**0.37****	3.15
Government support	0.07	0.67	**0.38****	4.16
N%	54%		46%	
R^2	0.48		0.72	
F	4.73**		10.00**	

N=102. †p<0.10, *p<0.05, **p<0.01 (2-tailed).
DV= dependent variable; SOE=state-owned enterprises

4.5 Discussion

There is a paradox concerning innovation in China. On one hand, Chinese firms are often considered as followers and even imitators of foreign technologies. A recent example is the LandWind X7, a new sports utility vehicle that went on sale in China in 2015 and was criticized as a clone of the Range Rover's successful model Evoque (Sharman, 2014). On the other hand, mounting evidence suggests that innovation is taking place in China, especially in terms of process innovation, adaptive product innovation, and value chain localization (Zhou and Li, 2008). In this study, we focus on a process-based conceptualization of innovation and set out to study innovation capability, which is particularly valuable for firms in emerging markets, as it allows them to build up their competitiveness and to move gradually from imitation and innovation (Fan, 2006; Li and Kozhikode, 2009).

Answering the calls of Li & Kozhikode (2009) for more research on how emerging market firms develop innovation capability, we examine the impact of resources on a firm's innovation capability. Different resources fulfil distinct purposes that enable the innovation process to unfold, and as a result, innovation capability can be developed. We demonstrate that financial resources, human resources, transformational leadership, collaborative culture, and government support play a significant role in promoting the innovation capability in Chinese automakers. And more importantly, a firm's ownership moderates the effect of resources on its innovation capability.

Our study extends the existing RBV literature in a number of ways. First, unlike studies downplaying the role of tangible resources, our results suggest that tangible resources like financial resources are important drivers of firms' innovation capability (Galbreath, 2005). This is most likely due to the resource-intensive nature of innovation (especially in the early stage) and the serious financial constraints faced by automotive firms in China. Second, echoing research on micro-foundations of firms (Foss, 2011), we posit that a firm's

innovation capability ultimately resides with its employees. Human resources, transformational leadership, and collaborative culture increase the innovation capability because they promote employees' motivation, ability, both individually and as a whole. Collectively, they contribute to the accumulation of knowledge resources of the firm. Third, the significant effect of government support on innovation capability supports the view that government in China is more than just background for business actors (Lu et al., 2011). Government support is an integral part in the innovation process, and appropriate design of innovation policies could promote innovation capability of Chinese firms (Doh and Kim, 2014).

Furthermore, this paper has highlighted the profound influence of ownership type on firms in China. Extending previous research, we showcase the value of a contingency approach by establishing that the influence of resources on innovation capability is contingent on the firm's ownership type. Our results offer several interesting findings.

First, there is a sharp contrast between foreign (i.e. IJVs) and domestic firms (i.e. SOEs and POEs). For IJVs, government support and human resources are critical resources to develop their innovation capability, yet both are non-significant to SOEs and POEs; conversely transformational leadership and financial resources are only effective for domestic firms but not IJVs. The foreign ownership of IJVs serves as both a facilitator and barrier in developing innovation capability. Access to advanced technologies places fewer requirements on financial resources, but it underscores the importance of high-quality human resources that absorb the foreign technology and develop new products for the local environment. In other words, human resources embody the local knowledge-related resources that could complement advanced foreign technology in enhancing the innovation capability (Choi and Beamish, 2013). However, IJVs often encounter difficulty in acquiring and managing human resources. For instance, IJV foreign expatriates tend to struggle with the

problems of adapting to the local business environment. Also, foreign ownership might result in the potential discrimination, resource exclusion and even expropriation and sabotage caused by the government, making government support an integral part of business operations. Lastly, the differential role of transformational leadership between foreign and domestic firms offer support for a contingent leadership paradigm (Kirkman et al., 2009). In terms of innovation, domestic firms with a higher power distance are more likely to respond to the impact of leaders; and foreign firms with a lower power distance orientation likely value autonomy and flexibility.

Second, POEs and SOEs should also be clearly differentiated on multiple dimensions. For POEs, financial resources and transformational leadership are two important determinants of their innovation capabilities. Starting from an inadequate resource base and mainly relying on independent R&D efforts, developing innovation capability requires abundant financial investments and strategic guidance from the company's top leadership. For SOEs, transformational leadership provides the incentives to break organisational inertia and prioritize innovation activities. At the same time, financial resources play a relatively minor role in SOEs than POEs. Collaborative culture is also crucial to the development of innovation capability for SOEs. This is probably due to the fact that SOEs tend to be bigger in size, with more complex organisational structures and clear divisions of labour that potentially hinder communication and collaboration.

Limitations and future research

This study has several limitations that open up the revenue for future research. First, this research is explorative in nature. While we have considered a number of resources as drivers of innovation capability, the list is not meant to be exhaustive. There are many other important resources worth studying. Also, one of the most promising directions for future

research lies in exploring the interactive effect of different resources on innovation capability and performance. And it may be useful to adopt a configurational approach to the bundles of multiple resources by identifying distinct groups of firms (Short et al., 2008). Second, it is a study mainly based on cross-sectional, survey data. Although we have taken multiple methods (methodological and statistical tools) to validate the quality of data and constructs, the potential for common method bias cannot be ruled out. To account for the dynamic relationship between resources and innovation capability requires other methodologies such as panel data analyses, path analyses or case studies. Lastly, our data was collected from one single country (i.e., China). Although China is representative for emerging markets, it still limits the generalizability of findings to other countries. Future studies could benefit from utilizing data from other emerging markets and also adopting a multi-country comparative approach.

4.6 Conclusions

Promoting innovation has been a major task for both business managers and governments in emerging markets. This study investigates some of the key resources in developing firms' innovation capability and the contingent role of firm ownership. Synthesizing previous research, the resource-based view provides an appropriate theoretical lens to study the impact of a range of resources on firms' innovation capability. The study suggests that in general financial resources, human resources, transformational leadership, collaborative culture, and government support positively relate to the development of innovation capability. But different resources play a key driving force of innovation capability development of IJVs, SOEs, and POEs. In particular, financial resources, transformational leadership and collaborative culture contribute to innovation capability in SOEs; transformational leadership, and financial resources enhance innovation capability in POEs; and human resources,

collaborative culture, and government support play a major role in developing innovation capability in IJVs.

Appendix

Table 4-VI Constructs and items

Construct	Item	SFL	CR	AVE
New product performance	The percentage of new product output value as a part of the total output value	0.82	0.73	0.57
	The number of new products going on the market	0.69		
Innovation capability	Ability in obtaining accurate market demand tendency in advance by using scientific and effective market survey methods	0.82	0.91	0.62
	Ability in accurately understanding the policies and regulation dynamics in advance	0.82		
	Ability in designing, selecting, and proposing technical specifications, parameter to satisfy the shaping requirements for spare parts	0.82		
	Ability in appraising and verifying whether the end product can satisfy the requirements on performance, quality, and cost	0.80		
	Ability in inspecting and deciding whether spare parts satisfy design requirements	0.81		
	Ability in brand making and managing	0.66		
Financial resources	Fund used in improving and perfecting existing product (including quality control, cost control, improvement design)	0.86	0.90	0.68
	Fund used in new product development	0.78		
	Fund used in investment in the fixed assets	0.86		
	Fund used in employee trainings	0.80		
Human resources	Human capital to solve current research and development task	0.86	0.77	0.63
	Human capital to develop new products in future	0.72		
Transformational leadership	Have a strategic plan for enterprise long-term development	0.77	0.94	0.63
	Good at guiding enterprise staff to carry on internal transformation and reforms to adapt to external changes	0.81		
	Undaunted and persistent, fearing no defeat	0.87		
	Very accurate at grasping market opportunity and profession tendency and able to seize each promising development opportunity	0.82		
	Concerned about firm long-term development and sustainable competitive power	0.76		
	Have good ability to communicate with employees	0.86		
	Collect staff feedback information promptly and earnestly, and make good use of it.	0.79		
	Participate actively in selecting innovation projects and making investment decisions	0.72		
	Dare to take risk and responsibility for innovation	0.73		
Collaboration culture	Enjoy harmonious interpersonal relationship and mutual trust.	0.91	0.94	0.80
	Take initiatives in helping one another to analyse and solve problems.	0.93		
	Share the knowledge and experience with other people.	0.89		
	Strong team spirit in work, always seek the common ground while maintaining individual difference, and sacrifice local benefit for the benefit of the whole.	0.85		
Government support	State-level, province/local/municipal-level, and related ministries and commissions innovation fund and project support	0.83	0.85	0.58
	National/profession promulgated related policy support	0.71		
	Tax relief and policy-type (guarantee, deducted interest or low interest) loan	0.72		
	Research and development fund subsidy and patent application subsidy provided by the government	0.79		

Notes: Overall model fit: $\chi^2(413) = 574.01$, $p < .01$, confirmatory fit index = 0.92, incremental fit index = 0.93, root mean square error of approximation = 0.06. SFL = standardized factor loading; CR = composite reliability; AVE = average variance extracted.

Chapter 5
Motivating Absorptive Capacity Development: The Roles of Incentives, Leadership, and Teamwork

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Abstract

This study explores the *motivational* antecedents of a firm's absorptive capacity by examining the role of innovation incentives. Building on expectancy theory and equity theory, we argue that innovation incentives enhance absorptive capacity, and this effect is positively moderated by teamwork but negatively moderated by transformational leadership. To test our hypothesis, we employ a multi-respondent research design based on a sample of 102 Chinese automotive companies. The results show strong support for the hypotheses and demonstrate the positive direct impact of innovation incentives on a firm's absorptive capacity, as well as the moderating effect of relational working context in shaping the influences of innovation incentives.

5.1 Introduction

Absorptive capacity (AC), defined as 'a firm's ability to recognise the value of new information, assimilate it, and apply it to commercial ends' (Cohen and Levinthal 1990:128). Motivating factors are indispensable to the development of firm capabilities, in that they provide the inner drive that leads employees to apply their cognitive abilities and build organisational capabilities (Ebers and Maurer 2014; Minbaeva et al. 2003; Volberda, Foss, and Lyles 2010) Motivating factors may be as important as knowledge-based assets in determining employee behaviours and organisational outcomes (Zhao and Chadwick 2014).

In this study, we focus on a particular type of motivating factor, namely, *innovation incentives*, which refer to the firm's use of strategic compensation tactics that reflect employees' innovative behaviours and efforts (Yanadori and Marler 2006). These innovation incentives relate directly to the acquisition and creation of new knowledge, such that they are highly relevant for motivating employees to engage in activities that lead to the development of AC. Whereas the influence of incentives on employees' motivation and firm performance has been widely studied, controversial theoretical arguments have led to mixed empirical findings. One camp, guided mostly by expectancy theory (Vroom 1964), indicates a positive effect of incentives on employee motivation and firm performance; because incentives link desirable future gains for employees to their own achievement, employees feel motivated to exert effort to meet performance expectations (Cadsby, Song, and Tapon 2007; Gerhart and Milkovich 1990; Trevor, Reilly, and Gerhart 2012). In contrast, drawing primarily on equity theory (Festinger 1954), another camp posits that incentives have detrimental effects on employee motivation, because they evoke social comparisons and feelings of injustice that in turn

undermine social behaviours (Bloom 1999; Pfeffer and Langton 1993; Siegel and Hambrick 2005; Yanadori and Cui 2013).

According to equity theory, incentives are inevitably social and relational, because social comparison processes are likely to occur when incentives are given to employees in a differentiated manner (Greenberg, Ashton-James, and Ashkanasy 2007). This theory suggests that individual employees do not respond to their own incentives in isolation, but instead are influenced by their relative standing among their peers (Bloom 1999; Shaw, Gupta, and Delery 2002; Trevor et al. 2012). Underpaid employees may develop inequity perceptions and then engage in remedial behaviours to restore justice (Lam et al. 2011; Larkin, Pierce, and Gino 2012). Overpaid employees, on the other hand, may tend to have less trust in their peers' ability, due to their downward comparison, which results in reduced future cooperation (Dunn, Ruedy, and Schweitzer 2012). Equity theory highlights the importance of the relational context in shaping employees' perceptions of incentives, however prior incentive research seldom has taken it into consideration.

To bridge this gap, we consider two relational factors in the workplace: horizontal relationships among co-workers (i.e. teamwork) and vertical relationships between a leader and subordinates (i.e. transformational leadership) (see Figure 5-1). Specifically, we aim to address two research questions: (1) How do innovation incentives affect the development of AC? and (2) How is this effect contingent on teamwork and transformational leadership? Building on expectancy and equity theory, we argue that innovation incentives foster AC, and this effect is enhanced by teamwork but attenuated by transformational leadership.

The results from a multi-informant survey of Chinese automotive assembly companies provide strong support for the hypotheses, leading to several theoretical contributions. First, in extending prior knowledge-based considerations, this study

examines the micro-foundation of organisational capability by assessing the role of an important motivational factor, namely, innovation incentives. Second, we incorporate equity theory to highlight the importance of the two relational factors as moderators of the effectiveness of innovation incentives. Our findings reveal contrasting moderating effects of teamwork and transformational leadership. Third, we introduce social comparison and justice assessment processes to transformational leadership research. By revealing the negative interaction between transformational leadership and innovation incentives, our findings provide a more nuanced and balanced understanding of transformational leadership.

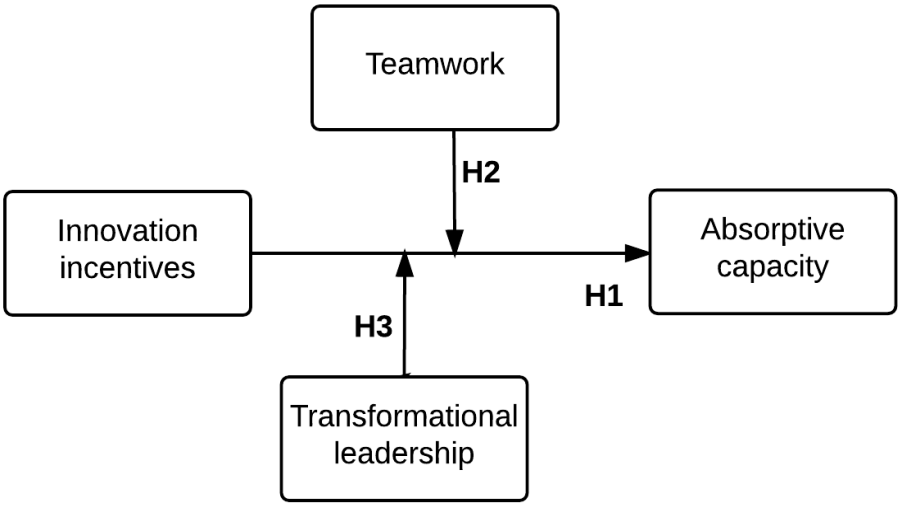


Figure 5-1 The conceptual model of Paper 2

5.2 Theoretical background

5.2.1 Absorptive capacity

Since Cohen and Levinthal's (1990) seminal work, many studies have examined the role of AC. The performance implications of AC have been well recognised, such as exploiting strategic opportunities, facilitating intra-and inter-organisational learning, and

accelerating innovation process (Foss, Lyngsie, and Zahra 2013). Prior studies also examine various drivers of AC. For example, Jansen *et al.* (2005) argue that firms need combinative capabilities to be able to synthesise and apply new knowledge; therefore, organisational mechanisms associated with those combinative capabilities enhance AC. Such combinative capabilities include cross-functional interfaces, participation in decision-making, job rotation, connectedness and socialisation tactics, and so forth. In a multinational corporation setting, Schleimer and Pedersen (2013) focus on organisational mechanisms such as decentralisation, normative integration, and innovative culture as determinants of AC. Thus, most prior studies consider macro-level, knowledge-based, or structure-related drivers of AC.

However, a firm's knowledge ultimately resides with individual employees (Yanadori and Cui 2013). Employees' motivation and effort to acquire, assimilate, and apply new knowledge is critical to the development of AC (Chang et al. 2013; Minbaeva et al. 2003). Employees' self-interests are not necessarily aligned with those of the firm though, so incentives are required to motivate employees to exert their efforts to achieve organisational goals (Cadsby et al. 2007). According to expectancy theory (Vroom 1964), individual motivation and efforts to perform depend strongly on the instrumentality or rewards of that activity. In the workplace, employees receive cues about incentives and attempt to infer the likelihood that a given level of performance will result in certain outcomes, and then act accordingly (Belogolovsky and Bamberger 2014). Guided by this theory, many empirical studies note the positive effects of various forms of incentives on employee motivation and performance (Cadsby et al. 2007; Gerhart and Milkovich 1990; Shaw et al. 2002).

To perform innovation-related activities, employees must deal with uncertainties and overcome organisational inertia (Christensen 1997; Leiponen and Helfat 2010).

Innovation incentives can motivate employees to overcome such challenges by rewarding them for conducting innovation-related activities, which demand their time, effort, expertise, and creativity (Shin, Taylor, and Seo 2012). Such incentives come in various forms, including oral praise, promotion opportunities, competitive salaries, and bonuses. Innovation incentives thus enhance employees' beliefs that engaging in innovation activities will lead to desirable outcomes, such as promotions, monetary rewards, or recognition. Consequently, employees will act on this belief by exerting greater effort to pursue innovation, which leads to a build-up of AC.

5.2.2 Relational factors: teamwork and leadership

Whereas expectancy theory focuses on the *absolute* value of incentives, equity theory highlights their *relative* value (Adams 1965). The main argument underlying equity theory is that people naturally acquire and use social comparisons to develop their equity assessments. This may relate to specific events, collectively, it forms and shapes employees' perception of the fairness of the organisation (Aryee et al. 2015). Perceive inequitable treatment not only threatens economic self-interest, cause distress and encourage action to restore justice; it might also violate the moral standard as everyone deserves to be treated, and should be treated, in a fair and just manner(Bernerth and Walker 2012). As such, it is not the *absolute* value but the *relative* value of incentives that drives a person's emotion and motivation. However, equity theory implicitly grounds justice on an equity-based reward allocation rule[1] such that those who contribute most should receive the greatest share of the outcomes. Moreover, an individual's judgment of

[1] Other types of reward allocation rules also are possible, such as need-based (i.e. outcomes are distributed on the basis of individual needs) or equality-based (i.e. outcomes are distributed equally) (Morand and Merriman 2012).

justice or equity may not always be based on facts, but rather be distorted by *subjective* social comparisons (Adams, 1965).

An important downside of such social comparison is that it may render performance-based incentives counter-productive, as the difference in incentives may promote interpersonal competition, evoke dissatisfaction, and as a result hinder employee collaboration and erode the association between incentives and desired outcomes (Jenkins and Shaw 1998; Pfeffer and Langton 1993; Siegel and Hambrick 2005). Empirical research demonstrates that pay dispersion yields motivating benefits only when it occurs for legitimate reasons or with perceived justice (Shaw et al. 2002); the negative effect of pay dispersion is most salient when the reward allocation cannot be justified (Pfeffer and Langton 1993). Therefore, relational conditions in the workplace should critically shape employees' attitudinal and behavioural reactions to unequal incentives, because they influence how employees receive and process the information they use in their social comparisons to form justice perceptions (Duffy et al. 2012).

Along this line of inquiry, we examine how two distinct dimensions of social relations in the workplace—horizontal relationships among co-workers, and vertical relationships between leaders and subordinates—influence the efficacy of innovation incentives for the development of AC. In particular, we address the horizontal relationship using the concept of *teamwork*, defined as the quality of the interactions and collaborations among team members (Hoegl and Gemuenden 2001; Hoegl, Weinkauf, and Gemuenden 2004). For the vertical relationship, we consider *transformational leadership*, which occurs when leaders emphasise employee development by acknowledging individual differences, elevating employees' interests, generating awareness and acceptance of the purpose of work, and providing employees with

confidence to perform beyond expectations (Dvir et al. 2002; Eisenbeiss, Knippenberg, and Boerner 2008; Kang, Solomon, and Choi 2015).

5.3 Hypotheses

The development of AC is a gradual process, during which employees engage in activities associated with information acquisition, assimilation, and application (Orlikowski 2002). Employees must actively engage in innovation activities, exploiting and developing their intellectual capital. This is because innovation implies novel solutions to problems (Subramaniam and Youndt 2005); and innovation efforts may be hampered by existing organisational processes and routines that create organisational inertia and strong resistance to change (Christensen 1997; Zhou and Wu 2010).

We argue that innovation incentives should facilitate AC development for several reasons. First, specific incentives tied to skills and innovation increase the breadth and proficiency of self-directed pursuits of new knowledge, skill, and ability (Dierdorff and Surface 2008; Shaw 2005). Because innovation incentives provide positive feedback to employees when they engage in innovation-related activities, employees feel motivated to keep learning and display a high rate of skill growth (Dierdorff and Surface 2008). Second, incentives provide utility for employees to take initiatives and exert effort to participate in activities that are conducive to AC development, such as new product development (Gottschalg and Zollo 2007; Zhao and Chadwick 2014). Without sufficient incentives, employees tend to revert to a comfortable effort level, rather than devoting themselves to difficult projects (Leiponen and Helfat 2010; Wang and Barney 2006). Third, not all employees are natural risk takers (Van De Ven 1986), so innovation incentives can help overcome risk-averse behaviours by encouraging employees to

challenge organisational inertia or the status quo and modify inefficient routines. Therefore, we provide our baseline hypothesis that:

> ***Hypothesis 1***. *Innovation incentives relate positively to a firm's absorptive capacity.*

Moderating role of teamwork

A team is a social system embedded in an organisation, with an emphasis on collaborative work toward common goals among members. Therefore, we conceptualise *teamwork* as high-quality interactions among team members, involving relational aspects of team dynamics (Hoegl and Gemuenden 2001; Hoegl et al. 2004). In many situations, teamwork is desirable, because it promotes communication and understanding among members based on mutual trust, respect, and caring (Jones and George 1998). However, teamwork also has potential pitfalls, such as free-riding concerns (Albanese and Fleet 1985) and groupthink syndrome (Klimoski and Mohammed 1994).

Teamwork should enhance the positive effects of innovation incentives on AC development. Although innovation incentives motivate extra effort in innovation activities, employees' individual efforts could be fragmented or redundant (Summers, Humphrey, and Ferris 2012). With strong teamwork though, the team members are better orchestrated towards the collective goal, in that the team could develop appropriate strategies and plans, adjust members' tasks, and manage pressure and conflicts coherently (Crawford and Lepine 2013; Zhao and Anand 2009). As a result, the team members' innovation efforts are likely to complement and reinforce one another. In the context of high-risk innovation, teamwork also enables mutual understanding and collective risk sharing among team members (Chen et al. 2007), providing support for the individual risk-taking behaviour that the innovation incentives have induced.

