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**A Tale of Three Cities: The Varied Trajectories of
Knowledge Economy Transition in Hefei,
Hangzhou and Tianjin**

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Abstract

Some cities in China are undergoing the transition to the knowledge economy: they are moving away from reliance on labour-intensive industries and beginning to facilitate economic growth through innovation and knowledge-intensive industries. Despite attempts to explain through either governmental or market forces, current research still lacks a systematic explanation for why some cities can make the knowledge economy transition while others cannot. Through building a process-based framework and tracing the creation of strategic emerging industries in Hefei, Hangzhou, and Tianjin, this thesis addresses this research gap and examines the causal mechanisms underlying varied trajectories of China's knowledge economy transition. This thesis argues that in the Chinese context, the formation of local government's change agency is the decisive trigger for regional knowledge economy transition. Regardless of the abundance of innovation resources, the absence of such change agency may result in the failure of the transition. The local government change agency is either formed exogenously through transmission from innovative enterprises, or endogenously, originating from the top leader(s) and subsequently diffusing downward through institutional reforms. This heterogeneous mechanism of agency formation causes the varied trajectories of China's knowledge economy transition. This thesis demonstrates that region's innovation resource endowment is not deterministic for its knowledge economy transition, and indicates that the role of government can extend far beyond merely providing institutions or services in this process. Furthermore, by shifting the analytical focus from agency to its formation, this thesis also offers new theoretical insights for the theory of industrial path creation.

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Author's declaration

Authors declaration:

“I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.”

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Signature: _____

Glossary

AI	Artificial Intelligence
B2B	Business-to-Business
B2C	Business-to-Customer
BOE	BOE Technology Group
CAS	Chinese Academy of Sciences
C2C	Customer-to-Customer
CETC-18	China Electronic Technology Group Corporation's 18th Research Institute
CNOOC	China National Offshore Oil Corporation
CNPC	China National Petroleum Corporation
CXMT	Changxin Memory Technology
DRAM	Dynamic Random Access Memory
EG	Economic Geography
EEG	Evolutionary Economic Geography
FDP	Flat-Panel Display
FDI	Foreign Direct Investment
GPE	Geographical Political Economy
HETDZ	Hefei Economic and Technological Development Zone
IaaS	Infrastructure as a Service
IC	Integrated Circuits
IOE	IBM, Oracle and EMC
IoT	Internet of Things
LCD	Liquid Crystal Display
MOST	Ministry of Science and Technology
MNE	Multinational Enterprises
OFDI	Outward Foreign Direct Investment
PaaS	Platform as a Service
R&D	Research and Development
SaaS	Software as a Service
SASAC	State-Owned Assets Supervision and Administration Commission
SEI	Strategic Emerging Industry
Sinopec	China Petroleum & Chemical Corporation
SOE	State-Owned Enterprise
TBNA	Tianjin Binhai New Area
TEDA	Tianjin Economic-Technological Development Area
TNC	Transnational Corporation
TVE	Township and Village Enterprise
USTC	University of Science and Technology of China

Chapter 1: Introduction

China is undergoing a “great transformation” in economic growth. In the first decade of the 21st century, China was widely perceived as the largest world’s factory, which relied mainly on labour-intensive business and large-scale exports to sustain its economic growth. In recent years, however, China’s economic growth has gradually moved away from dependence on labour-intensive industries and has increasingly been driven by innovation-intensive industries (Vinig and Bossink, 2015; Bazavan, 2020; Lee, 2021; Zhang, Dodgson and Gann, 2021). By 2022, technological progress accounted for more than 60 percent of the country’s economic growth, and innovation-intensive industries took over 13 percent of China’s GDP (Qin and Qu, 2023; State Council, 2023)¹. These changes indicate that China’s economic growth is shifting toward a model primarily driven by knowledge, technology, and innovation. Notably, this transformation toward a knowledge-based economy has not been confined, as some theories predict, to major metropolitan cities. Instead, innovation-intensive industries continuously and broadly emerged in more cities in the central and western China, and even in some peripheral regions, and started to become the engine for economic growth of these cities (Gong *et al.*, 2024).

Then, how has China (at least some cities in China) made the transition to the knowledge economy? In recent years, scholars showed growing interest in this question. On the one hand, China is still a country in the Global South. On the other hand, China’s transition to the knowledge economy challenges the long-held theoretical assumption that such economic transition can only emerge within the electoral political system (Iversen and Soskice, 2019). Therefore, the research on China’s knowledge economy transition not only has important implications for enriching existing theories, but also offers valuable insights for other countries and regions, particularly those in the Global South, seeking pathways to economic development and transformation.