Teamwork also complements innovation incentives in promoting knowledge sharing and integration through the development of trust. Innovation incentives can encourage knowledge sharing between colleagues, but without mutual trust, the extend of such knowledge sharing is rather limited, especially concerning tacit knowledge. Teamwork then complements incentives by encouraging team members to share useful knowledge voluntarily and thoroughly (Osterloh and Frey 2000; Quigley et al. 2007).

Moreover, teamwork may mitigate the detrimental impacts of social comparison, which is a key downside of incentives (Duffy et al. 2012; Lam et al. 2011). Unfair perceptions often stem from people's biased self-assessments, in that they exaggerate their own contributions and performance but have a limited understanding or appreciation of others' job efforts or performance (Zenger and Marshall 2000). By facilitating information flows and promoting good interpersonal relationships, teamwork reduces biased views of the contributions offered by oneself and by coworkers. Reward allocations then can be conducted with clear justifications, and the negative emotions associated with incentives, such as unfairness or jealousy, can be alleviated (Duffy et al. 2012; Sedikides et al. 1998; Zenger and Marshall 2000).

Finally, with strong teamwork, low-performing employees might see how much others contribute to the common task and the higher incentives they receive as a result, such that they could be motivated to elevate their own performance and put in more effort, rather than holding a grudge or trying to undermine others (Greenberg et al. 2007; Tai, Narayanan, and McAllister 2012). Team members' encouragement and support also should help low-performing employees close the performance gap with high performers and further reduce the negative impact of social comparisons (Hoegl and Gemuenden 2001; Lam et al. 2011).

In sum, strong teamwork enhances the positive effects of incentives on external knowledge acquisition, transformation, and exploitation, while reduces the negative impacts of social comparison associated with incentives. Therefore, we suggest that

> ***Hypothesis 2****. Teamwork enhances the positive relationship between innovation incentives and absorptive capacity.*

Moderating role of transformational leadership

In workplaces, managers represent a critical influence on employees' learning, motivation, and performance (Hoffman et al. 2011). We focus on transformational leadership, in which leaders consider ***individual*** differences and stimulate followers to improve their performance (Dvir et al. 2002; Eisenbeiss et al. 2008; Kang et al. 2015). Transformational leaders care about each subordinate's uniqueness and seek to support each individual separately; they spend time coaching, listening, and helping those in need, and they aim to assign each employee the most suitable task (Wu, Tsui, and Kinicki 2010). Furthermore, transformational leaders encourage employees to challenge existing assumptions, reframe problems, and come up with novel solutions (Eisenbeiss et al. 2008). According to empirical evidence, transformational leadership has a positive effect on employee efficiency and innovation (Dvir et al. 2002; Eisenbeiss et al. 2008; Hoffman et al. 2011; Kang et al. 2015).

Previous literature mostly notes the positive effect of transformational leadership on employee behaviours, but rarely discusses its potential interaction with an organisation's incentive schemes. We argue that transformational leadership may negatively moderate the impact of incentives on AC for two main reasons. First, the justice rule underlying transformational leadership is incompatible with that of innovation incentives. The justice rule for innovation incentives is equity-based, promoting greater rewards for better performance. In contrast, transformational leaders tend to rely on

needs-based rules in their attempts to provide individualised considerations according to employees' needs and regardless of their performance (Bono and Judge 2003; Jansen et al. 2008). The role of innovation incentives then gets downplayed, because the utilitarian or calculative logic that underlies innovation incentives is incompatible with the ethos of transformational leaders (Klein and Kim 1998; Shamir, House, and Arthur 1993), thereby resulting in a negative interaction between incentive and transformational leadership.

Second, transformational leadership may exacerbate the negative effect of social comparisons due to innovation incentives. Transformational leaders influence subordinates by developing close and individualised relationships with them (Carter and Armenakis 2013; Wang, Law, and Hackett 2005). Because transformational leaders form differentiated relationships with subordinates according to their unique situations, subordinates likely perceive a lack of neutrality, fairness, or equity (Harris, Li, and Kirkman 2014). If employees attribute differentiated reward outcomes to the dissimilarity of leader–employee relationships, rather than to differences in employees' work efforts and performance (Eberly et al. 2011), innovation incentives likely have weaker effects. Therefore, we predict

> ***Hypothesis 3****. Transformational leadership reduces the positive relationship between innovation incentives and absorptive capacity.*

5.4 Methods

5.4.1 Sample and data collection

We tested our hypotheses with 102 Chinese automobile assembly companies. This empirical context is particularly suitable for investigating AC for several reasons. First, with its long history of technological evolution, the automotive industry is now a highly dynamic network, featuring continuous innovations (Dilk et al. 2008; Rycroft and Kash 2004). Second, Chinese automotive companies are relative latecomers to the industry,

such that most relevant knowledge already exists elsewhere, which means that firms' absorptive ability to identify, acquire, and leverage external knowledge is particularly critical for their performance (Tsang 2002; Zhao, Anand, and Mitchell 2005). Third, this empirical setting features relatively wide variance in managerial practices, strategies, and innovation capabilities, due to the dynamic, uncertain nature of the Chinese market (Zhou and Wu 2010). Fourth, the single-industry and single-country sample limits potential confounds, by ensuring better comparability across firms (Ben-Oz and Greve 2012).

We reviewed relevant literature and developed the English-based questionnaire, and then translated it into Chinese and back-translated it into English to ensure consistencies. We undertook two rounds of discussion with a team of Chinese industry and academic experts and revised the questionnaire accordingly. We also conducted a pilot study with 20 Chinese automotive company managers, to ensure the clarity of questions. To facilitate our data collection, we solicited sponsorship from the National Development and Reform Commission of China, which is the key planning branch in China's national government, and the Chinese Society of Automotive Engineering, a nationwide, non-profit support organisation for automotive and related industries. With the help of these organisations, we sent questionnaires to all 105 companies in the whole-car manufacturing sector and received responses from all of them. We ensured the anonymity and confidentiality of all respondents and confirmed that the sponsors would have access only to the results in aggregated form. We also made clear to all respondents that there were no right or wrong answers. These efforts helped reduce potential social desirability biases.

We adopted a multiple-respondent, multiple-source research design to mitigate the threat of common method bias. To obtain high-quality information from the company representatives with the best insights into the different constructs, we surveyed four

respondents from each company: the top manager, human resource (HR) manager, R&D manager, and one key R&D engineer. In addition, we collected objective data from the China Automotive Technology and Research Centre, including firm age, firm size, R&D intensity, and foreign equity share. After dropping three firms with excessive missing data, we obtained a final sample of 102 firms. In the final sample, the average firm age was 17.46 years, and average sales in the previous year were RMB 7,634 million (~US$1,017 million). Furthermore, R&D intensity varied from 0 to 0.4, and foreign equity share ranged from 0 to 0.9.

5.4.2 Measures

Dependent variable

Absorptive capacity. In line with its original definition (Cohen and Levinthal 1990), we adapted the measure of AC from Jansen *et al.* (2005) and asked top managers to evaluate their firms' capability to acquire, integrate, and commercialise external knowledge. Top managers served as the informants, because they should be most knowledgeable about their firms' capabilities. Following Schleimer and Pedersen (2013), we treated AC as a second-order construct with three first-order factors—knowledge acquisition, integration, and commercialisation—that reflected its multidimensional nature. The measure was distinct from R&D intensity (r = 0.15). The questionnaire items and validity analysis results are in Table 5-I.

Independent variables

Innovation incentives. No prior measure is available for innovation incentives, so we developed a three-item scale that reflected its definition (Wei and Atuahene-Gima 2009; Yanadori and Marler 2006). Three items assessed the extent to which the company values employee behaviours related to innovation and knowledge sharing, through tangible (salary increase, promotion) or intangible (oral praise) rewards. The R&D managers

completed these items, because they are the ones most familiar with and directly in charge of implementing such incentives in R&D units.

Teamwork. Following Hoegl and Gemuenden (2001), we measured teamwork with four items that captured interpersonal relationship, trust, communication, coordination, support, and team cohesion among employees. Because employees are the ones engaging in team activities, they are the ideal respondents for this measurement. Accordingly, we asked the key R&D employees as the informant to assess teamwork quality *as a whole*. We used the wording of 'our' to reflect members' shared beliefs, reflecting a referent-shift consensus model (Chan 1998).

Transformational leadership. We measured top managers' transformational leadership, which constitutes a powerful organisational influence (Barrick and Thurgood 2014), according to specific leadership behaviours associated with stimulating, guiding, and supporting employees (Detert and Burris 2007). The five-item scale was rated by HR managers, who are the most knowledgeable about their firms' HR practices.

Control variables

We controlled for three sets of variables. First, we controlled for firm-level variables, including *firm age* (age of the firm in years), *firm size* (natural logarithm of annual sales in the previous year), *R&D intensity* (ratio of R&D expenses to revenue), and *foreign equity shares* (percentage of shares owned by a foreign parent). Second, we controlled for HR-related variables. *Employee training* directly contributes to the development of employee knowledge and capabilities, so it could influence a firm's AC (Chang et al. 2013). *Employee composition* consists of two factors: (1) the proportion of employees holding a college degree and (2) the proportion of newly hired employees. Both factors have direct impacts on a firm's current knowledge base and thus on its AC. They were rated by the HR managers, using five-point Likert scales. Third, we controlled

for *environmental dynamism*, defined as the degree of instability in the environment (i.e. market share, competition, and raw material supply). Decision makers' perceptions of the level of environmental dynamism likely prompt them to adjust their firms' new knowledge exploration and exploitation behaviours and thus influence AC (Ben-Oz and Greve, 2012). This construct was rated by the top managers, using three items.

Measurement validity

Following Gerbing and Anderson (1988), we conducted a confirmatory factor analysis to test the convergent and discriminant validity of the constructs (see Table 5-I). The overall measurement model fit index indicated satisfactory fit ($\chi^2(217) = 272.23$; confirmatory fit index = 0.97; Tucker-Lewis index = 0.96; incremental fit index = 0.97; root mean square error of approximation (RMSEA) = 0.05). The standardised factor loadings for each construct were highly significant; items belonging to the same constructs correlated highly with one another (ranging from 0.52 to 0.87) and had low cross-loadings with items from the other constructs. We also computed composite reliabilities and average variances extracted (AVE); they all exceeded the recommended thresholds of 0.7 and 0.5, respectively, demonstrating the convergent validity of our measures. Next, we calculated the square root of the AVE of each construct and compared it with the inter-construct correlations. These results indicated that the square root of each AVE was much higher than its relevant inter-construct correlations (see Table 5-II), in support of discriminant validity (Fornell and Larcker 1981). Table II contains the means, standard deviations, and intercorrelations for all variables.

5.5 Results

To test our hypotheses, we used moderated regression analysis with mean-centered techniques (Aiken and West 1991). Model 1 only included the control variables and served as the baseline model. Model 2 added three explanatory variables, which

addressed 28% of the total variance. The interactions of AC with teamwork and transformational leadership entered Models 3 and 4, respectively. Model 5 represented the full model. We inspected the variance inflation factors (VIF) for all variables across all five models, and the highest VIF was 1.70, well below the 10.0 cut-off, so multicollinearity is not a major concern. Table 5-III summarises the results. Consistent with Hypothesis 1, innovation incentives emerged as positively associated with AC in all tested models (*b* ranged from 0.24 to 0.31, $p < 0.05$). The coefficient of the interaction between incentives and teamwork also was positive and significant (M5: b = 0.29, $p < 0.01$), in support of Hypothesis 2. In support of Hypothesis 3, the coefficient of the interaction between incentives and transformational leadership was negative and significant (M5: b = -0.25, $p < 0.01$). The results thus provided strong support for all our predictions.

Table 5-I Construct measurement items and validity assessment

Model fit: $\chi 2$ (196) = 250.35; RMSEA = .052, CFI = .97, TLI = .96, IFI = .97.		SFL	AVE	CR
***Absorptive capacity*:** To what extent does your company possess the capabilities in the following areas (1: none, 5: fully. Respondent: top managers)				
1. *Acquisition* (AVE = .78, CR = .92)		0.77		
Obtaining market demand in advance using scientific and effective market research methods	0.85			
Accurately obtaining competitor dynamics in advance	0.91			
Interpreting policies and regulation dynamics in advance	0.89			
2. *Integration* (AVE = .82, CR = .90)		0.92		
Knowledge coordinating, exchanging, and integrating among employees in the same department	0.87		0.78	0.91
Knowledge coordinating, exchanging, and integrating across different departments (e.g. R&D, marketing, and manufacturing)	0.94			
3. *Commercialisation* (AVE = .87, CR = .93)		0.95		
Product marketing	0.93			
Brand building and managing	0.94			
Innovation incentives (1: strongly disagree, 5: strongly agree. Respondent: R&D managers).				
1. In terms of promotion and salary raises, we give priority to employees who actively engage in innovation activities.		0.78		
2. We recognise and reward employees for their knowledge-sharing initiatives.		0.84	0.62	0.83
3. We give commendation and praise to employees for their knowledge exchange and improvement.		0.75		
Teamwork (1: strongly disagree, 5: strongly agree. Respondent: key R&D employees)				
1. Our employees enjoy harmonious interpersonal relationships and mutual trust.		0.92		
2. Our employees take the initiative in helping one another analyse and solve problems.		0.93		
3. Our employees share, on their own initiative, knowledge and experience with others.		0.88	0.81	0.95
4. Our employees manifest a strong team spirit at work and are willing to sacrifice their own interest for the good of the whole.		0.88		
Transformational leadership (1: strongly disagree, 5: strongly agree. Respondent: HR managers)				
1. Our leader is good at guiding employees to conduct internal transformations and reforms to adapt to external changes.		0.78		
2. Our leader is open to advice and criticism and accepts them when appropriate.		0.81		
3. Our leader has strong communication capability when dealing with employees.		0.87	0.73	0.93
4. Our leader collects employee feedback promptly and seriously and makes good use of it.		0.88		
5. Our leader values and acknowledges employees' career development.		0.94		
***Environment dynamism*:** To what extent do you evaluate the external environment in terms of (1: very low, 5: very high. Respondent: top managers)				
1. Difficulty maintaining existing market share		0.51		
2. Competition for raw material or parts		0.94	0.50	0.73
3. Fluctuations in the cost of raw material or parts		0.57		

Notes: SFL = standardised factor loading; AVE = average variance extracted; CR = composite reliability; RMSEA = root mean square error of approximation, CFI = comparative fit index, TLI = Tucker-Lewis index, IFI = incremental fit index

Table 5-II Correlation matrix and descriptive statistics

	1	2	3	4	5	6	7	8	9	10	11	12
1. Absorptive capacity	(**0.88**)											
2. Innovation incentives	0.42**	(**0.79**)										
3. Teamwork	0.41**	0.39**	(**0.90**)									
4. Transformational leadership	0.35**	0.25**	0.19	(**0.85**)								
5. Firm age	-0.20*	-0.03	-0.07	-0.06								
6. Firm size	0.22*	0.12	-0.04*	0.23*	-0.09							
7. R&D intensity	0.15	0.01	0.02	0.05	-0.04	0.01						
8. Foreign equity share	0.07	-0.08	0.02	-0.01	-0.23*	0.15	-0.07					
9. Employee training	0.16	0.30**	0.26*	0.17	0.06	0.19	0.15	0.10				
10. Higher degree proportion	0.22*	0.19	0.05	0.09	-0.08	0.38**	0.02	0.05	0.41**			
11. New employee proportion	0.17	0.08	0.25*	0.11	-0.29**	0.11	0.07	0.07	-0.06	0.20*		
12. Environment dynamism	0.06	0.03	0.09	0.09	0.17	0.05	0.15	-0.12	0.04	0.00	-0.18	(**0.71**)
Mean	3.61	3.42	3.88	4.29	17.46	11.23	0.03	0.11	2.55	3.55	2.03	3.70
Standard deviation	0.78	0.95	0.83	0.74	16.71	2.55	0.04	0.20	1.46	1.41	1.01	0.67

Notes: N = 102. Bold figures on the diagonal are the square root of the average variance extracted for the constructs.
** $p < .01$, * $p < .05$ (two-tailed)

Table 5-III Standardised coefficients of hypothesis tests (t-value)

	Absorptive Capacity				
	M1	M2	M3	M4	M5
Control variables					
Firm age	-0.15	-0.04	-0.04	-0.09	-0.10
	(-1.32)	(-0.41)	(-0.47)	(-0.87)	(-1.11)
Firm size	0.18	0.14	0.18†	0.12	0.16†
	(1.60)	(1.42)	(1.89)	(1.26)	(1.80)
R&D intensity	0.14	0.18†	0.18*	0.20*	0.22*
	(1.27)	(1.92)	(2.05)	(2.21)	(2.51)
Foreign equity share	-0.03	0.06	0.08	0.08	0.11
	(-0.25)	(0.63)	(0.90)	(0.84)	(1.25)
Employee training	0.11	-0.13	-0.14	-0.16	-0.18†
	(0.95)	(-1.20)	(-1.36)	(-1.46)	(-1.80)
Higher degree proportion	0.03	0.07	0.10	0.09	0.13
	(0.21)	(0.68)	(1.02)	(0.88)	(1.38)
New employee proportion	0.13	-0.01	0.00	-0.04	-0.05
	(1.19)	(-0.05)	(0.04)	(-0.45)	(-0.49)
Environment dynamism	0.05	-0.02	-0.03	-0.05	-0.03
	(0.43)	(-0.25)	(-0.30)	(-0.54)	(-0.28)
Direct effects					
Teamwork		0.30**	0.33**	0.29**	0.32**
		(2.85)	(3.18)	(2.80)	(3.23)
Transformational leadership		0.24*	0.25**	0.22*	0.22*
		(2.58)	(2.73)	(2.36)	(2.49)
H1: Innovation incentives		0.27*	0.24*	0.31**	0.29**
		(2.51)	(2.38)	(2.88)	(2.90)
Interaction effects					
H2: Innovation incentives × Teamwork			0.24**		0.29**
			(2.72)		(3.30)
H3: Innovation incentives × Transformational leadership				-0.19*	-0.25**
				(-1.99)	(-2.71)
R^2	0.13	0.41	0.46	0.44	0.51
Adjusted R^2	0.05	0.32	0.37	0.35	0.42
ΔR^2		0.28**	0.05*	0.03*	0.10**

Notes: Highest variance inflation factor = 1.70.
N=102. ** $p < 0.01$, * $p < 0.05$, † $p < 0.10$ (two-tailed).

To gain deeper insights into the two interaction effects, we followed Aiken and West's (1991) procedure and calculated the simple slopes of innovation incentives and AC at high and low levels (one standard deviation above or below the mean) of teamwork and transformational leadership (see Figure 5-2 and Figure 5-3). As Figure 5-2 shows, incentives are strongly associated with AC when teamwork is high (simple slope $b = 0.45$, $p < 0.01$), but the effect is insignificant when teamwork is low ($b = 0.03$, $p > 0.10$). In contrast, incentives are positively associated with AC when transformational leadership is low ($b = 0.42$, $p < 0.01$), but the effect is insignificant when leadership is high ($b = 0.05$, $p > 0.10$). These results provide further evidence in support of Hypotheses 2 and 3.

Post-hoc analyses

To test whether a curvilinear relationship exists between innovation incentives and AC, we included the squared-term of innovation incentives in the regression model. The results showed that the coefficient of innovation incentives was still positive and significant ($b = 0.23$, $p < 0.05$), yet the coefficient of innovation incentives squared-term was not significant ($t = 1.30$, $p = 0.20$). These findings provided no evidence for the curvilinear effect.

Moreover, we measured incentives with responses of R&D employees and teamwork with responses of R&D managers. The results were highly consistent (see Table 5-IV). Innovation incentives were positively associated with AC in all tested models (b ranged from 0.22 to 0.29, $p < 0.05$). The coefficient of the interaction between incentives and teamwork also was positive and significant (M5: $b = 0.28$, $p < 0.01$), supporting Hypothesis 2. The coefficient of the interaction between incentives and transformational leadership was negative and significant (M5: $b = -0.27$, $p < 0.01$), In support of Hypothesis 3.

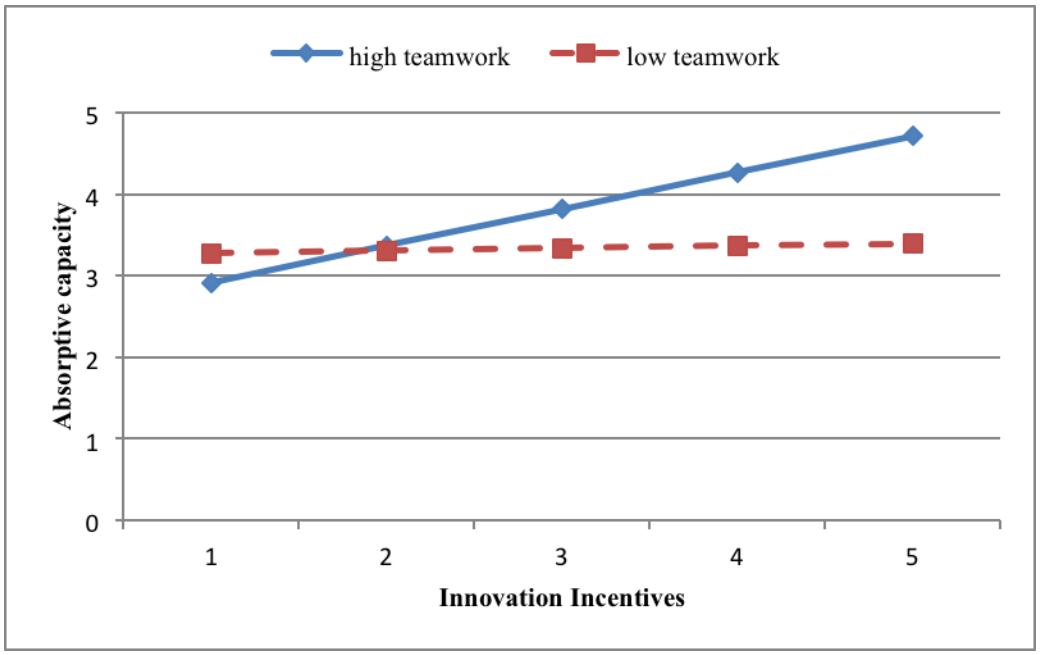


Figure 5-2 Interaction effect: teamwork and innovation incentives (H2)

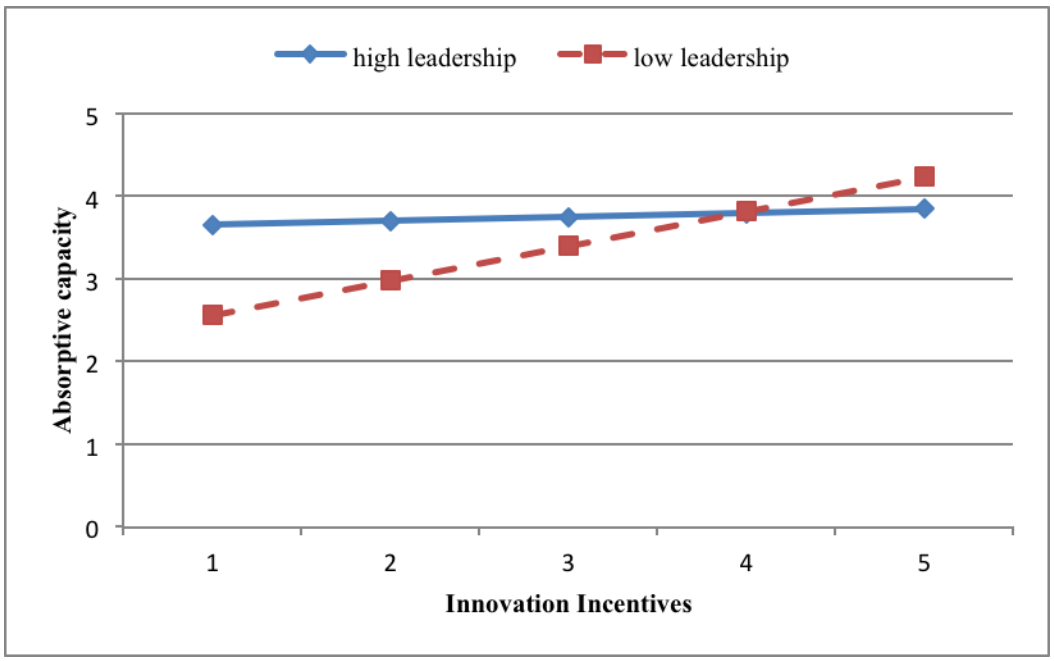


Figure 5-3 Interaction effect: transformational leadership and innovation incentives (H3)

Table 5-IV Standardised coefficients of hypothesis tests (t-value) (Post-hoc analyses)

	Absorptive Capacity				
	M1	M2	M3	M4	M5
Control variables					
Firm age	-0.15	-0.09	-0.13	-0.13	-0.17*
	(-1.33)	(-0.97)	(-1.47)	(-1.42)	(-2.06)
Firm size	0.18	0.05	0.12	0.04	0.12
	(1.55)	(0.53)	(1.34)	(0.50)	(1.43)
R&D intensity	0.14	0.20*	0.20*	0.25**	0.25**
	(1.25)	(2.28)	(2.44)	(2.85)	(3.15)
Foreign equity share	-0.03	0.08	0.06	0.09	0.07
	(-0.24)	(0.92)	(0.73)	(1.00)	(0.81)
Employee training	0.11	-0.12	-0.11	-0.18†	-0.17†
	(0.94)	(-1.23)	(-1.10)	(-1.85)	(-1.83)
Higher degree proportion	0.03	0.09	0.08	0.11	0.10
	(0.23)	(0.95)	(0.88)	(1.14)	(1.10)
New employee proportion	0.13	-0.01	-0.02	-0.05	-0.06
	(1.19)	(-0.15)	(-0.17)	(-0.56)	(-0.66)
Environment dynamism	0.06	-0.04	-0.03	-0.11	-0.11
	(0.51)	(-0.43)	(-0.37)	(-1.26)	(-1.36)
Direct effects					
Teamwork		0.36**	0.37**	0.43**	0.45**
		(3.44)	(3.75)	(4.18)	(4.69)
Transformational leadership		0.25**	0.21*	0.21*	0.16*
		(2.80)	(2.46)	(2.45)	(2.03)
H1: Innovation incentives		0.29**	0.24**	0.27**	0.22*
		(3.07)	(2.68)	(2.99)	(2.56)
Interaction effects					
H2: Innovation incentives × Teamwork			0.26**		0.28**
			(3.14)		(3.58)
H3: Innovation incentives × Transformational leadership				-0.25**	-0.27**
				(-2.78)	(-3.26)
R^2	0.37	0.69	0.73	0.72	0.77
Adjusted R^2	0.05	0.39	0.46	0.44	0.52
ΔR^2		0.34**	0.07**	0.05**	0.08**

Notes: Absorptive capacity was rated by top managers; transformational leadership was rated by HR Managers; teamwork was rated by R&D managers; innovation incentives were rated by core R&D employees.
Highest variance inflation factor = 1.68.
N=102. ** $p < 0.01$, * $p < 0.05$, † $p < 0.10$ (two-tailed).

5.6 Discussion

We have focused on innovation incentives as a key motivational driver of AC development, to determine how and when they contribute to AC. Building on expectancy and equity theories, we take a contingency approach to study the effectiveness of innovation incentives using a micro-level perspective. We also extend prior research, by highlighting the importance of relational contexts for shaping employees' subjective perceptions of justice, which significantly influence the effect of incentives on AC. Specifically, teamwork, which constitutes a type of horizontal relation among employees, strengthens the positive role of innovation incentives, whereas transformational leadership, a vertical relation between leaders and subordinates, weakens their influence. The results of a multirespondent survey of Chinese automotive companies provide strong support for these arguments.

5.6.1 Theoretical contributions

We note three pertinent theoretical contributions of this study. First, we contribute to growing literature on the antecedents of absoprtive capacity, a dynamic capability that is critical to organisational innovativeness and long-term success (Lane, Koka, and Pathak 2006; Zahra and George 2002). To extend prior literature that has mostly focused on macro-level, knowledge-based drivers (Jansen et al. 2005; Schleimer and Pedersen 2013b), we study micro-level motivating factors for AC. With the growing intersest in microfoundation of capabilities among strategic management research (Foss 2011; Teece 2007), this study represents an initial effort to unravel the microfoundation of AC by examining the nuanced interplay between a motivational lever (i.e. innovation incentives) and the relational context (i.e. teamwork and leadership). Echoing the idea that AC 'is inherently a multi-level construct, the capability of absorbing knowledge ultimately resides within individuals, while

synergies are manifested at the organisational level' (Minbaeva et al. 2013:7), we contend that the development of AC depends strongly on individual employees' motivations and actions. We therefore focus on how economic-based governance mechanisms (i.e. innovation incentives) affect individual motivation and behaviour, which underlies the development of AC. In line with the logic that employee governance mechanisms affect the nature of knowledge resources (Wang, He, and Mahoney 2009), we find that innovation incentives act as an important mechanism for promoting organisational capabilities to identify, assimilate, and exploit external knowledge.

Second, previous studies provide inconsistent arguments and empirical evidence about the role of incentives (Yanadori and Cui 2013). We offer a possible means to reconcile this inconsistency, namely, by considering the moderating effects of the relational context. Because social comparison is an inevitable human act, driven directly by formally imposed incentive schemes (Greenberg et al. 2007), the relational work context could influence social comparison processes significantly. Studies of pay secrecy indicate that discouraging social comparison by limiting employees' access to relevant information can be counterproductive (Belogolovsky and Bamberger 2014). We argue further that maintaining good teamwork and thus enhancing justice perceptions represents an effective solution. Through coherent interactions, team members obtain additional information about their efforts and rewards, then develop a less biased perception of justice. Financial incentives often have been assumed to be detrimental in interdependent work settings (Pfeffer and Langton 1993; Yanadori and Cui 2013), but our findings suggest that when coupled with quality teamwork, they can facilitate the development of AC.

Third, we contribute to leadership literature by demonstrating a negative interaction between innovation incentives and transformational leadership. In stark contrast with the conventional wisdom, which holds that transformational leadership always promotes innovation and creativity (Gong, Huang, and Farh 2009; Shin and Zhou 2003), we find that this leadership style can hamper innovation incentives, likely because of the conflict between the rules that underlie transformational leadership versus innovation incentives. The former are need-based; the latter is equity based. Transformational leaders seek to form differentiated interpersonal relationship with their subordinates, which can cause employees to interpret the unequal treatments as favoritism rather than based on their merit or contributions. Consistent with recent developments in leader–member exchange research, which show that comparisons of relationships across employees can have significant consequences (Harris et al. 2014; Tse et al. 2013; Vidyarthi et al. 2010), our findings highlight the importance of social comparison processes and equity assessments for transformational leadership research.

5.6.2 Managerial implications

Our findings also provide important implications for practitioners. Managers should understand that to develop their firm's AC, they must carefully design and implement innovation incentives that will boost employees' motivation to undertake knowledge-intensive activities. Teamwork and transformational leadership also facilitate the development of AC on their own. Thus, managers should encourage efficient collaboration and mutual trust among coworkers, or hire leaders with tranformational features, to enhance AC.

Yet it may be more important for managers to consider the interplay among incentives, teamwork, and leadership. Teamwork strengthens the positive role of incentives; In fact, incentives are effective only when teamwork quality is sufficiently high, but they have little significant effect when teamwork quality is low (Figure 5-2). Therefore, if the firm initiates strong innovation incentives, managers should ensure that employees are working in collaborative and supportive team environments. Menon and Thompson (2010) offer the example of a star worker who became so upset by his colleagues' success and rewards that he lost focus on his own work, deliberately undermined his colleagues, and eventually decided to leave the company. Our study findings suggest that such detrimental effect of incentive dispersion could be curtailed by greater teamwork. Managers therefore should cultivate a strong sense of teamwork to ensure that employees do not distance themselves from other employees who are paid differently.

In addition, the simultaneous existence of incentives and transformational leadership is counterproductive for the development of AC. Incentives lose their power when transformational leadership is high (Figure 5-3). Therefore, when strong innovation incentives are in place, leaders should refrain from displaying differentiated consideration of individual employees. If leaders possess inherently strong transformational features though, firms also should adopt less intensive innovation incentives. Because strong innovation incentives prompt employees to focus on distributive justice, managers should take special care to avoid any perceptions of favoritism in the workplace, such as establishing inconsistent standards or specialised treatment, because they seriously undermine the effectiveness of incentives. For transformational leaders, especially if differentiated

treatment is inevitable, we suggest they should make sure to clarify their decisions, increase the transparency of the incentive allocation processes, and adopt weaker incentives.

5.6.3 Limitations and further research

Some limitations of this study suggest avenues for research. First, the cross-sectional nature of our data raises the question of causality, though the reverse logic is much less likely. Our data come from automotive assembly companies in China; this single-industry, single-country sample limits the generalisability of the findings. Additional research should use longitudinal data from other industries or countries to help address these concerns.

Second, though we highlight the crucial role of employee motivation and justice perceptions, invoked by innovation incentives, we do not measure these individual-level psychological mechanisms. Additional research is needed to specify these underlying mediating mechanisms.

Third, previous research suggests that tacit knowledge is more difficult to evaluate and reward, and its generation and transfer depend on the intrinsic motivations of the exchange parties (Li, Poppo, and Zhou 2010). Incentives likely are important means to motivate the transfer and integration of explicit knowledge, but other mechanisms are required to ensure tacit knowledge transfer. Therefore, we encourage further research to consider different types of knowledge and examine the interplay of incentives and the relational context accordingly.

Chapter 6
Managing External Knowledge: Search Breadth and Depth of Chinese Automobile Assembly Companies

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Abstract

This paper studies how the configuration of external knowledge linkages influences firms' innovation performance, and consequently determines its financial performance. Following research on organisation learning and knowledge search, this paper decomposes a firm's linkages to external knowledge into two distinct dimensions, knowledge breadth and knowledge depth and analyses how the two differently affect the firm's innovation and consequent financial performance. Research findings suggest that knowledge linkage depth has an inverted U-shaped relationship with innovation, but similar relationship is not observed between knowledge linkage breath and innovation. Moreover, the effect of knowledge breadth translates into financial performance through enhanced innovation performance, further validating the importance of maintaining a broad external knowledge linkages and conducting innovation in firms.

6.1 Introduction

The capability to innovate has been considered as one of the main sources of firms' competitive advantage that differentiate the focal firm from its competitors. However, innovation could hardly be created or sustained merely through the firm's internal efforts. The extremely risky and interactive nature of innovation has made firms' external knowledge linkages valuable, especially those with lead users, suppliers, universities, and even competitors (Dahlander and Gann 2010; Etzkowitz and Leydesdorff 2000; Lundvall 1992; Powell, Koput, and Smith-Doerr 1996). In this sense, how to manage the firm's linkages to these important external knowledge sources in order to promote innovation is a strategic concern.

Several streams of research have shed light on addressing the proposed question. One is the knowledge search and organisational learning literature, gaining root in the behaviour theory of the firm (Cyert and March 1963). Built on the concepts of bounded rationality, satisficing, adaptive learning, and sequential attention, it posits that in the innovation process, firms usually go about searching for new ideas, knowledge, and solutions, especially when they fail to meet pre-set aspirations and expectations (Afuah and Tucci 2012; Katila and Ahuja 2002; Kim et al. 2013; Laursen and Salter 2006; Leiponen and Helfat 2010, 2011; Liu, Chen, and Kittilaksanawong 2013). In other words, it has emphasised the problemistic search that results in organisational learning and changes. Such external-oriented search behaviour can be either explorative, aiming at discovering a wholly new set of resources; or it can be contributing to the exploitation of existing resources. Correspondingly, there are two distinct dimensions of search, namely

the knowledge search breadth and search depth.

The Schumpeterian literature on innovation highlights *recombination* as a crucial source of novelty. It is in line with evolutionary economic theories, suggesting that the diversity and variety of knowledge input will increase the opportunities for creating new combinations, which in turn leads to new knowledge and technology. Therefore, increasing the breadth of external knowledge linkages will benefit the firm in terms of innovation outputs. In parallel, another stream of literature differentiates between tacit and explicit knowledge (Nonaka, 1994). The main essence is that explicit knowledge might be easy to transfer between organisations, yet tacit knowledge can only be learnt with substantial effort and time. That is, search depth assists the absorption of this type of external knowledge. Despite the positive impact of knowledge breadth and depth on innovation, research on information processing suggests that there is potential downside caused by information overload or rigidity in repeated knowledge interaction. This implies a more complex relation between external knowledge sources and firm innovation performance.

This study follows previous research and decomposes firms' external linkages into two dimensions (*breadth* and *depth* of external linkages). In so doing, it first explores how the two dimensions may affect firms' innovation performance, respectively. Additionally, this paper examines whether a firm's innovation success mediates the benefit of external knowledge on its financial performance.

In sum, the conceptual model is presented in Figure 6-1. To test these arguments, this study utilises a comprehensive dataset based on the survey of 102 whole-car

manufacturing firms in China. Previous studies tend to use more general datasets containing multiple industries (Laursen and Salter 2006; Leiponen and Helfat 2010). This could lead to misleading results, as different industries can vary systematically in their levels of technology complexity, external knowledge search needs and patterns. This study has found that consistent with prior studies, external knowledge depth has a curvilinear relation with the firm's innovation performance; but in contrast, a similar relationship has not been observed for external knowledge breadth. This suggests that the two dimensions of external linkages function in fundamentally different ways in influencing the firm's innovation performance. Secondly, this study has demonstrated that the benefit of acquiring external knowledge will get translated into its financial performance through the mediating role of innovation, confirming the essential role of conducting innovation activities in firms.

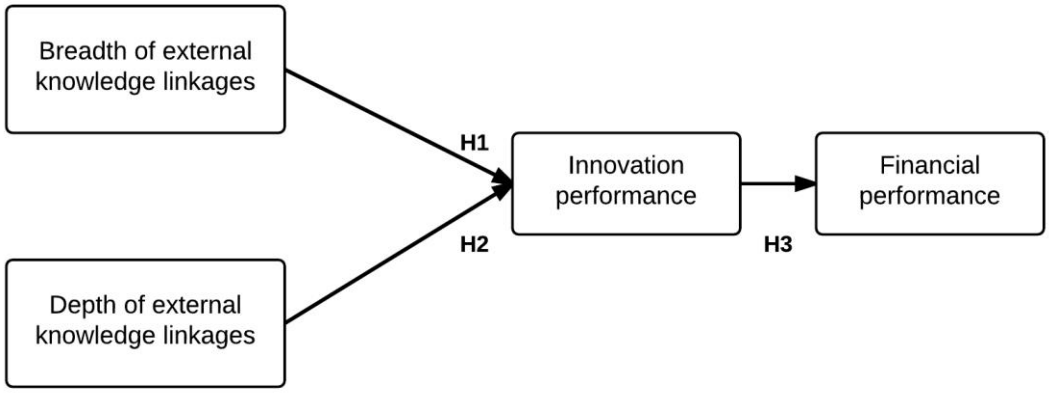


Figure 6-1 The conceptual model of Paper 3

6.2 Theoretical background

Firms innovate to sustain their competitive advantage, especially in a dynamic business environment. Innovation activities can bring about incremental or radical changes to the existing processes and products, overcome organisational inertia, and enhance profitability. However, innovation activities normally require substantial investment and are characterised by an extremely high failure rate. They are fraught with puzzles, paradox, and trade-offs. The high level of uncertainty and difficulty motivate firms to seek inspiration and help from the outside rather than do it all alone (Shinkle 2012). Powell et al.,(1996) insightfully note that the locus of innovation will be found in networks, rather than in individual firms, especially when the knowledge base of an industry is both complex and expanding and the sources of expertise are dispersed. Dorothy Leonard's (1995) stated that most innovation happens at the boundaries between disciplines or specialisations.

Moreover, external knowledge has been demonstrated to be beneficial for the firms throughout the innovation process, from idea generation, experimentation, implementation, to commercialisation. For instance, the firm could consult existing customers about their experience in order to come up with ideas to improve existing products. They might get potential customers directly involved in the R&D process before launching a radical new product (Foss, Laursen, and Pedersen 2011). Customer involvement could further reduce the costs of gaining legitimacy and gaining efficiency during multinational enterprises' (MNEs) internationalisation processes (Zhang, Zhong, and Makino 2014). Similarly, firms could tap into the knowledge bases of suppliers,

universities, public research laboratories, professional consultants, and industrial societies and associations (Bercovitz and Feldman 2007; Hoegl 2005; Petersen, Handfield, and Ragatz 2005). In terms of the form of knowledge sourcing, it ranges from hiring technical staff and consulting external experts to conducting joint development projects, forming R&D alliance, outsourcing through formal contracts, as well as the direct acquisition of licence and patents (Grimpe and Kaiser 2010; Tyler and Caner 2015).

6.2.1 The variety paradox

Evolutionary economics and innovation literature have stressed the importance of variety in creating and sustaining innovation outputs (Nelson 1982). Evolutionary economics describe the process of variation, selection, adaption, and change under constraints of bounded rationality. Variation should be enabled and facilitated for further refinement and development, and ultimately to replace old practices. In parallel, innovation, by definition, is the creation of new knowledge through novel combinations of different knowledge. New ideas, arising from the recombination of existing ideas, could have the desired property of limitless expansion through a chain reaction (Weitzman, 1998). Without the inflow of distant information, innovation would be limited to mutation and subject to diminishing returns (Baumol, 2002). As Mokyr put it, 'Diversity is the root of creativity, and much of what we call technological creativity is the ability to absorb, assimilate and apply ideas borrowed from others' (1994b: 48). As such, increasing the variety of existing knowledge sources will lead to a bigger chance of discovering new combinations, namely innovation.

For firms, different external partners have distinct knowledge and expertise. They are likely to offer differentiated insights, information, and expertise to the firm on the same topic and problems. Therefore, increasing the number of external partners will enhance the diversity of knowledge inputs to the firm, and in turn, the opportunities for creating innovation. Moreover, the likelihood of successfully tackling a given innovation problem (e.g. developing new products) is highly uncertain. Hence, it would enhance the odds of innovation by pursuing parallel path strategies with a variety of external partners (Leiponen and Helfat 2010).

Despite these insights, the detrimental effect of diversity may be salient when it reaches a certain level. There are two major reasons for this. First, the firm needs to devote scarce organisational resources to manage heterogeneous external partners, including financial resources, human capital, and managerial attention. Since external partners have different norms, habits, and preferences, the firm may need to develop differentiated strategies when working with different partners. And an extremely high level of external-oriented actions could be complex to coordinate. Therefore, an increased number of external partners is likely to consume a substantial amount of resources, especially when it reaches a certain threshold.

Second, diversified external knowledge could result in information overload and high integration costs (Vegt and Bunderson 2005). Unconstructive bargaining and harmful conflicts might incur when it is difficult to accommodate opposing views. As a result, information overload will delay the decision-making speed and harm organisational efficiency. The information processing literature views firms as

information processing systems and are of idiosyncratic levels of information processing capabilities depending on the organisational structure (Tushman and Nadler 1978). Higher levels of informational processing capability mean relatively lower costs associated with the time, resources, and managerial control of the same tasks. Hence, it follows as the firm better strikes the balance between informational processing requirements facing the organisation and its capability in dealing with a large amount of information.

6.2.2 The depth of external knowledge search

In addition to the fact that firms can search broadly and obtain knowledge from a variety of external sources, some have proposed that firms also vary in terms of how *deeply* they draw from their external knowledge sources. Katila and Ahuja (2002) defined knowledge search in terms of both depth and scope, although this is not necessarily confined to external search. They found that search depth and scope independently and interactively influence firms' ability to introduce new products. In a similar vein, Laursen and Salter (2006) suggested that firms not only search broadly among external knowledge sources, they can also draw deeply from these sources. Accordingly, they developed the concepts of *breadth* and *depth* as two components of firms' external search strategies; and empirical testing shows that both the breadth and depth of search are curvilinearlly (taking an inverted U-shaped relationship) related to innovation performance. As such, the depth of external knowledge search is defined as the extent to which firms draw deeply from various external knowledge sources and channels. Whereas the breadth of knowledge search characterises the overall structural configuration of external

knowledge linkages, the depth of search describes the actual interaction behaviours regarding external sources. Therefore, they are two complementary dimensions of firms' external knowledge linkages.