Many scholars seek to demystify China’s knowledge economy transition from the economic perspective. Some scholars argue that China’s transition is the outcome of the agglomeration of economic activities and the externalities it produces, whereby the metropolitan cities siphon innovation resources from surrounding areas to create such an agglomeration and realise the knowledge economy transition (Crescenzi, Rodríguez-Pose and Storper, 2012; Rodríguez-Pose and Wilkie, 2016; Crescenzi and Rodríguez-Pose, 2017). However, this

¹ At the same time, the share of the real estate industry, once considered a key engine of China’s economic growth, fell to below 7 percent of GDP (Peng, Ni and Xu, 2022; National Bureau of Statistics, 2025b).

explanation obviously overlooks the fact that China's knowledge economy transition has also occurred in non-core cities and even in some peripheral regions (Gong et al., 2024). Other scholars argue that China's large domestic market creates unique opportunities for this transformation. On the one hand, the large market endows China with bargaining power over foreign technologies (Lee, 2021). On the other hand, it provides a space for trial and error in technological innovation, allowing technologies that align with market demand to be retained and developed while eliminating those that do not (Liu, 2005; Li, Ji and Zhang, 2020; Zhang, Dodgson and Gann, 2021). Nevertheless, despite acknowledging the role of the market, important gaps remain. For instance, we still lack a clear understanding of why some regions or cities are more effective than others at identifying and capturing these market opportunities.

More scholars realise and argue that China's knowledge economy transition is a complex political economic process, which involves not only economic activities but also government interventions (Vinig and Bossink, 2015; Chen and Naughton, 2016; Zhao *et al.*, 2019; Bazavan, 2020; Zhang, Dodgson and Gann, 2021). In this process, the role of government, both central and local, is given particular attention, and the government is seen as a force that should not be overlooked in China's knowledge economy transition (Yang et al., 2019; Lee, 2021; Zhang, Dodgson and Gann, 2021; Ang et al., 2023; Jin, 2023). Research has shown that through a dirigiste approach, the government can guide and actively provide resources for innovation, and even integrate innovation into national and regional development strategies to drive the transition to the knowledge economy (Sigurdson, 2004; Xue, Li and Yu, 2021; Zhang, Dodgson and Gann, 2021; Huang, 2022; Băzăvan, 2024; Yan *et al.*, 2024). Based on this perception, a growing body of research focuses on how industrial policies, made and published by the government, facilitate the industrialization and commercialization of knowledge and innovation. For instance, the government in China is found to use industrial policies to provide funding, create markets through public procurement, and reduce firms' risks in order to facilitate the knowledge economy (Kenderdine, 2017; Gao, 2018; Zhao et al., 2019; Zhang, 2020; Gao and Yi, 2021; Chen et al., 2024).

The research on industrial policy provides insights but do not bridge the gap. Industrial policy, on the one hand, lacks the ability to explain differences. For instance, we cannot explain why, among regions implementing similar industrial policies, some can achieve the knowledge economy transition while others cannot. As Gao and Yi (2021) suggest, the broader political and economic context determines whether industrial policy can function as

expected. On the other hand, taking industrial policy as the single independent variable not only limits our ability to uncover the deeper causal mechanisms behind China's knowledge economy transition, also has the risk of reversing causality. For instance, if we attribute the success of the knowledge economy transition to the implementation of industrial policy, does this imply that any region adopting such policies will inevitably achieve the same success? In reality, some cities, despite actively pursuing industrial policies, continue to struggle in making progress toward a knowledge-based economy.

Therefore, any theories trying to explain China's knowledge economy transition must first realise that it is a complex and heterogeneous process. At a minimum, current evidence shows that this transition is not confined to major metropolitan areas; a number of inland cities have also embarked on the path toward the knowledge economy (Deng, Zhang and Yu, 2020; Ma, 2022). Moreover, the trajectories of knowledge economy transition vary considerably across cities, as we will show in the empirical chapters. As such, any single-variable explanation risks overlooking the broader social-economic and political context and thus faces inherent limitations. The key to addressing this challenge lies in conducting deeper research into the causal mechanisms underpinning China's knowledge economy transition. By doing so, it allows us to understand why certain factors play a decisive role in some contexts but fail to advance innovation and its industrialization as expected in others.

To address this challenge and bridge the gaps, the overarching aim of this thesis is to examine and trace the developmental trajectories of the knowledge economy transition to clarify its underlying causal mechanisms. Specifically, this research is driven by two core research questions: (1) How does China make the transition to a knowledge economy? (2) Why do some cities in China achieve this transition while others do not? By addressing these questions, this thesis seeks to understand why certain factors and mechanisms play a decisive role in some contexts but fail to advance technological innovation and its industrialization as expected in others.

To answer these questions, this thesis examines the creation of strategic emerging industries (SEIs)² in cities and traces the origins and developmental trajectories of knowledge economy transition, while seeking to clarify the causal mechanisms driving these processes. To this

² The strategic emerging industry is defined as "those industries which are based on major (domestic) technological breakthroughs and significant development needs, with significant leading and driving roles in the overall and long-term development of the (Chinese) economy and society, and intensive in knowledge and technology, low in material resource consumption, with great growth potential, and good comprehensive benefits" (State Council, 2010). The reason for choosing SEIs can be found in Chapter 3.

end, this thesis integrates theories of industrial path creation with the key insights exacted from the directed improvisation proposed by Ang (2016), and constructs a process-based framework to explain China's knowledge economy transition. The underlying premise of this framework, as discussed below, is that China's knowledge economy transition is a complex and diverse process in which knowledge and technologies are continuously applied to the creation and development of innovation-intensive, high value-added industries.