A classic classification of knowledge is made between explicit and tacit knowledge (Dhanaraj et al. 2004). While explicit knowledge is codified and can be easily transferred across firm boundaries, tacit knowledge is uncodified, unarticulated, and often sticky to its owner. Nevertheless, it is the tacit knowledge that is most valuable for firms (Lam 2000). Following this logic, certain depth with external partners is essential, as increased interaction depth will assist the transfer of tacit knowledge. In-depth, repeated knowledge exchanges will build confidence and trust in the other party and foster long-term relationship. It will therefore enhance the knowledge provider's motivation in transferring its knowledge. Feedbacks and frequent interactions further help clarify the ambiguous concepts and misunderstandings. Additionally, the depth of linkages contributes to the formation of organisational routines, enhancing the efficiency and reducing future cost of interactions.

Nevertheless, the downside of depth is also well documented. The depth of external linkages could result in organisational rigidity and structural inertia (Hansen 1999). Firms could be easily satisfied with the existing information at hand and compromise the knowledge completeness. The firms feel comfortable dealing with existing and familiar knowledge sources, as it could cause anxiety and uncertainty to explore alternatives. However, repeated interactions could lead to similar mind-set between the firm and its external partners. Over time, fewer amounts of novel insights can be drawn from the

specific external linkage. To make matters worse, it might give rise to relational burden, as the firm feels obligated to maintain existing relations at the expense of potentially better alternatives.

6.3 Hypotheses

In contrary to previous studies proposing a curvilinear relationship between the breadth of external linkages and innovation performance, we argue that the relationship strongly depends on the nature of the innovation task and the stage of learning in dealing with such relationships. Based on previous work, we focused on two key attributes of the innovation task, namely problem complexity and knowledge hiddenness (Felin and Zenger 2014). Complex problems are parable to complex hierarchical systems, which are made up of a large number of interactive parts, and normally have a parts-within-parts structure (Simon 1962). Problems also vary in the degree to which the location of knowledge deemed relevant is known, namely knowledge hiddenness. Consequently, the optimal management of external knowledge sources should match the nature of the specific type of problem at hand (see Table 6-I). For problems high in complexity and knowledge hiddenness, open, theory-guided search is the optimal solution.

Table 6-I Optimal solution search methods by alternative problem types

		Problem complexity	
		High	Low
Knowledge hiddenness	High	Open, theory-guided search	Open, trial-and-error search
	Low	Centralised, theory-guided search	Centralised, trial-and-error search

Adapted from Felin and Zenger (2014)

We believe that compared with other industries, the diversity of knowledge is much more important for automotive companies in China (Brusoni, Prencipe, and Pavitt 2001). First, a typical passenger car is a complex product system, made up of more than 30,000 functionally meaningful components. The process of designing and making automobiles involves numerous disciplines and fields, ranging from mechanical engineering, electrical engineering. In their very influential book on innovation in the world auto industry, Clark and Fujimoto (1991) elucidated that despite somewhat lower technological sophistication of each component in automobiles (compared with some high-tech products), tight-interdependence among a great number of components makes the production of vehicles extremely challenging. Consequently, for whole car producers, the capability of coordination among various suppliers and alliance partners, integrating across various disciplines and functions is more relevant and valuable (Takeishi 2001). In other words, they act as the coordinators of multiple external players in the theory-guided search of innovation; and their capability to handle the breadth of the network is crucial.

Second, compared with developed economies, the relatively ineffective market supporting institutions in China increase transaction costs and heightens the problem of information asymmetry. This speaks to the absence of specialised intermediates, inefficient property right protection. More specifically, the context of China increases the difficulty of locating the proper knowledge to help problems solving as well as the development of suitable partners, thereby heightens the knowledge hiddenness. In this

circumstance, external knowledge breadth would be especially beneficial for overcoming the issue of informational asymmetry.

Third, the learning effect is present in terms of dealing with external linkages. Love and his colleagues (2014) have argued that learning will take place in two ways: i) selecting appropriate partners, and ii) managing a specific relationship. Firms will accumulate relevant experience of identifying the potential relationship. They will be better at spotting and selecting valuable partners to satisfy their need. They will learn how to better deal with a specific partner, as they develop supporting organisational routines. Such learning effect might also spill over a variety of similar partners. As a result, experience over time will greatly increase the return from a given breadth of relationship configuration and lower the cost of maintaining those relationships. Further, the conceptualisation and operationalisation of breadth should be paid special attention to. The breadth of knowledge could be the structural configuration of external knowledge linkages, potentially could be useful for firm's innovation activities. Or it could indicate the actual usage of knowledge source variety. We believe that structural configuration reflects the overall interactions of knowledge sourcing, it is a potential pool of channels which firm can draw insight from when needed. Therefore, it does not incur cost unless actually been used. In sum,

> ***Hypothesis 1****: For firms with high technological complexity/hiddenness and substantial learning period, external knowledge breadth will have a positive relation with innovation.*

The depth of external linkages conceptualises how heavily firms rely on external sources of information and technology. While heavy use of key external knowledge

sources contributes to the transfer of tacit knowledge, it could at the same time create strong rigidity and reliance on external partners at the expense of internal knowledge accumulation and renewal. For firms with high technological complexity, leveraging capability and resource of external partners is crucial. However, they might easily be trapped into existing relations. In some extreme situations, the firm may completely rely on outsourcing thereby losing the opportunity of learning by doing itself. Moreover, for two parties with long-term interaction, they might have an increasingly similar mind-set, therefore offering little novel insights as the relationship gets firmly entrenched. In sum, consistent with conventional wisdom, this study argues that

> ***Hypothesis 2:*** *For firms with high technological complexity, external knowledge depth will have a curvilinear (an inverted U-shaped relationship) relation with innovation.*

Firms constantly offer new products to stay financially healthy and competitive. The ultimate goal of the firm is to stimulate sales and make a profit. In the innovation value chain, external knowledge is useful in all three stages including knowledge sourcing, transformation and exploitation. As a more distant outcome, financial performance is enhanced through better innovation outputs (Love, Roper, and Bryson 2011). Therefore, the benefits of maintaining external knowledge linkages will get further transmitted into firms' financial performance through their positive impact on innovation. In other words,

> ***Hypothesis 3:*** *Innovation performance mediates the benefit of external knowledge breadth and depth on financial performance.*

6.4 Methods

6.4.1 Sample and data collection

We test our hypotheses on a sample of 102 Chinese automobile assembly companies. As

stated previously, an automobile is a typical product featuring as complex systems. Modern automobile companies moved away from integrated production systems to more dynamically loosely connected supply chain (Schmitt and Biesebroeck 2013). While external suppliers take on more design and engineering processes, automobile companies are still required to have architectural knowledge as well as a certain amount of component knowledge. Additionally, although many questioned the capability of Chinese automobile companies in creating novel innovations, some researchers have argued that one critical task for Chinese automobile companies is to adapt existing product design to local conditions, regulations and consumer tastes (Zhao and Anand 2009). In this sense, it makes external linkages even more valuable.

The empirical data for this study comes from a 2007 innovation survey of Chinese automobile industry. The methods of the survey were described in the previous paper on developing absorptive capacity of Chinese automobile companies. The construct validity, reliability, and interpretability of survey questions were established by both expert view and a small-scale pilot study. The final survey received 100 per cent response rate, due to the sponsorship of the National Development and Reform Commission of China, the key planning branch of the Chinese government, and Chinese Society of Automotive Engineering, a national-wide non-profit organisation in the fields of automobile and relative industries. Anonymity and confidentiality to all respondents were assured in the survey process and a third-party agency was employed to collect the data, as the sponsors would have access to the results only in the aggregated form therefore mitigate the

potential social desirability issue. They were assured that there was no right or wrong answer, adding validity to our data.

The general managers from each firm are asked to state their opinions on a variety of questions, such as the overall strategy, leadership quality, the usage of various external knowledge sources, and performance on multiple dimensions, organisational culture, IT usage and information on intellectual property protection. All survey questions used five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). In addition, objective data was collected from the China Automotive Technology and Research Centre, such as firm age, firm size, R&D intensity, and foreign equity share. The final sample consists of 102 cases due to excessive missing data of 3 cases. In the final sample, the average age of the companies was 17.46 years (SD = 16.71, ranging from 1 to 58 years) and the average sale per year was 7634.87 million RMB, with R&D intensity (the ratio of the firms' R&D to revenue) varies from 0 to 0.4, and foreign equity share from 0 to 0.9.

Descriptive results

Table 6-II lists all the potential knowledge sources contained in the innovation survey. Each company was asked to indicate the extent to which each of these sources has been used on a 1-5 scale. Overall, the results show that most frequently and extensively used external knowledge sources are customers (1, characterised as learning by doing), special training courses (8), as well as academic papers, fairs and exhibitions (10). Over half of the total firms reported the highest usage (a score of 5) for each of these three sources, with a proportion of 63.7%, 57%, and 52% respectively. In addition,

joint venture partners, competitors, and suppliers are important sources of knowledge for automobile assembly companies in China, all of which has over 55% coverage of firms reporting a fairly high level of usage (a score of 4 or 5). In contrast, the least common channels were through establishing overseas research and development centre and directly hiring into oversea researchers (including both foreign researchers and Chinese researchers with an oversea degree). This is not unexpected as both channels require substantial investment and entail much higher risks. It appears that Chinese automobile companies are rather internal-oriented and prefer local-search than more distant one. The top three channels are all characterised by less commercialised knowledge, therefore, core R&D task is still kept within the firm.

6.4.2 Measures

Dependent variable

Innovation performance. We measure innovation performance by asking top managers to rate their firm's performance over the past three years in terms of 1) the proportion of total output by new products; and 2) the total number of new products ($\alpha = .72$, $r = 0.57$). The evaluation is done based on a five-point Likert scale.

Financial performance. Given excessive missing data, objective data from corporate financial reports were not used. Instead, we ask top managers to rate their firm's performance trend in terms of making a profit.

Independent variable

Based on previous research, we constructed the variables for **BREADTH** and **DEPTH** of external knowledge sources of firms. The breadth is a combination of all the

17 sources listed in Table 6-II. Each of the 17 sources is coded as a binary variable, 0 being no use and 1 being used. The coding method is 1,2 as no or very limited use; 3,4,or 5 as used. The 17 sources were then added up to represent the overall level of usage. In other words, if all sources are used, the corresponding firm will score 17; while if no source is used, the firm will score 0. It is assumed that firms with higher scores have a wider connection with external knowledge sources. Similarly, DEPTH is measured using the information on the same 17 sources of knowledge as those used in BREADTH. In this case, each of the 17 sources is coded as 1 when the firm reports a usage of 5, and 0 otherwise. Then the corresponding 17 binary variables are added up to form the DEPTH variable. A final score of 0 means that the firm uses no external source to an extensive degree; and a score of 17 suggests that the firm uses all the sources extensively. To minimise the issue of multicollinearity, we mean-centred the constructs of breadth and breadth before calculating their squared term, **BREADTH^2** and **DEPTH^2**.

Table 6-II Source of knowledge for innovation in Chinese automakers

Knowledge source	Percentage				
	1 Never	2	3 Some	4	5 High
1. Learning by doing (e.g. customers)	0.0	1.0	18.6	16.7	63.7
2. Hire overseas researchers (foreigner or Chinese with overseas degree)	48.5	5.1	28.3	13.1	5.1
3. Hire domestic experts	5.0	11.0	32.0	32.0	20.0
4. Invite expert to stay on–site	17.5	19.6	34.0	14.4	14.4
5. Short-term course/supervision	3.0	10.1	35.4	27.3	24.2
6. Consultants	18.6	17.5	35.1	17.5	11.3
7. Overseas R&D institute	82.5	7.2	3.1	4.1	3.1
8. Special training courses	0.0	2.0	19.0	22.0	57.0
9. Visit other firms (including competitors)	2.9	8.8	29.4	30.4	28.4

10. Academic papers, fairs/exhibitions	2.0	4.0	25.0	17.0	52.0
11. Purchase patents, licences	32.3	21.9	24.0	11.5	10.4
12. Joint venture partners	17.6	2.0	17.6	19.6	43.1
13. Industrial association and platform	13.1	12.1	45.5	16.2	13.1
14. Universities or public research institute	14.6	8.3	33.3	25.0	18.8
15. Strategic alliance outside business group	26.0	11.5	28.1	17.7	16.7
16. Specialised design companies	28.6	16.3	18.4	23.5	13.3
17. Suppliers	7.1	11.2	25.5	27.6	28.6

Note: N = 102

Although the list of external sources in Table 6-II may not fully comprehensive nor are items mutually exclusive, it contains a wide range of potential external knowledge and information sources, including external experts, suppliers, competing firms, customers, universities and industrial associations. Moreover, it is comparative with previous research on similar topics, such as Laursen and Salter (2006), Mol and Birkinshaw (2009), Leiponen and Helfat (2010), Wu and Wei (2013). Profile of linkages to external knowledge by the extent of usage is presented in Figure 6-2.

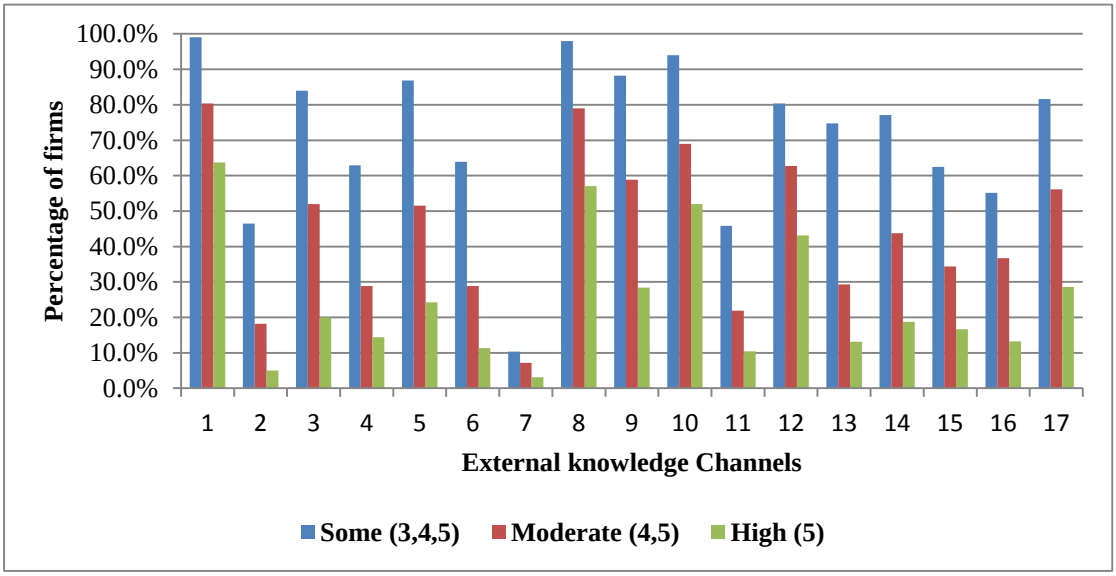


Figure 6-2 Profile of linkages to external knowledge by the extent of usage

Control variables

We control for a number of factors to rule out alternative explanations. Consistent with previous research, controls include **firm age** (the age of the firm in years) and **firm size** (the natural logarithm of the firm's return on assets in 2006); **foreign equity shares** (percentage of shares owned by foreign parent), as it is the provision of capital resource by firm's foreign parent therefore reflects their ability and motivation to involve in the focal firm's learning and knowledge acquisition (Tsang, 2002); and **R&D intensity**, measured as firm R&D investment divided by its total sales. As the most commonly used proxy for firm's innovation effort and capability, we include R&D intensity to control its effect on innovation performance and to test the potential moderation effect. In addition to all these objective measures, we include a measure for **environment dynamism**, defined as the degree of instability of the environment (including market share, competition, and raw material supply). In an environment featured by fierce competition and dramatic changes, innovation performance is likely to suffer. This construct was rated by top managers using four items ($\alpha = 0.70$).

6.5 Statistical method and results

Table 6-III reports the means, standard deviations, reliability coefficients and intercorrelation of all variables. As the results show, innovation performance is significantly correlated with both breadth and depth of external knowledge sources, with the *r* value of 0.35 and 0.32, respectively. Similarly, financial performance is correlated with both breadth and depth of external knowledge sources, but with a relatively lower level of correlation, confirming the expectation that financial performance is a more distant outcome of organisational learning. Further, financial performance is highly

correlated with innovation performance (r = 0.34). The correlation between breadth and depth is 0.493. Although this number is much higher, it is actually comparable with similar studies. For instance, in the seminal paper of Laursen and Salter (2006) on open innovation, the correlation of the two constructs is at a value of 0.42. In terms of control variables, firm age has a negative correlation with innovation performance, meaning that older firms tend to be less innovative. Firm size has no correlation with either innovation or financial performance. However, it is positively related to external knowledge breadth. The inspection is that firms bigger in size have more external knowledge sources.

To test the above hypotheses, we used hierarchical regression analysis with mean-centered explanatory and independent variables (Aiken and West 1991). Model 1 is the baseline model, including all the control variables. Model 2 added two variables, namely breadth and depth, to test their independent direct effects. This model added 14% of total variance. Two square terms of breadth and depth were entered in Model 3, showing a moderate increase in explained total variance. Model 4 and 5 test the mediation effect of innovation performance on the relationship between external knowledge and financial performance[1]. We inspected the variance inflation factors (VIF) of all variables for all five models, which yielded values between 1.0 and 1.8, indicating that there are no problems with multicollinearity. Table 6-IV summarises the results.

Confirming the variety hypothesis, our results show that the coefficients for breath are positive and significant. This reflects a positive effect of external knowledge breadth on innovation. Additionally, the coefficient for breadth[2] is positive with marginal

[1] Only the mediation effect of external knowledge breadth is tested, as the external knowledge depth is not related to financial performance in the regression model.

significance ($p < 0.1$), which rejects the curvilinear relationship between the breadth of innovation performance. In contrast, the coefficient for depth^2 is negative and significant. Consistent with Hypothesis 2, it indicates that there is a limit beyond which extensive external knowledge search would have negative consequences. Model 4 and 5 confirm that innovation performance mediates the effect of the breadth of external knowledge sources on financial performance, as the significant and positive coefficient of breadth becomes insignificant when innovation performance is added.

In addition, firm age has a consistently negative effect on innovation performance, as the coefficients are all significant and negative in model 1-3. Interestingly, the regression results also indicate that external environment dynamism have a negative effect on firms' financial performance while having no direct impact on innovation performance. This might due to the fact that in a dynamic environment, some firms could do extremely well and some extremely badly, therefore resulting in a non-significant overall effect. However, upheaval market and technology changes could have a detrimental effect on the whole industry. Almost every firm would perform less well financially compared with a more stable situation.

Table 6-III Means, standard deviations, and correlation

	1	2	3	4	5	6	7	8	9	10	11
1. Financial performance	1.0										
2. Innovation performance	0.336**	1.0									
3. Breadth	0.235*	0.351**	1.0								
4. Depth	0.217*	0.320**	0.493*	1.0							
5. Breadth^2	-0.008	-0.029	-0.410*	-0.095	1.0						
6. Depth^2	0.230*	0.115	0.306**	0.607**	0.110	1.0					
7. Firm Age	-0.020	-0.197*	-0.044	0.049	0.124	0.021	1.0				
8. Firm size	0.011	0.017	0.238*	0.087	-0.167	-0.010	-0.121	1.0			
9. R&D intensity	0.148	0.151	0.078	0.130	-0.086	0.094	-0.127	-0.047	1.0		
10. Foreign equity share	-0.053	-0.074	-0.008	0.166	-0.017	0.156	-0.211*	0.188	-0.022	1.0	
11. Environment dynamism	-0.161	0.022	0.112	0.088	-0.021	0.004	0.162	0.055	0.010	-0.113	1.0
Mean	3.74	3.85	11.86	4.07	9.98	8.73	17.45	-1.91	0.02	0.11	3.70
S.D	0.81	0.66	3.18	2.97	12.65	14.12	16.54	0.69	0.03	0.21	0.67

Note: N = 102

** $p < 0.01$, * $p < 0.05$, † $p < 0.1$ (two-tailed).

Table 6-IV Standardised coefficients of Hypothesis testing (t-value)

DV:	Innovation performance			Financial performance	
	M1	M2	M3	M4	M5
Controls					
Firm age	-0.27*	-0.26*	-0.28**	-0.02	0.05
	(-2.45)	(-2.52)	(-2.83)	(-0.21)	(0.47)
Firm size	0.01	-0.07	-0.08	-0.04	-0.02
	(0.10)	(-0.68)	(-0.84)	(0.38)	(0.20)
R&D intensity	0.12	0.06	0.08	0.16	0.14
	(1.10)	(0.61)	(0.82)	(1.58)	(1.34)
Foreign equity share	-0.14	-0.15	-0.13	-0.07	-0.04
	(-1.26)	(-1.48)	(-1.29)	(-0.67)	(-0.39)
Environment dynamism	0.03	-0.00	-0.02	-0.21*	-0.21*
	(0.27)	(-0.02)	(-0.18)	(-2.01)	(-2.06)
IV					
3. Breadth		0.23*	0.33**	0.31*	0.20
		(2.03)	(2.72)	(2.73)	(1.65)
4. Depth		0.23*	0.33**	-	-
		(2.06)	(2.64)		
Innovation performance		-	-		0.28**
					(2.50)
IV squares					
5. Breadth^2			0.19†	0.16	0.11
			(1.80)	(1.41)	(0.99)
6. Depth^2			-0.25*	-	-
			(-2.12)		
R Square	0.31	0.49	0.54	0.40	0.48
Adjusted R Square	0.10	0.24	0.30	0.15	0.21
Δ R Square		0.14**	0.06*		0.06*

Note: N = 102

** $p < 0.01$, * $p < 0.05$, † $p < 0.1$ (two-tailed)

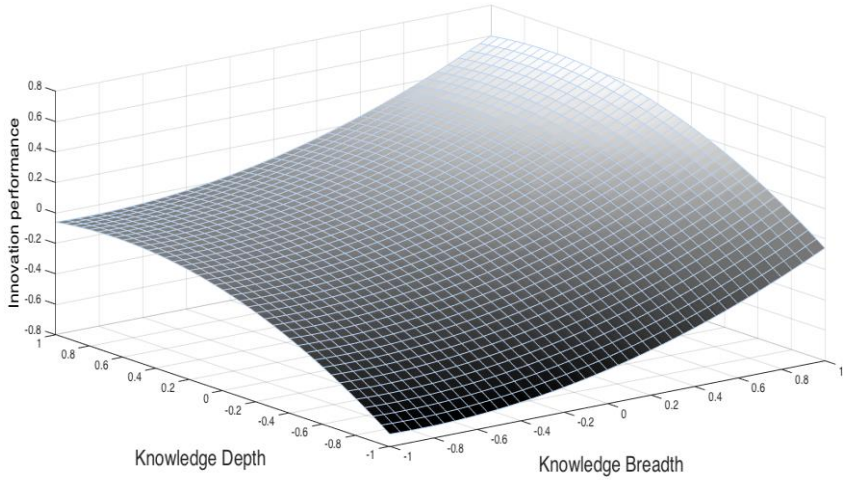


Figure 6-3 Effects of knowledge breadth and depth on innovation

Note: breadth and depth are mean centred, ranging from -σ to σ (standard deviation).

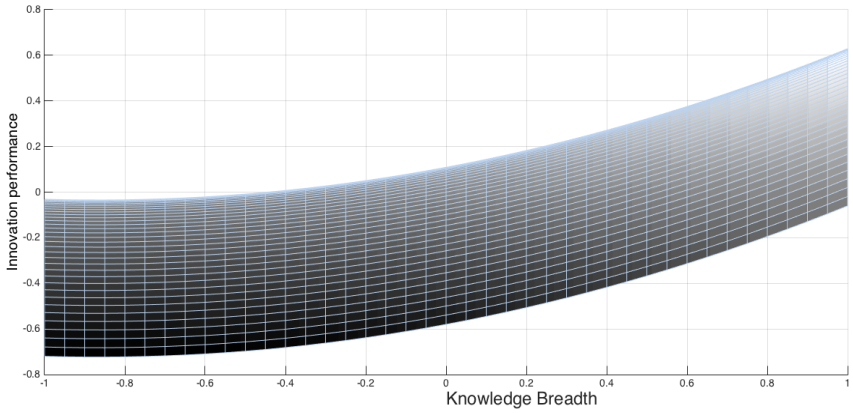


Figure 6-4 A 2D view on the effect of knowledge breadth on innovation

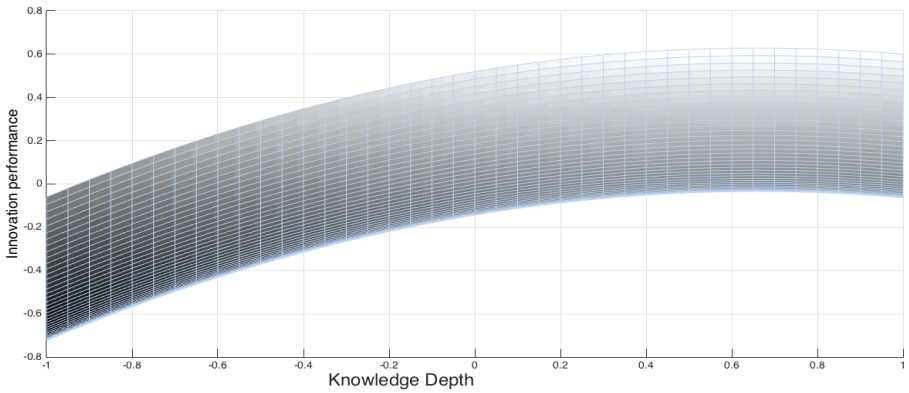


Figure 6-5 A 2D view on the effect of knowledge depth on innovation

6.6 Discussion

The notion of ‘open innovation’ is getting momentum nowadays, ranging from R&D outsourcing and new product co-development to solution crowd-sourcing. At the core, it points to the fact that firms increasingly rely on external information and knowledge sources in their innovation activities. This paper investigates how the configuration of a firm’s external knowledge linkages influences its innovation performance, and ultimately the financial performance. Building on multiple streams of literature, this study has demonstrated that the breadth and depth of external knowledge linkages are two complementary but distinct dimensions of firms’ openness toward external knowledge. Breadth and depth have asymmetric impacts on the firm’s innovation performance.

In particular, a greater variety of external knowledge, as characterised by the number of external knowledge sources (i.e. breadth), leads to better innovation performance. This study thus confirms the importance of variety in creating innovation, as argued by evolutionary economics. As such, it is worth questioning regarding a universal inverted-U shape between knowledge breadth and innovation, as the relationship may largely depend on the nature of the problems and the hiddenness of potential solutions. For products with complex systems and numerous inter-related components, the threshold level might be much higher than that has been previously documented using multi-industry samples. The Chinese context could have also contributed to the effect of knowledge breadth, which is most beneficial in higher levels of knowledge hiddenness. Moreover, this study has highlighted the learning effect of dealing with multiple external knowledge partners. The experience of interacting with

multiple external partners could help develop the capability of managing them, therefore lowering the searching cost and increasing efficiency. Empirically, our data on Chinese automobile assembly companies did not observe the inverted-U shape for the list of existing 17 external knowledge sources, providing support for the arguments.

In contrast, the findings on depth are largely consistent with previous research. Extremely high commitment on specific channels of external knowledge sources can be both risky and costly. Repeated and intensive interaction could lead to rigidity, lock-in, and groupthink, constraining future innovation. In support, we provide additional empirical evidence on the fact that there is a tipping point, over which the depth will have a negative effect on innovation. Notably, the referred tipping point in our data is smaller than previous studies. We observe that the maximum number of external knowledge sources with increasing return on average is less than 1 in our sample, whereas Lauren and Salter (2006)'s study suggested a value of 3. Potentially, heterogeneous firms would have different values. At the industry level, this might be explained by the fact that depth and breadth of external knowledge search are inherently complementary, representing one underlying construct, namely the openness for external knowledge and information. For any given firm with limited resources and managerial attention, the requirement on breadth could further lower the benefit of depth. Consequently, firms should be especially cautious of using depth as their knowledge search strategy.

In addition, as expected, we illustrate that the firm's external knowledge linkages contribute to its financial performance via promoting innovation. According to the

resource-based view of the firm (Barney 1991, 2001), external linkages and network position can be characterised as one special type of resources (Gulati 1999; Lee 2007). However, these potential knowledge resources will only be of true value to firms when they are adequately utilised in their innovation activities.

Limitation and future research

This study comes with certain limitations that worth mentioning and offer the avenue for future research. Although the adoption of the concept breadth and depth allows a direct assessment of firms' innovation openness, it sacrifices a certain amount of valuable information on individual knowledge channel. This is because that we treat each individual channel as identical, and count aggregated levels in measuring breadth and depth. Therefore, future research will benefit from incorporating more in-depth analysis of each individual channel and developing a fine-grained measurement of openness.

The second major limitation concerns the use of subjective performance measures on firms' innovation and financial performance instead of objective ones, such as the number of patents and revenue generated from new products. We chose subjective ones for two main reasons. First is because of substantial missing data in potential objective measures. Since we are interested in measuring the performance trend over the past three years, missing data in any given year will compromise the validity of the objective measures. Second in terms of reliability, the objective measures in China are rather questionable. With subjective data obtained from different sources within the same company, we were able to control the reliability and validity of specific dimensions of the performance of interest. Third, the findings of our study can complement previous

research using objective measures. However theoretically, the discrepancy might exist between subjective and object measures of performance. Future research could explore the existence of such discrepancy with both subjective and objective data, and how external knowledge breadth and depth might contribute to such discrepancy.

Another limitation is caused by the single industry sample of Chinese automobile assembly companies. This isolates our findings from confounding industrial-level explanations, but potentially also limits the generality of the findings. The automobile is a typical example of moderately complex technological system with mainly incremental innovation, it would be fruitful to study companies that offer more complex technology or radical innovation, such as aeroplanes, and compare them with the results of this study. In a similar vein, the effect external knowledge on innovation in the service industry is worth exploring. Extant studies have focused exclusively on manufacturing industries, while it is expected that managing external knowledge sources is equally, if not more, crucial for service firms, such as IT support services, management consultancy, accounting, and legal services (Love et al. 2011; Mina, Bascavusoglu-Moreau, and Hughes 2014).

Lastly, this study is cross-sectional in nature. It has established the association between external knowledge sources configuration and innovation; however it is not able to prove the causation. Additionally, the nature of the dataset constrains the exploration of how the configuration of external knowledge sources might change over time.

Chapter 7
Institutions and the effectiveness of an integrated strategy: the case of a Chinese indigenous automobile assembly company

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Abstract

This study investigates how China's indigenous automobile assembly companies catch-up and achieve competitive advantage. Based on the institution-based view and the literature on the integrated strategy, this study explores the various types of political activities of Chinese indigenous automobile firms engaged in to avoid discrimination and achieve government support. I also discuss the nature of these different political activities and argue that in an institutional environment characterised by an underdeveloped regulatory framework and arbitrary government intervention, firms are likely to benefit from taking an integrated strategy that combines market- and nonmarket-activities. Different dimensions of the integrated strategy (i.e. political, market, and technological) could complement and reinforce one another, contributing to the growth of the firm. Utilising a variety of data sources including a review of previous studies, new reports, company reports, interviews, and field observation, I justify the arguments through the empirical analysis of the first Chinese privately owned automobile assembly company, Geely.

7.1 Introduction

In recent years, business headlines, such as the deal of Geely buying Volvo from Ford Motor for 1.8 billion and Warren Buffett investing US$230 million to acquire a 10% stake in BYD Auto, have put Chinese privately owned local (indigenous thereafter) automakers under the spotlight. Indigenous automobiles companies in China were not officially established until early 2000, with very limited resources and a poor knowledge base (Chu 2011; Luo 2006). Moreover, compared with their domestic rivals (including stated-owned firms and international joint ventures), they also face pressure for legitimacy and lack government support. In an industry with frequent policy changes and intense competition, how can indigenous automobile companies in China catch up and achieve competitive advantage?

Most previous studies on the development process of Chinese indigenous automakers focus on their market-based strategies, including their business model, market positioning, and supply chain management, as well as their innovation capability building through imitation, reverse engineering, organisational learning, international acquisition, etc. (Jiang, Xie, and Yang 2014; Long and Xiaoling 2012; Wang 2008; Zhilong et al. 2010). Yet few have explored the political activities of Chinese indigenous automobile companies and how their political strategy might substitute or complement the market strategy in promoting the firms' capability and performance (Except for (Jiang, Gong, and Wei 2011)).

In fact, extant research has suggested that firms in China generally develop and maintain good connections with government authorities (Park and Luo 2001; Zhang, Tan, and Wong 2014). Despite the pro-market reforms and increasing government support for indigenous innovation in the auto sector, the influence of the Chinese government has not necessarily declined and the importance of business-government ties continues (Shi,

Markóczy, and Stan 2014). We expected that indigenous Chinese automakers could spend considerable efforts on their political activities in spite of their extremely limited resources and other important tasks. There are two major reasons. First, the automotive industry has long been treated as strategic by the Chinese government (Luo 2006; Yeo 2007). Hence, the government would continue to emphasise managing the development of industry. Second, the nature of the auto industry motivates the firms to seek government endorsement in order to obtain critical resources, such as bank loan, cheap land, favourable tax rates, government subsidies and procurement (Sun, Mellahi, and Thun 2010). Therefore, it is crucial to examine the political activities in Chinese indigenous automobile firms and the relationship between engaging in political activities and firm capability building.

Despite the significance of this topic, several issues remain underdeveloped. First, most previous research on firms' political behaviours has rested on western political systems, which feature more checks and balances or veto-players are more constraining for political actors. Firms engage in informational, financial, and constituency-building activities targeted at the state, as well as various organised pressure groups and the wider public (Hillman and Hitt 1999; King 2015). Specific tactics include lobbying, campaign contributions, appointing recently departing cabinet members as board members, and bribery. However, the set of political strategies available to Chinese private entrepreneurs is more limited than in most developed economies (Jia 2015b). In fact, most empirical studies on Chinese firms' political strategy and activities utilised measures, such as political ties, political experience, and time investment (e.g. Arnoldi and Villadsen 2015; Sun, Hu, and Hillman 2015; Zhou, Li, Sheng, and Shao 2014). Although informative, such aggregated measures sacrificed the rich and dynamic process of how firms manage the institutional environment.

Second, prior studies have been inconclusive on the outcomes of firms' political activities. On one hand, the positive role of firm political strategy and activities is well documented. Empirical studies have demonstrated that firms' political connections enhance new ventures' performance (Li and Zhang 2007), increase entrepreneurial investments (Zhou 2013), and provide benefits in the process of going public (Francis, Hasan, and Sun 2009). Indirectly, political connections strengthen the effect of market/technological capability on firm performance (Dong, Li, and Tse 2013; Zhou et al. 2014). On the other hand, a growing literature has unveiled a dark side of political ties (Sun, Hu, and Hillman 2015). Luo et al.'s (2012) meta-analysis found diminishing returns of government ties in China. Political connections might negatively affect the innovative corporate culture (Sheng, Zhou, and Li 2011), lead to overconfidence in a particular investment (Heidenreich et al. 2015), cause over-embeddedness (Sun et al. 2010) and a potential disadvantage at unexpected changes in the political regime (Siegel 2007), and even organisational failure (Sun, Mellahi, and Wright 2012).

Third, according to the institutional theory, a firm's institutional contexts of the firm shape the value of its political activities (Peng, Wang, and Jiang 2008). The firm's ownership determines its own internal institutional environment through the endowment of resources and creation of specific values. And given the lack of legitimacy and support, private domestic firms could benefit more from political activities than foreign firms and SOEs (Li and Zhang 2007; Li et al. 2012). However, as the external institutional environment improves, the influence of political connections will ultimately become less important. Empirical studies have suggested that the positive relationship between political connections and corporate diversification is moderated by the level of regional institutional development. As a result, private firms may need to carefully manage the costs and benefits of political activities.

Taken together, this study builds on the institution-based view and the integrated strategy literature to study the development of Chinese indigenous automobile assembly firms. I argue that they have engaged in a variety of corporate political activities to cultivate connections with the government. Moreover, indigenous automobile firms in China could adopt an integrated business strategy, as different dimensions complement one another in promoting their capability and performance. Implementing a political strategy helps the firm to avoid the discrimination, disadvantage, and exploitation. It also helps to obtain institutional support, greater legitimacy, and government-controlled resources, all of which facilitate the firm's market activities, including developing innovation capability and foreign acquisition. Meanwhile, market-based activities that increase the economic, political, and social significance of the firm will further enhance the effectiveness of its political activities. This study illustrates these arguments using the case of Geely, the first Chinese privately owned automobile manufacturer

In the following sections, I will first review the literature on the institution-based view, corporate political strategy, and integrated strategy (Section 2). Connections are drawn to the context of China. Section 3 outlines the research methodology and data collection procedures. Section 4 presents the case of Geely, focusing on its institutional environment and corresponding strategies in three development stages. The last two sections offer discussions and conclusions (Section 5 and 6).

7.2 Theoretical background

7.2.1 An institution-based view

The institution-based view (IBV) has gained prominence in the literature on emerging market firms (Peng et al. 2008). Drawing on insights from both economics and sociology,

[1] IBV considers the complex and dynamic interaction between institutions and firm strategy. In general, institutions create the 'rule of the game' to guide and constrain human interactions in society. In the business arena, institutions play an important role in supporting market functioning as they define the boundaries of what is legitimate, reduce uncertainty, and smooth market transactions (Peng et al. 2009). Yet compared with developed markets, emerging market institutions are much underdeveloped, especially in terms of the legal framework and its enforcement, property rights, and regulatory regimes. Despite the pro-market reforms, institutions are rapidly changing, causing uncertainty and potential risk during this process (Kim, Kim, and Hoskisson 2010). As the institutional context varies substantially across countries, here I have focused on the most influential institution in China, the Chinese government.

In China, the government is one of the most powerful institutions (Stevens, Xie, and Peng 2015). It is not only the constitutor of national laws, regulations and standards, and the ultimate arbitrator of contracts, but also in control of resources allocation[2] (Duanmu 2014; Ring et al. 2005; Tsui-Auch and Möllering 2010). To foster economic development and enhance market efficiency, the Chinese government has begun to liberalise the national economy, privatise state-owned assets, and attract foreign investments since the 1980s (Hoskisson et al. 2000). However, crucial market-supporting infrastructure in China remains inadequate and the power of government has sustained (Shi et al. 2014; Zhou and Poppo 2010).

[1] Institutions are defined by economist Douglass North (1990:3) as 'the humanly devised constraints that structure human interaction,' and by sociologist W. Richard Scott (1994) as 'regulative, normative, and cognitive structures and activities that provide stability and meaning to social behavior.'

[2] The Chinese government directly or indirectly controls resources by imposing government-regulated price, influencing government spending, industrial and antitrust policy, and financial regulation (Xu and Zhang 2008). This is especially true when strategic resources are involved, such as land, natural resources and financial capital (Okhmatovskiy 2010). For instance, according to China's land policy, the government owns all the land; and all major banks in China are SOEs, under the tight control of the central government (Lin 2011); the Chinese government has managed to keep electricity price down to increase the international competitiveness of its manufacturing sector, exacerbating power shortage in recent years (Wang, Qiu, and Kuang 2009).

Moreover, the Chinese political system is complex, multi-layered, and largely non-transparent. The public governance responsibilities are shared among various central agencies and local governments. Therefore, managers must negotiate and renegotiate a complex set of arrangements with a multitude of government bureaus and agencies, including, among many others, the taxation bureau for tax exemptions, the industrial bureau for product standards, and the local planning commission for land use (Park and Luo 2001). Without sufficient and clearly specified institutions, firms have to go through tedious process accompanied by high transaction cost when doing business in China. Further, the government in China is multi-layered – with a powerful central authority as well as autonomous provincial and local governments. The central government frequently intervenes in the management of strategic sectors and key companies, aiming to upgrade the country's domestic industries, foster economic development, and maintain social stability; whereas the local governments are pivotal in daily business operations; they also have strong incentives to support local businesses as they are important sources of tax revenue and could affect their political career (Arnoldi and Villadsen 2015).

Lastly, policymakers in China have weak institutional constraints and their decision-making processes are often non-transparent (Henisz 2000; Peng et al. 2008) Most government rules and regulations are ambiguous, subject to the personal interpretation of government officials, and enforced at the discretion of those officials. Significant ambiguity and uncertainty also leave greater room for manoeuvrability and action from the economic agents.

7.2.2 From political activities to an integrated strategy

A hazardous institutional environment requires the firms to manage the risks and uncertainty in order to survive and prosper. In this situation, political strategy and activities are especially relevant. Corporate political activity (CPA) is broadly defined as

firms' strategic efforts to influence or manage political entities and policies (Hillman, Keim, and Schuler 2004). Previous research has revealed a wide range of specific political tactics, such as lobbying, advocacy advertising, financial contributions, constituency building, and coalition formation. Nevertheless, the context-specific nature of political activities makes it difficult to generalise across nations. For instance, in China, there is a complete synchronisation of a party-government-military-economy regime (Lin 2011). Firm's influence on public policy making seems minimal. Campaign contributions are also formally forbidden.

In the Chinese context, most studies focused on informal personal connections with government officials, as they are the most viable and important drivers of political influence. However, corporate political activities are complex, dynamic and multi-faced phenomena. Drawing on five consecutive nation-wide surveys from 1997 to 2006 in China, Feng and Wang (2010) have provided the empirical evidence on the behaviours of private enterprises in obtaining organisational legitimacy. The authors have concluded that firms are willing to connect with government officers through participate in CPC or CPPCC, employ isomorphism in organisational structure, and apply government-oriented corporate social responsibility behaviours (Feng and Wang 2010). Employing a context analysis of website news, He and Tian (2008) have revealed that firms in China use six types of formal political strategies, including visitation, philanthropy, participation, publicity, party involvement and political propaganda to manage their government resource dependence (He and Tian 2008). They also have suggested that ownership structure influenced the use of specific political strategies, and private firms adopt participation and visitation strategies more often.

Based on both its value perspective (whether to maintain or create value) and its strategic orientation and capability (whether to influence to comply), a firm often engages

in multiple sequences of decisions when formulating political strategy and activities (Hillman and Hitt 1999; Oliver and Holzinger 2008). Therefore, the political strategy could be reactive, anticipatory, defensive, or proactive (Oliver and Holzinger 2008). Further, recent studies posit that in addition to traditional political actions, firms may also seek to change the effects of policy through market actions (Funk and Hirschman 2015). Political (i.e. nonmarket) actions are understood then as the 'coordinated actions firms undertake in public policy arenas'; by contrast, market activities capture the firm's actions unfolding within the organisation and its economic spheres, concerning operations and market transactions.

The research suggesting a close link between corporate political and market activities is in line with the integrated strategy literature. An integrated strategy suggests that a firm's business strategy must be congruent with its capabilities and the characteristics of its environment—in terms of both the market component and the nonmarket component. The integrated strategy literature further proposes that a genuine integration of market and nonmarket strategies in the organisation's management structure and processes is expected to enhance overall firm performance (Baron 1995; Jia and Mayer 2015). Next, I show how Geely has adopted an integrated strategy and achieved substantial growth since its establishment.

7.3 Research context and empirical data

7.3.1 Research methodology

For multiple reasons, this study chooses an in-depth, longitudinal case study to investigate the growth of one Chinese indigenous automobile company, especially focusing on the nature and patterns of political activities and the interactions between political and market/technological activities. First, the phenomenon under study is most likely to be

both context- and time-dependent. Specifically, I speculate that how firms engage in political activities and how such activities affect organisational performance could change over the space and time. Case study methodology is particularly appropriate because it allows a more contextual description and captures the dynamics of political activities by identifying critical events, processes, and interdependencies.

Second, while there are quite a few studies on the topic of corporate political activities, they tend to operationalise corporate political activities as political ties (with both central and local government) and/or investments. The multi-dimensional nature of political activities remains understudied. Given the exploratory nature of this study, a more qualitative orientation such as case studies could explore the variety and complexity of political activities. Potentially, the insights generated by this case study would stimulate future theoretical and empirical research.

Third, in terms of case selection, this paper's single-case research design can be justified by the fact that (1) the Geely Group (Geely thereafter) represents a critical case in testing, extending, and challenging the existing understanding (Yin, 2003: 40). Geely is known as the first privately owned passenger carmaker in China, officially registered in December 2001. There is a clear connection between its political activities and commercial success. (2) The study of Geely provides a sufficient level of details and understanding. Its high profile features extensive media coverage and academic scrutiny in both English and Chinese. It covers various ways of developing technological capability and growth, including imitation, reverse engineering, product architecture innovation, export and foreign acquisitions.

7.3.2 Data collection procedure and sources

The data collection process of this study comprises of two major stages. The first stage pertains to the fieldwork I conducted in 2013 focusing on understanding innovation in

automobile assembly firms in China. The aim was to investigate how the internal (e.g. organisational structure and culture) and external factors (e.g. external partners, universities, and government support) relate to the development of Chinese automakers. To provide a broader understanding beyond a single firm perspective, I got in contact with multiple informants in five cities (i.e. Chongqing, Hong Kong, Shenzhen, Guangzhou, Shanghai), ranging from automobile managers, R&D personnel, and consultants to business school professors in related areas. Semi-structured interviews were conducted in Mandarin Chinese in person or over the phone. During almost all conversations, government support and the firm's political position emerge as an upmost concern mentioned. This leads to the question of how firms manage political activities and resources, and the relationship between firms' political and market-based activities, especially the innovation capability.

The second stage of research relies mostly on secondary and archival data. This is because firms are reluctant to share information about their connections to political actors (Jia 2015a; Xin and Pearce 1996). Also, there is the concern that retrospective interview data might involve faulty memory and retrospective sense making on the part of the informants. Instead, I refer to the Geely Group official website and its founder's personal website, which systematically list the milestones of corporate development, high-profile political events, political engagement and etc. These event lists serve as a starting point of data collection and organisation. Information was further enriched and cross-validated by business news, research articles, autobiographies, and books on Geely (in both English and Chinese). I also collected the company annual reports from 2005 to 2014 and the social responsibility reports for the year of 2012 and 2013. In addition, most of the archival data referred to is obtained from the China Automotive Industry Yearbooks (CAIY) from 1998 onwards. Further qualitative and quantitative evidence is available on

the website of China Automotive Information Net. This website has been created by the China Automotive Technology and Research Centre (CATRC), who also publish CAIY.

7.4 The case of Geely

The Geely group is China's first privately owned car manufacturer and now one of the major players in China's passenger car manufacturing industry. In 2014, Geely has won the 34th place in the top-500 manufacturing corporation in China, a list composed by China Enterprise Confederation/China Enterprise Directors Association that is dominated by large SOEs such as China Petrochemical Corporation, SAIC Motor, FAW Automotive, Dongfeng Motor, and China Minmetals Corporation.[3] Geely has also sought a global presence through exporting and acquiring overseas assets-now the owner of Volvo and the London Taxi Company. Geely has won the first place in the top-100 Chinese international company list in 2014 in terms of oversea index.[4] Behind the successful story of Geely, its founder and CEO, Mr Li Shufu, has been constantly mentioned. Li's in-depth understanding of Chinese markets has guided him in his constant exploration of new products and industries. He is also described as one of China's most prominent industrialists, who has actively engaged in China's politics (Sharman 2015). The development of Geely is briefly classified into three distinct stages, namely before officially entering the auto sector (1984-2000), initial development (2001-2006), and organisational re-orientation (2007-now) (see Table 7-I). The three stages of Geely are identified based on its distinct business strategies and technological development. The first stage pertains to its development prior to obtaining the official licence of vehicle production. The second stage highlights Geely's substantial growth via adopting a low-cost, low-price business strategy and imitation. The third stage focuses more on

[3] See http://cec-ceda.org.cn/

[4] Oversea index = oversea revenue/total revenue + oversea asset/total asset + oversea employee/total employee.

promoting product performance and innovation, during which the company has extensively engaged in acquiring foreign technology and brands. The chronology of Geely in this paper is also in line with previous studies on the Chinese automobile industry and Geely (Balcet, Wang, and Richet 2012; Wang 2008).

Table 7-I Descriptive information on Geely

	Year	Total assets (Million RMB)	Total Employees	Production (unit)	Sales (unit)	Market Share	Export (unit)	Government subsidy (RMB 000)
3rd Stage	2014	37,280	18,481	429,145	417,851	2.18%	59,721	898,196
	2013	33,599	18,138	548,842	549,468	3.03%	118,871	800,048
	2012	31,380	18,512	494,648	483,483	3.19%	101,908	870,119
	2011	27,597	17,288	435,476	421,611	3.01%	39,600	877,437
	2010	23,974	17,102	416,776	415,843	3.00%	20,555	660,626
	2009	18,802	12,282	330,275	326,710	3.18%	19,350	216,080
	2008	10,151	9,945	220,955	204,205	3.28%	37,940	203,119
	2007	2,920	8,813	216,774	181,517	3.40%	21,079	--
2nd Stage	2006	1844	9,498	206,958	164,041	3.95%	10,000	--
	2005	811	7,714	148,182	133,041	3.77%	7,000	--
	2004	641	6,941	91,744	96,693	3.96%	5,000	--
	2003	568	2,864	77,852	76,274	3.86%	--	--
	2002	22	--	43,475	47,800	3.95%	--	--
	2001	--	--	21,171	21,000	3.01%	--	--
1st Stage	2000			8,000	8,000	1.32%		--
	1999			2,000	2,000	0.35%		--
	1998			200	200	--		--

7.4.1 Prophase (1990-2000)

Before entering the automobile industry, Geely was a progressively diversified enterprise, major businesses involving the manufacturing of refrigerator components (1984), materials for decoration (1989), and motorcycles (1994) (Jiang et al. 2011).

In the late 1970s, China initiated the economic reform and open-up. A huge domestic demand for electronic apparatus attracted Mr Li to set up a refrigerator-evaporator manufacturing factory in his hometown, *Taizhou* city, Zhejiang Province. It was later expanded into refrigerator manufacturing. However, the overheated competition

with over 400 independent manufacturers provoked government intervention in 1989. Li's company was obliged to shut down. Afterwards, Li started the business of manufacturing decoration materials. The factory was again located in *Taizhou*. It turned out to be a huge success and has been profitable till today. In the early 1990s, the motorcycle industry was booming in China. But Li faced the similar regulation problem as in the previous refrigerator experience–the production licence was reserved for state-owned enterprises. Li bailed out a state-owned motorcycle factory in *Hangzhou* City, Zhejiang Province in 1993. Geely later became one of the leading motorcycle manufacturers in China.

In the second year (1994) since his motorcycle business, Li acquired a large piece of land from *Taizhou* government to build up 'Haoqing' auto industrial park, as he believed auto-making to be much more profitable and technologically feasible. One of his famous remarks was 'making cars is not as mysterious as people think. A car is merely four wheels, a steering wheel and an engine.' However, the industrial policy and regulation barriers were extremely significant. The auto industry was added as a pillar industry in 1986, but it has been rather fragmented with over 110 existing carmakers backed by central and local governments (Huang 2002). To consolidate the industry, the central government adopted a strategy of 'three majors and three minors' in 1988[5]. It also imposed severe approval procedures for new projects and even for each type of vehicles proposed by existing carmakers. The long-term goal of the central government was to upgrade the domestic industry and enhance its international competitiveness. At that time, the central government emphasised foreign technology transfer instead of indigenous development as a way to achieve these goals. Therefore, several joint ventures were

[5] First Auto Works (FAW), Second Auto Works (SAW), and Shanghai Auto Industry Corporation (SAIC) as the three majors, and Beijing, Tianjin and Guangzhou Auto as the three minors.

established during this period[6], whereas local entries were prohibited. However, the complexity of the situation and frustration did not stop Li's entrepreneurial ambitious. To overcome institutional barriers, Geely strategically engaged in both market and nonmarket (i.e. political) activities. The concurrent use of various tactics gave rise to the first privately owned passenger carmaker in China, which was not officially registered until December 2001.

i) Market activities

1.1) Partner with SOE

In order to obtain a government licence, Geely set up a joint venture (JV) with an ailing state-owned minivan plant in *Deyang* County, Sichuan Province in 1997. It later fully acquired the JV and moved the manufacturing base back to Zhejiang Province. Clearly, establishing JV and acquisition are both typical market-based actions, yet for Geely, they were initiated in order to overcome the initial institutional barriers.

1.2) Develop innovation capability

During this period, each new vehicle model had to be approved separately by the government before going on market sales. Thus, Geely still could not produce its own vehicle model except for the inherited ones. Nevertheless, it secretly developed its first vehicle model in 1998 without an official licence. Geely's first car model, Haoqing, was based on extensive reverse engineering and imitation from FAW (First Auto Works)'s model Xiali, with was a high level of similarity between the two. Around 70% of Haoqing's components were interchangeable with those of Xiali - 60% directly purchased from FAW Xiali's component suppliers (Balcet et al. 2012)(Wang 2008). By so doing, Geely also demonstrated its determination to enter this industry; and more importantly, its

[6] Early JVs include American Motor Corporation (AMC)-Beijing Automotive Works (BAW) in 1984, SAIC-Volkswagen (VW) in 1985, Guangzhou-Peugeot in 1985; Tianjin Auto Works purchased Daihatsu's Charade technology in 1986, FAW–VW in 1991.

ability to produce vehicles without foreign investment or technology aid. Determination and demonstrated innovation (or technological imitation and learning) capability later helped Geely to win support from a few crucial government officials.

ii) Political activities: initiating and developing business-government ties

Given a lack of legitimacy, developing business-government relationship was utterly important yet difficult for Geely. The local government is often directly involved with daily business operations, as it relies on local enterprises for tax revenue and local employment. Easy access and frequent interactions with local government officials provide a critical starting point to build wider public-private networks, as well as bridges central government (Salmi and Heikkilä 2015).

Since his refrigerator business, Mr Li had developed and maintained a good personal relationship with the local government officials in his hometown (i.e. *Taizhou*). For instance, Mr Li got to know Mr Xu Gang, the then director of fiscal revenue in *Huangyan* County, Taizhou City. In 2002, Mr Xu was hired as the CEO of Geely when he was then the provincial tax officer. Another important local contact is Mr Huang Xingguo, who first met Li when he was the then Secretary of the CPC in *Taizhou*. When Mr Huang became the Secretary of the CPC Ningbo Municipal Committee, he assisted Geely to acquire land and build a larger production plant in Ningbo. Compared with Taizhou, Ningbo is closer to larger cities (e.g. Shanghai and Hangzhou) and has a larger pool of talents. When Mr Huang moved to Tianjin, Geely was also considering a potential cooperation with Tianjin Auto.

In early years, it was extremely difficult for Geely to gain access to higher-level government officials. Among numerous attempts, Ms Ye Rongbao (叶荣宝), former vice governor of Zhejiang Province, was the only government official at the provincial level that showed up at Haoqing's roll-off ceremony in 1998. Ms Ye saw a potential in Geely's

future and provided a strong support in helping Geely to gain official recognition and to connect with the central government. In 1999, the successful development of its first car model provided Geely with the chance to meet Mr Zeng Peiyan, the former Minister in charge of the State Development Planning Commission. While operating in a legally grey area, the encouragement from Mr Zeng greatly strengthened Li's confidence and determination. In 2006, Zeng, former Vice-Premier of the State Council of China, again met Li[7]. Now Mr Zeng is the Chairman of China Centre for International Economic Exchanges (CCIEE), a national think tank with the mission of promoting international economic research and exchanges and providing consulting service[8]. It holds the Annual Meeting of China's Economy, which Mr Li has enthusiastically taken part in.

7.4.2 Early development (2001-2006)

At the time when Geely entered the auto industry, the market was dominated by joint ventures and SOEs, who received preferable treatment by the central government. Yet a rising middle class created an increasing demand for private cars at more affordable prices. Against this backdrop, Geely entered the industry with the slogan of 'Making *affordable* and *nice* cars for ordinary Chinese'. It focused on the low-end market (Wang 2008; Zhilong et al. 2010), which allowed it to attract price-sensitive customers. In terms of price, Geely's Haoqing was sold at 37,999 Yuan (US$4,588), whereas its direct competitor Xiali was priced at 40,000 Yuan (US$4,830) and foreign brands of the same category sold at 100,000 Yuan (US$12,075). This strategy effectively spurred sales and increased its market share.

In addition to the market-based actions, Geely has developed its political resources and become more skilled at navigating China's political waters. During this

[7] See http://www.shufuli.com/media_info.php?158
[8] See http://english.cciee.org.cn/index.aspx

period, Geely took advantage of the policy relaxation and grew steadily in terms of production and market share. Various political tactics helped during this process. It also has invested intensively in R&D, focusing on core vehicle components (e.g. engine). Achievement in the market and technological space not only brought market benefits (lower production costs), but also gain official recognition and support from both local and central governments. On one hand, Geely, once the transgressor of the central industrial policy, set an example of autonomous development. In 2004, the government policy formally emphasised indigenous technology development and nurture national brands. In 2005, Ministry of Science and Technology held seminar on the development of Chinese auto industry in Beijing discussing the successful story of Geely[9]. In turn, wider governmental recognition further facilitates the conduct of Geely political activities in both depth and width.

i) Market activities

1.1) Expand and upgrade its manufacturing capability

While the central government still held tight to its most important policy tool, the power to grant entry (approval was still required to establish a new enterprise), it had relaxed the control over new projects planned by existing enterprises. Geely has conducted continuous expansion and upgrading of its existing production plants to further reduce costs and achieve the economy of scales. In addition, legitimacy power and government relationship management skills made it possible for Geely to negotiate with local governments of less developed provinces in China, such as Lanzhou and Chengdu, to gain more investment incentives offered by the respective local governments. Locating new production facilities in less developed provinces in China enjoys the benefit of

[9] Development Research Centre of the State Council, Ministry of Science and Technology, NDRC, China Association of Automobile Manufacturers, endorse the indigenous development and export-orientation of Geely http://auto.sina.com.cn/news/2005-11-10/1459149757.shtml to praise the virtues of indigenous development.

proximity to new demand, lower costs and access to additional financial and other resources; it also enables the building of wider political networks with government officials in those provinces.



Figure 7-1 The production plants of Geely in Mainland China in 2014

1.2) Develop innovation capability – R&D on core components

Geely initially developed its innovation capability through imitation and reverse engineering. In order to manage the dependence on powerful component suppliers, Geely invested heavily on the design of the core vehicle components, including engine, gearbox, and electronic and electric components. Specialised research centres and manufacturing plants were established. In 2006, Geely's R&D effort and achievements gained official recognition. Its JL-ZA series of automatic gearboxes was awarded the sole first price in

Technology Advancement in the auto industry by the Ministry of Science and Technology. In the same year, three products, including its electric power steering, JL4G18 1.8L engine and the JL automatic gearboxes, were invited to participate in the first 'China National Exhibition of Major Achievements in Technology Innovation' jointly hosted by Ministry of Science and Technology and Ministry of Finance.

1.3) Export

The Chinese government strongly encourage local enterprises to invest abroad and conduct international expansion by offering preferential access to capital, tax concessions, and other incentives (Lu, Liu, and Wang 2011). Exporting, as opposed to other modes of foreign market entry, is the quickest and easiest way for firms to penetrate foreign markets and engage in internationalisation. It requires fewer organisational resources and lower commitment, provides greater flexibility for managerial actions, and involves lower business risks than other modes of entry such as licencing and equity investment (Gao et al. 2010). Geely included exporting as an integral part of their business strategy since 2003. It was the first Chinese auto manufacturer to establish 24-hour after sale service information and call centre. Exporting requires Geely to meet more stringent safety, fuel-efficiency and emission requirements of foreign countries, thereby facilitating its technology upgrading. It also helps to gain knowledge from international markets, and in turn improves Geely's productivity and performance. In fact, to promote export, Geely has focused on improving product quality by obtaining product certifications in the United States and Middle East, participation in major international car shows, and looked for CKD manufacturing and product development outside China.

ii) Political activities:

2.1) Appointing former government officials.

As mentioned earlier, Mr Xu Gang, a former provincial tax officer, was appointed as the managing direct of Geely from 2002 to 2007. Mr Xu was equipped with in-depth knowledge regarding the public policy environment; served as channels of communication to existing government officials, bureaucrats, and other political decision makers; exert influence over political decisions; and legitimacy (Lester et al. 2008).

2.2) Participation in public policy making.

In 2003, Mr Li was appointed as a deputy of the tenth session of Chinese People's Political Consultative Conference (CPPCC). CPPCC is one of the two most important political councils in China and the key means for business leaders to participate in the government. Each council meets once a year and serves as a forum for mediating policy differences between the Chinese Communist Party and various parts of Chinese society (Jia 2015b; Li and Liang 2015). Serving as a deputy in political councils allows Geely to directly involve in political decision-making, it also significantly increases its political connections with politicians and bureaucrats (Jia 2015b). During the period of 2003-2008, Li publicly proposed issues on promoting economic and compact vehicles (2004), protection of indigenous Chinese automobile brand (2005), encouraging market competition (2006), and supporting the development of innovation capability in indigenous Chinese firms (2006).

2.3) Publicity

Geely was warmly welcomed by local governments, given that automobile manufacturing contributes to local economic development through providing a large number of local employment and tax revenue. As a consequence, it was much easier for Geely to invite local government officials to attend different types of ceremonies. For instance, in 2004, Geely held the 18th anniversary in Linhai, during which all major local

government officials were present[10]. It also exhibited several newly developed vehicles and serve as a powerful marketing channels. In early 2007, the rollout ceremonies of Geely Lanzhou products also had the full range of provincial government officials. Publicity on one hand signifies the legitimacy of Geely, on the other hand, serves as important marketing channels.

7.4.3 Organisational re-orientation (2007-now)

While Geely has accumulated abundant experience, resources and skills in dealing with the government[11], it faced increasing challenges in the marketplace. First, market competition greatly intensified. This was partially due to the fact that the central state came to be less stringent in granting entry permits to local firms. For example, BYD, which is China's largest cell phone battery producer, was allowed to buy out a small auto SOE in 2003 and entered car production. Local new entries tend to adopt a low-price strategy to capture market share, resulting in enormous price pressures. Geely also face challenge resulting from the rising costs of raw materials and components. Second, macro-economic issues (2008 financial crisis and weakening of emerging market currencies against United States Dollar) and the political instability in some of its major export markets negatively impacted its export sales.

In 2007, Geely has embarked on a major strategic re-orientation, focusing on improving product quality, brand image, customer satisfaction, and technological leadership. This was done through a multi-branding strategy as well as international collaboration and acquisition of foreign asset. At the same time, Geely continues to be active in the political arena, such as the establishment of communist party organisation

[10] http://auto.163.com/04/1109/09/14O3N6BK000816HJ.html

[11] In the year of 2014, government grants and subsidies received up from RMB 0.2 to 0.9 billion in 2008. The government grants and subsidies mainly related to cash subsidies (excluding any asset related subsidies) in respect of operating and research and development activities from the governments.

within the corporation and issuing corporate political responsibility (CSR) report. In return, political engagement assisted many of the ambitious international acquisition. For instance, Geely's bid for Volvo was publicly endorsed by the central government in Beijing. And heightened international appearance enables more interactions with higher-level government officials within and outside China, granting Geely greater political bargaining power.

i) Market activities

1.1) Expansion into higher-end vehicles and building of brand image

Geely aims at gradually transforming its competitive advantages from price competitive to technology and performance competent. It adopted a new corporate slogan, 'Make good cars that are safest, most environmental-friendly and most efficient. Let Geely cars go around the whole world.' Early and low-end models such as Haoqing, Merri and Ulion were ceased production during the year of 2008. To further strengthen brand image, in 2009, Geely also implemented a multi-brand strategy targeting at different types of customers (see Table 7-II). The three independent brands, namely GLEagle, Emgrand and Englon, are all equipped with their own management teams, production facilities and distribution network. In 2013, Emgrand brand also surpassed GLEagle to become the most important brand in terms of sales volume and accounted for 37% of the Group's total sales volume in 2013. The average pre-tax ex-factory prices of Geely have been rising steadily in recent years (see Figure 7-3), all data source come from Geely's annual report from multiple years).

Table 7-II A multi-brand strategy of Geely

Brand	Model/Series	Key attributes	No. of Shops		
			2010	2011	2012
GlEagle	Free Cruiser	Entry level, signifying	363	336	324

(i.e. Global Eagle)	Geely Panda Vision GX2 GC7 GX7 (SUV) GX9	attributes like 'Style', 'Passion', and 'Dream'.			
Englon (i.e. Shanghai England)	Kingkong SC7 SC5-RV TX4 (Taxi)	Middle level, characterised features like 'Classic', 'British', and 'Noble'.	463	395	360
Emgrand	EC7 EC7-RV EC8	Launched in 2009, symbolises the concepts of 'Luxury', 'Solid', and 'Power'.	212	245	297

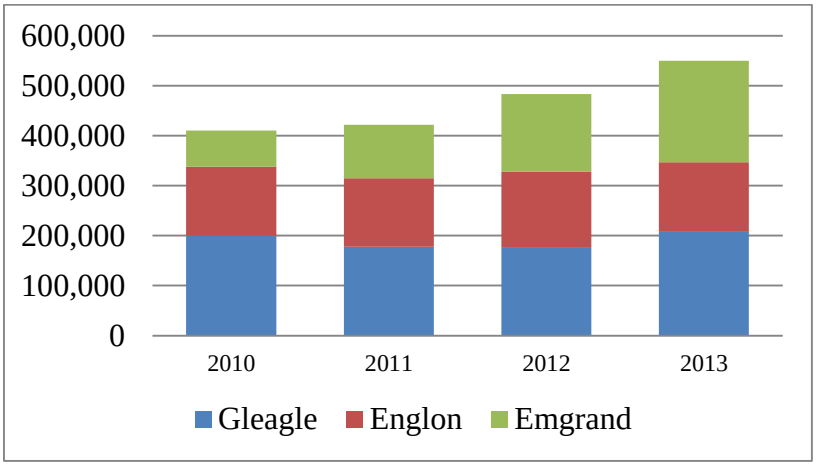


Figure 7-2 Annual sales volume by brand

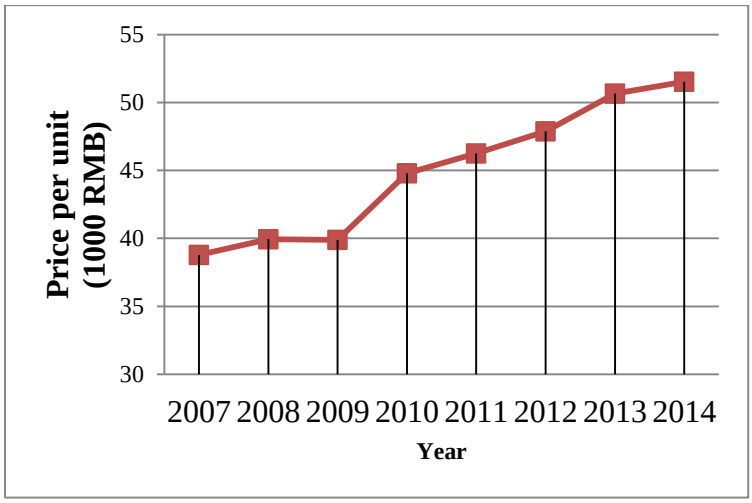


Figure 7-3 Average pre-tax ex-factory prices per unit

1.2) International collaboration and foreign acquisition

Although Geely has initiated several international collaborations on manufacturing and technological development, including a Memorandum of with the Hong Kong Productivity Council in 2005 and the joint venture with Manganese Bronze Holdings Plc in 2006, the front of international collaboration gets greatly advanced by a series of acquisition. The list includes acquisition of leading Australian transmission producer DSI in 2009,Volvo Car Corporation (Volvo) in 2010, the principal assets of Manganese Bronze Holdings PLC in 2013, the UK electric-car start-up Emerald Automotive in 2014.

Geely has now established an independent research and development centre (CEVT, China-Euro Vehicle Technology AB) located in Lindholmen Science Park in Gothenburg, Sweden. Officially opened in September 2013, CEVT is currently staffed by 300 resident engineers and about 600 consultants. Its first task is to develop a new modular architecture and set of components for future C-segment cars, addressing the needs of both Volvo Car and the Group. The modular strategy will deliver on the premium aspects that Volvo Car requires as well as the Group's demands in order to compete in the automotive market. The modular architecture and set of components will not only deliver world-class product technologies and attributes, but also considerable cost saving in terms of development, testing and sourcing, leading to the realisation of significant economies of scale.

ii) Political activities

2.1) Participation in public policy-making and publicity

Geely continues the active participation in public policy making through attending political council meetings and various other government-organised activities. Since 2007, Geely has publicly proposed more than 20 proposals during the political councils, covering a variety of issues including technology standardisation, public traffic building,

education system, tax system reform, personal and corporate tax and sustainable development.

In terms of publicity, the number and level of government officials have both substantially increased. It is clear that the acquisition of strategic foreign assets helps Geely to connect with higher-level officials from both home and abroad. Notably, China highest officials are especially likely to visit Geely overseas sites during their state visit. For instance, President Mr Xi Jinping visited the Geely in Belgium in 2014, CPPCC[12] chairman Mr Yu Zhengsheng and the former Prime Minister Mr Wen Jiabao visited Geely in Sweden in 2013 and 2012, respectively.

2.2) Corporate Social Responsibility (CSR)

The Chinese government is sending signals through many channels that CSR is an appropriate and desired activity. Hence, CSR-related activities are considered as a political strategy in China, as it reflects that firms respond to government signals (Marquis and Qian 2014). Geely has engaged in many CSR-related activities since its establishment, including philanthropy and investment in education. However, prominent market position creates higher pressure for Geely to be more engaged in dealing with issues in the society. The size of the firm also offers greater financial resources available to conduct CSR in a more systemic way.

In 2008, Geely, together with its employees, suppliers, and marketing agents, donated RMB 10 million to support relief efforts following the Sichuan Wenchuan earthquake. Geely also launched the 'Geely Future Talent Fund' and the 'Li Shufu Education Fund' with donations totalling at RMB 12.5 million. In 2012, Geely for the first time officially released to the public its Corporate Social Responsibility (CSR) report. The report discloses an array of corporate CSR practices and activities, in relation to its

[12] Chinese People's Political Consultative Conference

customers, employees, as well as the wider environment, economy and society. It embodies Geely's actions and efforts to promote social welfare, environment protection and sustainable development, as well as being a credible corporate citizen.

2.3) Communist Party Organisation

The China Communist Party (CCP) has played a central role of in its political system since the establishment of the People's Republic of China in 1949. The CCP also has a direct role in the business sector. For the SOEs in China, explicit regulations assign the broad power to the Party. More importantly, CCP typically appoints the leadership of SOEs, as they are then moved either vertically to government positions (or vice versa) or horizontally to other SOE positions (Shi et al. 2014). In contrast, the party has a lower intervening role in the private sector. While the Charter of the CCP requires a Party organisation where there are more than three Communist Party members, none of the laws makes any explicit references to the Party and does not mandate the establishment of Party organisations within private firms (Huang 2003). Yet it is not uncommon for private organisations to establish a Communist Party Organisation out of normative pressures, and/or for deliberate and strategic purposes (Feng and Wang 2010).

Geely formally established its Communist Party Committee in late 2006[13]. Currently, its party organisation has a three-level structure, with over 1200 party members (comprising over 5% of total employees). It has been awarded the exemplary party organisation at both the province (in 2011) and national level (in 2012). The growing size of the firm certainly attracts the attention and pressure from the government, it is clear that Geely has taken an active part in organising party-related activities and demonstrating its compliance to the CCP.

[13] The Communist Party Organisation was first established in as early as 2000, but was more symbolic in nature.

7.5 Discussion

7.5.1 The merit of an integrated strategy

Despite years of reforms, China's formal institutions are still weak and underdeveloped. The legal system is ambiguous and riddled with loopholes, which continues to bestow upon government officials great liberty in interpreting and arbitrating policies and regulations. Furthermore, while China has unified laws nationwide, legal enforcement varies widely across regions because of local government intervention and the varying interpretations of laws by different enforcement authorities (Zhou and Poppo 2010). As a result, firms need substantial investment into corporate political activities in order to obtain support from both local and central governments. Nevertheless, departing from the conventional view that clearly divided between corporate political and market activities, the case of Geely has demonstrated the two could be closely intertwined and mutually reinforcing, contributing to the firm's growth and success.

On one hand, demonstrated market capability could help draw the attention from the government and gain institutional legitimacy. Growing market shares and local employment enhances the firm's economic, political, and social significance, which facilitate the interactions between the firm and the government, as well as its political bargaining power during these interactions. On the other hand, a wider business-government network provides the firm with greater resources in the forms of information, capital, and administrative privileges. These resources are essential for firms' market actions, such as innovation, production expansion, and foreign acquisition. In other words, a reinforcing logic is at play, leading to a spiral of self-fulfilling mechanisms between the effectiveness of firms' market- and nonmarket-activities. As such, in emerging markets characterised by arbitrary government intervention and an underdevelopment institution,

adopting an integrated strategy that combines both market- and nonmarket-activities would enhance the firm's survival and success.

Take the firm's innovation capability as an example. Developing the firm's innovation capability is clearly one of the most important market-based activities, as innovation involves detecting market opportunities, improving production processes and product features, establishing market channels, and introducing new products to the market. However, developing innovation capability requires the on-going provision of various resources both internal and external to the firm. Among all, government support is essential in granting permission and government controlled resources. As such, corporate political activities would impact the development of innovation capability. Yet on the flip side, obtaining the hard-to-imitate innovation capability could, in turn, narrow its power disadvantage and assist the firm to negotiate with the government for greater resources. In other words, the reverse effect of innovation capability on its political influence is also at play. Therefore, to develop innovation capability, firms could benefit from taking an integrated strategy that combines market- and nonmarket-based activities.

***Proposition 1**: The firm's market and nonmarket-activities can reinforce each other in enhancing its political influence.*

7.5.2 Corporate political activities

The case of Geely has also clearly demonstrated that there are diverse forms of corporate political activities in Chinese automobile assembly firms. These activities include hiring prior government officials, inviting government officials to visit the firm and attend various ceremonies, engaging in corporate philanthropy, establishing communist party groups within the firm, supporting government-organised trade shows, direct participation in government policymaking, and many others. Overall, corporate political activities can

be conceived as the various actions that firms take to protect their value and obtain institutional-related advantage.

i) Connecting

Given the power of the Chinese government at all levels and a permeated relationship-based culture (i.e. guanxi), many corporate political activities concerns building connections with *specific* government officials to win their support. The significance of business-government relationship building and management in Chinese corporate political activities resonates with the existing literature on firms' political ties (Sheng et al. 2011). Moreover, this study has suggested the significant role of corporate core members (i.e. Mr Li Shufu, the founder and CEO of Geely), as they are the 'architect' in the company-government network construction. Like most connections, company-government connections can be distinguished between preordained (e.g. family and kinship) and voluntary (self-constructed). In many cases, voluntary network building is vital as it enables a substantial expansion of the original network. Yet constructing voluntary network requires an entrepreneurial and creative component. This is because 1) private companies are often at a power disadvantage in the business-government relationship, with the government official yielding enormous authority over the manager. It is especially true when the levels of government officials get higher. 2) The business-government relationship is generally sensitive and opaque, as connections between firms and political authorities do not involve formal agreements and judicial enforcement and the risks to firms are high.

Therefore, the objectives and targets of firms' political connecting activities are likely to evolve over their development stages. In early stages, private automakers like Geely have no natural connections with the government and do not enjoy the institutional legitimacy. Lacking legitimacy and government support makes them subject to the

potential risk of unfair treatment and state expropriation. As a result, firms often mobilise personal contacts in order to build the business-government relationship and protect their value. During the initial stage, successful connecting with the local government is likely to play a key role in assisting the firm's future development. This is because the initiating of business-government relationship requires familiarisation and self-disclosure, which is largely bound by geographic distance. Also, the Chinese local officials are mostly being held politically accountable for the success of businesses and economic development in their jurisdiction, which means that there is a potential mutual dependence between the local officials and the firm, contributing to a long-term reciprocal relationship (Shi et al. 2014).

Over its development stages, the firm's portfolio of political connections likely coevolves with its business executives' social capital and its accumulated capability to deal with political authorities. In this sense, as the firm grows, it is more likely to have the access to interact with higher levels of government officials (Arnoldi and Villadsen 2015). Connections with the central government may be particularly important, as they provide exclusive information about high-level public policy decision-making and the leverage on its local political connections. Over time, strengthened business-government connections not only contribute to firms' value protection and maintenance, but could also create value through the provision of privileges and institutional advantages. In addition to relinquishing the firm's institutional constraints and disadvantages compared with similar firms, the firm may make more active use of its political connections, including shaping government regulations, recognising entrepreneurial opportunities stemming from institutional changes, and taking advantage of environmental uncertainties. Therefore,

Proposition 2a*: Over their development stages, Chinese private automakers' corporate political activities objectives shift from 'value-protection' to 'value-creation'*[14]*.*

Proposition 2b*: Over their development stages, Chinese private automakers' corporate connecting activities targets shift from the local government to the central government.*

ii) Signalling

While connecting and network building are mainly targeted at specific government officials, private automakers also engage in political activities that aim at signalling their economic, social, and political significance to the local and national economy, thereby increasing government dependence on the firm more generally. For instance, firms can engage in corporate philanthropy that provides gifts or monetary contributions to social and charitable causes, often associated with education, culture, minorities, healthcare, and disaster relief. Such behaviours send signals to the government and the wider public about the firm's goodwill in contributing to the wider society and alleviate the government's burdens (Marquis and Qian 2014; Wang and Qian 2011). Many private firms also establish communist party groups within the firms and regularly organise party member discussion. The firm's party secretary becomes the chairman of the union within that private firm, with the ability to monitor and influence important decisions in private firms. Jointly these acts signal the firm's loyalty to the ruling party, accepting their monitoring and fully complying with the rules and norms of the institutional environment.

Along this line, certain market-based actions can also serve the purpose of gaining political influence. Just as nonmarket activities could have market consequences (e.g. financial performance, high-level government officials serve marketing purpose), many

[14] 'Value protection' refers to that firms attempt to protect their private assets and earnings from state expropriation. 'Value creation' suggests that firms could leverage their political strategy and connections to access regulatory information and scarce resources to create value.

market-based actions may have nonmarket consequences (Funk and Hirschman 2015). In the interactive process between the firm and the government, the firm's dependence on the government can be successfully managed when the firm has the ability to accomplish the goals of government through its market-based actions, such as local employment and innovation. Thus, the firm would have greater power in negotiating specific treatment and influencing public policies. For instance, to establish new manufacturing plants, Geely were able to negotiate with the provincial government on the favourable tax break and cheap land.

Taking a general approach to corporate political activities (e.g. signalling) may be more effective than connecting with specific government officials in several circumstances. First, connecting strategy aims at specific officials can be particularly sensitive to political changes (Siegel 2007). Although government officials could use their power to steer resources towards the firm with which they share network connects, the same firm could be the target for exclusion and discrimination when the political rivals rise to power. Second, as the institutional environment develops, government policy is less subject to government officials' personal accommodation. It follows that a relational-based, personalised governance structure is likely to gradually give ways to a rule-based, impersonal exchange regime (Peng 2003). In this sense, specific business-government connections will be less important and political activities that draw the attention of the wider society will gain greater influence. Therefore,

> ***Proposition 3a****: Signalling that increases the general government dependence on the firm will serve as a more effective way than connecting with specific government officials.*

> ***Proposition 3b****: Market-based actions that increase the general government dependence on the firm will serve as a more effective way than nonmarket-base actions.*

7.6 Conclusion

Just as firms' nonmarket activities have an impact on its market activities and performance, market activities could also affect the nonmarket activities of the firm. The case of Geely indicates that Chinese privately owned automobile assembly companies have adopted a range of market and nonmarket activities to gain legitimacy and government endorsement. Some of these activities are targeting at building the firm's business-government network, whereas others are broader and more general in nature. Specifically, some market activities (e.g. building innovation capability) can enhance the firm's economic, political, and social significance, which consequently increase the government's dependence on the firm. As such, Chinese indigenous automobile assembly firms could benefit from adopting an integrated strategy that combines both market and nonmarket activities. This integrated strategy may be more effective when the pro-market institutions gradually develop.

Chapter 8 Conclusion

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This thesis has investigated the development of innovation capability in Chinese automobile assembly companies, and the current chapter offers a general discussion of the research findings with specific advice for Chinese automobile assembly firms and policymakers, aimed at promoting firms' innovation capability. It also identifies several limitations of the study, sets out some future research directions, and finally concludes the thesis.

8.1 General discussion

8.1.1 Innovation and innovation capability in China

This thesis has explored innovation in China and the innovation capability of Chinese automobile assembly firms. Traditional innovation research tends to emphasise product

innovation and technological breakthroughs, advocating extensive R&D investments intended to foster new-to-the-world innovations that advance the world's technological frontiers. Innovation is mostly assumed to originate in developed countries, where the world's leading multinational corporations (MNCs) are located. For instance, a prevailing view is that the automobile industry can only achieve sustainability through the development of cost-effective, safe, and reliable vehicles fuelled by alternative energy, while a key hurdle to that lies in the radical improvement of battery technologies (Baker, Chon, and Keisler 2010). It is also though most likely that those technological breakthroughs will take place in advanced economies before gradually diffusing to the rest of the world.

Despite the profound significance of radical product innovation and the huge role played by global technology leaders, it is crucial to recognise the diverse forms and alternative models of innovation, such as process innovation (Damanpour and Gopalakrishnan 2001), business model innovation (Chesbrough 2007, 2010), reverse innovation[1](Von Zedtwitz et al. 2015), system innovation (Williams 2007), and many others. In particular, innovations occurring in emerging markets tend not to involve technological breakthroughs comparable those in developed countries. They do, however, involve novel combinations of existing knowledge and technologies to solve pressing local problems and allow the creative adoption of new processes and business models, which potentially could even benefit developed countries (Govindarajan and Ramamurti 2011). Thus, it is imperative to rethink innovation in China (as well as other emerging markets), including the innovation capability in both local and foreign firms, and the factors that facilitate it.

[1] 'Reverse innovation' refers to the case where an innovation is initially launched/adopted in poor (emerging) economies before 'trickling up' to rich (developed) countries. It is also often referred to as 'frugal innovation', meaning innovating with limited resources.

In this regard, it is argued in this thesis that innovation in China mainly consists of incremental improvements to products and processes, local experimentation and adaptations, and/or developing new markets and customers (Wooldridge 2010). Innovation capability in Chinese automakers is better understood as the capability of facilitating organisational learning, understanding and adaptation to the local context, as well as the novel recombination of resources, which assist the firm in overcoming institutional hurdles and in gradually moving closer to the technological frontier (Corredoira and McDermott 2014). This pragmatic view of innovation capability is supported by the analytical approaches, based on innovation surveys (i.e. **Paper** 1, 2 and 3) and a case study (i.e. **Paper 4**) employed in this thesis, which provide a better evaluation of the empirical context.

8.1.2 An examination of the drivers of innovation capability

Through the deployment of multiple theories, namely the resource-based view, organisational learning, and the institution-based view, this thesis has provided a systematic way to examine factors that facilitate the development of innovation capability in Chinese automobile assembly firms. **Paper 1** has conceptualised five important factors as organisational resources, fulfilling distinct purposes that enable the innovation process to unfold, and as a result, innovation capability to be developed. As it clearly shows, the list of resources pertains to both tangible resources (e.g. financial resources), and intangible ones (e.g. human resources, transformational leadership, collaborative culture, and government support). While valuable resources have the potential to positively affect innovation capabilities, some factors can change the effectiveness of resources. **Paper** 1, 2 and 3 have demonstrated the value of developing a nuanced understanding of how to foster innovation capability in specific contexts.

Paper 1 has offered evidence on how firm ownership may change the relationship between different resources and innovation capability. For international joint ventures (IJVs), government support and human resources are critical resources to develop their innovation capability, yet both are non-significant to SOEs and POEs. Conversely, transformational leadership and financial resources are only effective for domestic firms and not for IJVs. The foreign ownership of IJVs serves as both a facilitator and barrier in developing innovation capability. For POEs, financial resources and transformational leadership are two important determinants of their innovation capabilities. For SOEs, transformational leadership provides the incentives to break organisational inertia and prioritise innovation activities. At the same time, financial resources play a relatively minor role in SOEs in comparison to POEs. A collaborative culture is also crucial to the development of innovation capability for SOEs.

In contrast to the conventional wisdom, which holds that transformational leadership always promotes innovation and creativity, **Paper 2** has found that this leadership style can in fact hamper the effectiveness of innovation incentives, likely because of the conflict between the rules that underlie transformational leadership and innovation incentives. The former is need-based; while the latter are equity-based. Transformational leaders seek to form differentiated interpersonal relationships with their subordinates, which can cause employees to interpret the unequal treatments as favouritism rather than as being based on merit or contribution. By contrast, maintaining good teamwork and thus enhancing justice perceptions represents an effective solution. Through coherent interactions, team members obtain additional information about their efforts and rewards, then develop a less biased perception of justice. Financial incentives have often been assumed to be detrimental in interdependent work settings (Pfeffer and Langton, 1993; Yanadori and Cui, 2013), but the findings suggest that when coupled with

quality teamwork, they can facilitate the development of absorptive capacity. Taken together, the relationship context in the workplace matters, and horizontal and vertical relationships differently influence the impact of innovation incentives on absorptive capacity, one type of innovation capability.

Paper 3 has focused on the role of the depth and breadth of external knowledge in firm innovation. External knowledge's depth has an inverted-U shaped relationship with innovation performance (as an indicator of its innovation capability). In other words, too many deep knowledge linkages actually harm innovation capability, confirming the logic of over-embeddedness suggested by the literature. However, different from existing research, which has tended to find a similar inverted-U relationship, external knowledge's breadth relates positively to innovation capability for two major reasons. Firstly, due to the problem complexity resulting from the automobile as an intricate technological system, automakers act as the coordinators of multiple external players in the search for innovative solutions. Their capability to handle the breadth of the knowledge network is crucial. Secondly, knowledge hiddenness, which is caused by informational asymmetry in the Chinese context, is salient. In this circumstance, external knowledge's breadth would be especially beneficial for overcoming the issue of informational asymmetry.

8.1.3 The impact of institutions on innovation capability

This thesis further highlights the influence of institutions on firms' innovation capability (i.e. **Paper** 1, 3, and 4). Primary institutions include, for example, government policies, legal regulations and enforcement, capital market structures, cultural values, etc. (Child, Chung, and Davies 2003). I have focused on the role of the Chinese government and the relatively ineffective market-supporting institutions in the country. In China, the government is not only the constitutor of laws, regulations, and industrial policies, as well

as the ultimate arbitrator of contracts, it also controls critical and scarce resources (Duanmu 2014; Ring et al. 2005; Tsui-Auch and Möllering 2010). Despite the pro-market reforms, the power of government has not necessarily declined and market-supporting institutions are still not well developed in China. Adequate institutional arrangements support voluntary business exchanges yet are almost invisible; in contrast, 'weak' institutions fail to ensure or even undermine market functioning (Meyer et al. 2009). In the face of serious institutional deficiency, Chinese auto assembly firms are forced to deploy specific strategies in order to gain government endorsements and necessary resources.

Paper 1 has conceptualised government support that a firm receives as one type of resources contributing to the development of its innovation capability. The empirical results from the innovation survey demonstrate that government support enhances firms' innovation capability, above and beyond the influence of other important resources. In line with the resource-based view, the level of government support is heterogeneously distributed among firms in China. Such heterogeneity originates from two sources (Lazzarini 2015; Sheng, Zhou, and Li 2011). One reflects the extent to which the local government provides general support to all firms in the region. The local government provides public services to firms and the common infrastructure supporting regional economic development, including universities, research institutes, regional trade associations, and technical centres. Within China, government support varies across regions as a result of uneven economic development and institutional reforms (Chan, Makino, and Isobe 2010). The other pertains to the firm-specific political resources a given firm can obtain (Frynas, Mellahi, and Pigman 2006). Even in the same region, regulation often has asymmetric effects on competing firms. Firm-specific government support is gained through deploying political connections. Overall, a higher level of

government support implies an advantageous treatment by political decision-makers, lower levels of uncertainty and fewer operational risks, as well as greater confidence and better resources for engaging in risky innovation activities.

Taking a different perspective, **Paper 3** has emphasised the influence of institutions on information availability and subsequently, firms' search behaviour. In addition to providing public services and support, institutions also offer information about market rules and the likely behaviour of business partners. In emerging economies like China, weak institutional arrangements magnify the problem of information asymmetries. Due to deficiencies in formal institutions, individuals and firms in emerging economies are more likely to follow tacit rules and are subject to more complex informal constraints on their behaviours. So firms face higher partner-related risks and need to spend more resources searching for information. As a consequence, the breadth of knowledge linkages likely relates positively to innovation.

In addition to the abovementioned direct effects, the influence of institutions on innovation capability could be even more complex. The case of Geely (Paper 4) shows that a firm's market-based strategies may, in turn, promote the effectiveness of its non-market strategies, together enhancing its position and bargaining power with the government. As a result, market-based strategies – such as developing innovation capability – can increase the level of firm-specific government support. In other words, a reinforcing logic may be at play, leading to a spiral of self-fulfilling mechanisms connecting innovation capability and government support. In this regard, adopting an integrated strategy that combines market- and nonmarket- based strategies is especially beneficial in emerging markets like China (Baron 1995).

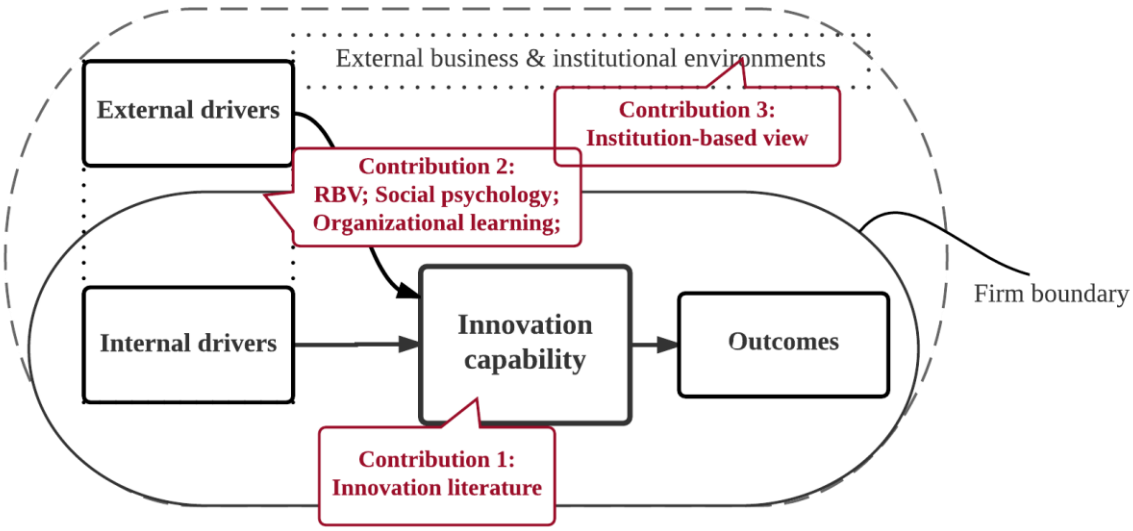


Figure 8-1 Major theoretical contributions (highlighted) of this thesis

8.1.4 Implications for Chinese automobile assembly firms

This thesis has offered advice for Chinese automobile assembly firms on how to promote their innovation capability. To begin with, managers should understand that a number of factors, both internal and external to the firm, influence the development of firms' innovation capability. The internal provision of financial resources, human capital, transformational leadership, and collaborative culture enhances innovation capability; in parallel, access to external knowledge and government support also play important roles in fostering the firm's innovation capability. Moreover, managers should be aware that developing innovation capability takes persistence and dedication. On-going access to resources is crucial so that innovation capability can be acquired over time. More importantly, rather than expecting a 'one-size-fits-all' prescription for success, managers need to tailor their innovation strategies based on a thorough understanding of the firm as well as its contextual environment.

Specifically, managers aiming at developing the firm's innovation capability need to do the following:

(1) *Exhibit transformational leadership*. Organisational leaders should devise clear strategies and articulate the vision, stimulate innovative behaviours (e.g. critical thinking and questioning), foster knowledge sharing and collaboration among employees, and help alleviate employees' fear and anxiety that may arise during their innovation endeavours. Chinese society is deeply influenced by Confucianism, which emphasises familial ties, paternalistic control, and submission to authority. An authoritarian leadership style is widely found among Chinese leaders (Zhang, Tsui, and Wang 2011). In this sense, executive education that helps managers to develop transformational leadership skills might be highly valuable for Chinese automobile assembly companies.

However, given the potential counter-effects between innovation incentives and transformational leadership, leaders need to jointly consider the design of the incentive scheme and their transformational behaviours. With high levels of innovation incentives, transformational leaders should avoid the perception of favouritism in the workplace by clarifying their decisions, establishing consistent standards, and increasing the transparency of the incentive allocation processes.

(2) *Ensure the quality of organisational human resources*. The firm's knowledge and capability ultimately reside with its individual employees. Firms need to have a 'bundle' of interrelated human resource management practices in order to recruit, develop, and retain the best talents (Macduffie 1995). For instance, firms can design formal recruitment programs to select appropriate candidates (e.g. university recruitment programmes or external recruiting agency), provide training programmes and opportunities for existing employees (e.g. on-the-job training, one-to-one training), establish performance appraisal systems to provide feedback and directions for future improvement, and offer compensation and bonuses to motivate and retain capable individuals.

(3) *Cultivate an organisational culture that facilitates collaboration*. There are a number of ways can create and sustain a collaborative culture. While formal training (e.g. in communication and social skills) and regular team-building workshops can be useful, it is also necessary to build a facilitative environment and a structure of communication that promote information exchanges within and between different units in the organisation. Open-plan offices and communal spaces can provide proximity and opportunities for casual conversation. Planned job rotation, cross-functional interfaces, and cross-training expose employees to a broader context, thus being likely to encourage further information exchanges between different functional units and create a network structure.

(4) *Engage in active collaboration with external partners and effectively govern the collaboration portfolio*. Organisational decision makers need to appreciate the value of external knowledge and the benefits of collaboration. Assimilating external knowledge requires the support and cooperation of firms' in-house R&D personnel, who need to overcome the 'Not Invented Here' syndrome. In addition, understanding the variety of knowledge sources and partner types is important. These including suppliers, users, universities and public research institutions, industrial associations, and international conferences. Furthermore, managers need to play an active role in managing external knowledge linkages, if they are to help organisations reap the benefits of open innovation. They face the challenging task of tailoring governance mechanisms (formal, contractual based vs. informal, relational-based) not only to their specific objectives, but also to the characteristics of the specific partner type and exchange relationship.

(5) *Integrate market- and nonmarket-strategies*. As the research findings suggest that the institutional environment in China affects the development of innovation capability, Chinese automakers can benefit from adopting an integrated strategy of acquiring government support in conjunction with upgrading innovation capability. Firms

must consider employing political strategies to protect against hazards, such as those associated with excessive governmental power, weak protection of private property, etc. they could also take advantage of government R&D subsidiaries and policies when planning for production expansion.

8.1.5 Implications for Chinese policy makers

This thesis has also shed some light on policy-relevant issues, thereby contributing to the contemporary innovation policymaking in the Chinese automobile industry and other similar contexts. The Chinese national and local governments, which are eager to develop the automobile industry for economic and political purposes, need to understand that the challenges that need to be surmounted by industrial latecomers seeking to develop innovation capability are formidable. Therefore, they should strive to make coherent, consistent, and long-term efforts in order to achieve that goal.

Undoubtedly, government support is vital for the development of firms' innovation capability. The government needs to provide adequate financial support for companies that wish to undertake or have already committed to innovation activities. In emerging markets, private financial agents, such as venture capitalists, business angels and financial trusts, are not well established and funding sources are extremely limited. Thus, governmental funding is crucial in stimulating investment in R&D and developing innovation capability in the Chinese automobile industry. Financial support from the state should be provided throughout the innovation stages from basic research and learning (e.g. direct research grants, equipment upgrading, and technology acquisition) to innovation and diffusion (e.g. preferential rate loans, tax credits, and public procurement).

More fundamentally, general and broad government support originates from the

gradual progress of institutional development and the strengthening of governance capability. Hence, the Chinese government should take an active role in transforming the country's national institutions toward higher levels of market development while at the same time, minimising the uncertainty and volatility associated with pro-market reforms. The government needs to make an effort to: i) improve the legal system so as to ensure better enforceability of formal contracts and general legal protection; ii) minimise government interventions with market-based resource allocation; iii) ensure a consistent, transparent, and credible policy-making process. In this way, the state assumes a more supportive role and unleashes the power of entrepreneurship and innovation in the private sector.

It is also crucial that the government promotes the quality of human resources to order to meet the developmental needs of the Chinese automobile industry. China's recent move to mass higher education has resulted in the inflation of qualifications and an increasing rate of unemployed graduates, as education investments are concentrated in a few elite universities (Bai 2006). The government needs to balance the various forms of vocational training and education, including the training in vocational and technical skills, higher education of automotive engineers and researchers, and executive education of business managers. To achieve that end, China could consider the introduction of polytechnics and institutes of technical education that are recognised in the labour market. The government may partner with private enterprises in providing professional training and education. Of course, pioneering firms, such as Geely, have already established universities and colleges with 10,000 graduates each year in subjects such as management, mechanical and electrical engineering, auto design, manufacturing, and repairs. However, in additional firms' efforts, government incentives and regulations are needed so as to guarantee the involvement of companies and, indeed, the quality of the

education on offer (Barabasch, Huang, and Lawson 2009). Moreover, the state should continue to invest in higher education and provide opportunities for its most promising students to study overseas, as well as devising incentives to lure top-tier researchers to China to work in the industry.

Similarly, facilitate knowledge exchanges and innovation collaboration in the automobile industry is vital. Policymakers can encourage the development of innovation capability through the creation of meeting places and occasions where various agents (i.e. automakers, financial institutions, research institutes, etc.) can meet and exchange ideas. They can establish geographical clusters by building specialised infrastructure, strategically planning the location of universities and specialised research centres, and providing financial and tax benefits for firms settled in the target area.

In some cases, the government can get directly involved in the initiation and operation stages of the collective innovation process. In 2008, for example, the Chinese Ministry of Science and Technology helped establish automobile innovation strategic alliances, focusing on key auto manufacturing technologies [2]. These alliances are government-coordinated innovation consortia among major Chinese automakers and non-profit organisations such as universities, national labs, and research institutions. They attempt to bring together different players and shareholders to negotiate the direction of innovation, to facilitate societal learning, and to share the responsibilities. This active involvement of the government could be effective in innovations involving sustainability goals and large-scale coordination among businesses within the ecosystem; however, it also requires the government to have strong technical and coordination capabilities. Moreover, the effectiveness of this strategy is yet to be evaluated.

[2]See http://www.sae-china.org/zhizaojianjie.aspx

8.2 Limitations and future research directions

8.2.1 Toward a multi-level innovation research

Since this research tapped into a field (i.e. innovation) that is exceptionally diverse and spans multiple levels, I have focused on the firm level and the firm's innovation capability. Subsequently, most constructs have been operationalised at the firm level, representing idiosyncratic firm-level attributes. However, beyond the basic level of analysis, some variables may have their origins in and/or impact on other levels (e.g. individual, team, or regional level). For example, a firm's government support originates from both its relationship with the government (i.e. at the firm level) and from the general support provided by the local/central government through various public services (i.e. at the regional and national level) (Sheng et al. 2011). Also, the effect of transformational leadership can be directed at both the individual and organisational levels. Transformational leaders may display different behaviours toward each follower and hence transformational leadership is an individualised perception; transformational leadership can also be directed at the whole group, resulting in a shared perception among followers (Wang and Howell 2010). Therefore, the nature of innovation entails a need for cross-level models that specify functional mechanisms between constructs at different levels and provide more in-depth understanding of cross-level effects.

8.2.2 Innovation capability: local or international standards?

With its focus on emerging markets, this thesis has chosen a broader and more pragmatic definition of firms' innovation capability. That is, the capability of organisational learning, swift adaptation to local circumstances, solving pressing local problems, and, in many cases, making incremental changes to existing technologies and products. In this sense, developing innovation capability itself serves as the process of successful

upgrading and catching-up for emerging market firms. This conceptualisation is supported by the idea that innovation exists in the eye of the beholder, i.e. innovation must be something new to the 'relevant unit of adoption'. It also fits the existing empirical context that currently Chinese auto assembly firms mainly serve the vast domestic market, with relatively few vehicle exports [3].

However, stimulated by the Chinese government's decision to 'go global', Chinese automobile assembly firms have been becoming increasingly internationalised in recent years. The internationalisation of Chinese firms involves both low commitment and less risky activities, such as exports, and greater commitments and investments ones, including foreign acquisitions and greenfield projects [4]. Adding an international dimension has potentially significant implications for developing firms' innovation capability. Internationalisation not only brings easy access to foreign technology and knowhow that contributes to innovation capability in the local context but also engenders a higher requirement for innovation capability so as to generate new-to-the-world knowledge and technologies. Hence, it remains an open question whether and how emerging market firms can acquire a level of innovation capability that meets international standards and is competitive in the global auto industry. Exploring the differences in innovation capabilities with respect to local and international standards would greatly extend the current research.

8.2.3 Unravelling the ownership structure of Chinese firms

Following previous research, this thesis has distinguished Chinese auto assembly firms into three categories: state-owned, privately-owned, and IJVs (Ralston et al. 2006). While the findings of this research suggest their differences are significant, it should be noted

[3] The share of passenger car exports counted for less than 3% of the total production in 2014.
[4] Foreign direct investment projects that involve starting a new venture in a foreign country by constructing new operational facilities from the ground up.

that the ownership structures of Chinese firms are rather complex and deserve future research attention (Cuervo-Cazurra et al. 2014).

First, due to the pro-market reforms, many SOEs are partially privatised and have varied levels of state ownership (e.g. fully owned, majority-owned, and minority-owned). The level of state ownership determines the level of government control over an SOE. When the government is the dominant stakeholder, it has the voting rights to significantly influence firm strategy and daily operations, including corporate innovation activities. When the state is the minority shareholder, its ability to interfere is reduced as other controlling owners have the upper hand (Inoue, Lazzarini, and Musacchio 2013). In support, Xu and Zhang (2008) found that Chinese high-tech companies with greater state shares prefer a process innovation strategy over a product innovation one, and are more likely to conduct innovation independently rather than collaborate with others.

Second, because of the multi-layered governments in China – with a powerful central government as well as autonomous provincial and local authorities – it may be worth differentiating among SOEs, drawing a distinction between the ones directly affiliated with the central government and those more subject to the influence of their local government (Arnoldi and Villadsen 2015). Governments at different levels can fundamentally differ in terms of their institutional logics [5] and patterns of resource allocation. It is likely that local SOEs acquire greater managerial autonomy and market orientation, which allow for a stronger commercial logic to pursue development goals set by local governments. Contrastingly, central SOEs have experienced increased consolidation, converting them into national policy instruments for sustaining macro-level growth and implementing national industrial policies (Li, Cui, and Lu 2014).

[5] Institutional logics are overarching sets of principles that prescribe "how to interpret organisational reality, what constitutes appropriate behaviour, and how to succeed"(Greenwood et al. 2011).

Moreover, business groups – defined as "sets of legally independent firms bound together in persistent formal and/or informal ways [6]" – are a prominent form in the Chinese automobile industry (Zhao, Anand, and Mitchell 2005). Business group affiliation embeds the firm in a unique governing and social environment. It can ease resource constraints by providing the firm with access to other group members' resources (Kim, Hoskisson, and Wan 2004). Ties between member firms through personnel transfers and social relations serve as a conduit for information flow and knowledge sharing. Business groups further resolve incentive, information, and control problems associated with agency conflicts, thereby serving as effective corporate governance and monitoring mechanisms. As such, it is interesting to look into how its business group affiliation may affect a firm's development of innovation capability. Shifting from the perspective of the firm to the group, research into the existence and functioning of collective innovation capability may also be worth pursuing.

8.2.4 Beyond existing external knowledge linkages

To develop innovation capability and performance, this thesis has underscored the value of external knowledge, the firm's ability to search, assimilate, and employ external knowledge (i.e. absorptive capacity), and the firm's configuration of external knowledge linkages (in terms of both breadth and depth). With a rapidly evolving automobile industry and many new players coming into play, the scope of external knowledge may be further expanded beyond traditional knowledge sources, such as suppliers, buyers, competitors, universities and public research institutes, strategic alliances (e.g. IJVs' foreign partners), and industrial associations and platforms.

[6] Examples include complex legal, administrative, financial, and transactional ties.

With the development of electric and hybrid vehicles, automakers may need to interact closely with vehicle battery manufacturers, utility companies, and infrastructure builders. Other emerging concepts, such as intelligent transport systems, the internet of vehicles [7], and autonomous driving, require that automakers expand their existing knowledge base to include advanced information and communication technologies, remote sensing and diagnostics techniques, network visualisation, cloud computing, and artificial intelligence. The industrial shift toward automation and self-driving vehicles could pit car manufacturers against software giants and technology firms such as Google and Apple. Yet perhaps a better alternative is to collaborate and explore the unprecedented opportunities. Therefore, extending the research to include how automakers interact with potentially important players and achieve a win–win solution would contribute to the existing literature.

Furthermore, the theorising and operationalisation of the breadth and depth of knowledge linkage in this thesis did not differentiate between the different knowledge sources. Different knowledge sources potentially provide different benefits and require specific capabilities in order to benefit from them. For example, firms collaborate with universities to access new ideas and knowledge with long-term benefits, yet firms often face greater difficulties in realising the commercial potential, as well as greater coordination problems originating from the different values, incentives, and norms of the two sectors (Bercovitz and Feldman 2007; Hong and Su 2013). In contrast, firms can obtain tacit, hard-to-imitate knowledge through close interactions with their major suppliers, but they should also deploy complex governance mechanisms to avoid over-embeddedness and reduce the risk of opportunistic behaviour on the part of suppliers

[7] This refers to dynamic mobile communication systems that communicate between vehicles and public networks using V2V (vehicle-to-vehicle), V2R (vehicle-to-road), V2H (vehicle-to-human) and V2S (vehicle-to-sensor) interactions. It enables information sharing and the gathering of information on vehicles, roads and their surrounds. Moreover, it features the processing, computing, sharing and secure release of information onto information platforms (Nanjie 2011).

(Zhou et al. 2014). Therefore, future research comparing different types of knowledge source would offer a richer understanding for academics and practitioners.

8.2.5 Data and methodologies

Another limitation relates to the data and methodologies. Firstly, as in many empirical studies based in organisations, the statistical models only explain a fraction of the total variance (Daft and Lewin 2008). Additional data and information are valuable to in terms of capturing many other important aspects beyond the scope of the current research. Notably, China is a vast country with large regional disparities. Such regional disparities originate in China's economic reforms; in particular, 'decentralised experimentation' allows provinces to develop their own variants of new institutions and involves the central government conducting trial reforms in a limited number of localities (Jia 2015). Certain regions, particularly the coastal regions, have significantly more advanced legal and regulatory arrangements than others. Thus, a fruitful future research direction lies in the incorporation of spatial context in the study of innovation. One research question is whether and how the firm's geographic location influences its development of innovation capability? As Doh and Hahn (2007) observed, current methodologies for dealing with geographic information are unnecessarily simplified, mostly controlling the spatial effect using dummy variables (firms located in certain areas were coded as 1). This line of research can be enhanced by the development and application of more advanced analytical techniques of spatial analysis, which offers greater precision and inferential reliability. For instance, with auto plant spatial data and appropriate analytical methods, it is possible to map the physical location of automobile assembly firms and explore their geographic features, thereby examining the impact of geography on firm innovation capability and performance.

Secondly, this thesis relies heavily on survey data to measure the firm's innovation inputs, outputs, and the behavioural and organisational dimensions of their innovative activities. As already mentioned in the methodology chapter, survey data is subject to many drawbacks that are difficult to remedy (for example, cross-sectional and subjective). Thus, additional research can validate and expand the current studies by conducting more up-to-date survey and employing alternative data sources/methods. Specifically, an additional survey conducted over a wider timeframe would enable longitudinal analyses on the dynamic process of developing innovation capability. Patent and bibliometric analyses can be useful tools to delineate the knowledge base and technological development of a company, allowing one to map the knowledge flows between organisations, research teams, and individual researchers. Laboratory experiments could test the reliability of the underlying theoretical mechanisms and ensure greater casualty.

Lastly, as the data was collected from a specific sample of firms in one single industry in China (i.e. Chinese automobile assembly companies), the generalisability of the research findings should be checked before applying the current work's findings to other firms, industries, and emerging market countries. For instance, Huang (2002) compared China's automotive industrial policy to that of Korea in the 1970s; he concluded that compared with Korea, China's institutional fragmentation made it difficult for the government to overcome coordination failure associated with scale diseconomies. One recent study that compared China's automobile and electronics industries found that an international vertical spillover is important for industrial development in the local automobile industry but not for the electronics industry (Motohashi and Yuan 2010). Future studies could benefit from utilising data collected from other contexts, as well as adopting a comparative approach.

8.3 Concluding remarks

Innovation is vital for emerging market firms to catch up with firms based in developed countries and to succeed at home and abroad. This thesis has focused on the innovation capability of Chinese automobile assembly companies, contributing to the understanding of innovation capability in emerging market firms, and its drivers and outcomes. Built on multiple theories and a mixed-methods approach, the main finding is that both internal and external factors influence Chinese automobile assembly firms' innovation capability. Internally, a firm requires financial resources, human capital, collaborative culture, and transformational leadership to develop its innovation capability. Externally, a firm need institutional support and external knowledge networks to facilitate the development of innovation capability. Furthermore, developing innovation capability is an inherently complex endeavour. In addition to a firm having sufficient access to a variety of resources, organisational and institutional contexts can also shape the process of building innovation capability. In particular, for Chinese automobile assembly firms, product characteristics, organisational relational contexts, firm ownership, and the role of the government all serve as important contexts that need to be taken into consideration. Specifically, this thesis finds that, to develop innovation capability, Chinese automobile assembly companies need to strike a balance between the strength of innovation incentives and level of transformational leadership, avoid over-embeddedness in certain knowledge linkages while exploring the diversity of external knowledge, devise specific strategies for specific ownership types, and integrate their innovation activities with nonmarket ones.

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