A theory of industrial path creation proposed by economic geographers is used to lay down the foundation of the analytical framework. Scholars have generated a rich body of literature on the actors and their relations involved in regional industry creation (Boschma and Frenken, 2009; Binz, Truffer and Coenen, 2016; Binz and Anadon, 2018; Hassink, Isaksen and Trippel, 2019; MacKinnon *et al.*, 2019; Grillitsch and Sotarauta, 2020). The analytical framework is based on MacKinnon *et al.* (2019) holistic framework, and the trinity of change agency proposed by Grillitsch and Sotarauta (2020) is also added to complement the framework. As shown in the empirical chapters, insights from MacKinnon *et al.*'s framework are used to identify the key actors and their behaviors contributing to the creation of innovation-intensive industries in China's knowledge economy transition. Moreover, following up on and inspired by the emphasis on the discussion of change agency in the industrial path creation, this thesis examines not only which actors possess agency but also why such change agency initially can be formed (discussed more in Chapter 2). Meanwhile, the theory of directed improvisation proposed by Ang (2016) provides an additional analytical dimension, especially acknowledging that the local government is pivotal in China's knowledge economy (Chen and Naughton, 2016; Zhao *et al.*, 2019; Bazavan, 2020; Lan, 2021; Zhang, Dodgson and Gann, 2021; Jin, 2023). Ang's theory reveals an important fact of China's government operation: the motivation of leaders and grassroots officials in the local government is very distinct, and the Chinese local government should not be treated as a monolithic actor (Ang, 2016). This insight informs the research on agency formation process in the government, especially the formation of change agency among leaders and among grassroots officials separately. As discussed below, analyzing the agency formation of key actors, particularly the local government, demonstrate the pivotal role of government's change agency to region's knowledge economy transition, and reveals the different mechanism of government's change agency formation in different contexts. This then helps reveal the root of diversity in China's knowledge economy transition. Through tracing the formation of change agency, the research can go beyond merely identifying who were the key actors by observing their actions, but can explain why actors in some regions, particularly the local government, can facilitate the knowledge economy transition.

Consequently, by analysing and tracing the process of change agency formation, this research contributes to revealing the underpinning causal forces driving China's knowledge economy transition. Moreover, with the analysis on industrial path creation in China's context, this research can also contribute to the development of theories in explaining industrial path creation, especially through shifting the analytical focus from change agency to its formation process.

As China's knowledge economy transition is highly diverse and complex, uncovering the causal mechanisms behind it is far from straightforward. To address this challenge, this thesis uses the process tracing to sketch the phenomena and identify the change, while the critical realism provides the ontological depth. From a critical realist perspective, China's knowledge economy, measured by the creation and development of innovation-intensive industries, is open-ended, stratified, and underpinned by complex causal forces. The method of process tracing has potential to analyse these complex causal forces by investigating and tracing the periodisation of industrial path creation and the main actors and their strategies in every period (Sotarauta and Grillitsch, 2023). This research selects three case studies, Hefei, Hangzhou, and Tianjin, to reflect three heterogeneous scenarios of China's knowledge economy transition. The comparison of three cities knowledge economy transition, at the same time, show the importance of local government's change agency; moreover, the comparison between cities demonstrates the different mode of agency formation in the local government. Specifically, Hefei represents how the city can facilitate the creation of innovation-intensive industries and transition to the knowledge economy despite very limited pre-existing innovation resources in the city. Hangzhou, on the other hand, exemplifies the other scenario in which how a city with relatively abundant innovation resources and the presence of giant innovative enterprises facilitated the creation of SEIs. The case of Tianjin serves to explore why some cities, despite having abundant innovation resources, failed to realise the knowledge economy transition.

Using the case studies of Hefei, Hangzhou and Tianjin and comparison between cases, this thesis finds that China's knowledge economy transition can manifest varying trajectories in different contexts. Among all the factors related to the knowledge economy transition, change agency of the local government stands at the core of this process. As shown in Chapter 5 and 6, in the Chinese context, even in regions endowed with abundant innovation resources, or where certain actors have already developed the mindset to create SEIs, the absence of governmental change agency often results in the failure of SEI creation and knowledge economy transition. On the other hand, change agency of the local government

is not inherently given or pre-existing at the very beginning. It may emerge exogenously, transmitted from the innovative enterprises within the region, or endogenously, originating from the top leader(s) and subsequently diffusing downward through institutional reforms. This perspective moves beyond conventional theories of industrial path creation that focus solely on agency itself (Grillitsch and Sotarauta, 2020). Instead, it emphasizes the processes through which agency is formed, illustrating that a local government (especially in peripheral areas) that does not have change agency at the initial stage can also acquire change agency through learning, diffusion, and dissemination, thereby opening up the opportunities for SEI creation and knowledge economy transition even in the global south or developing countries.

This thesis makes two principal contributions to the existing literature on China's knowledge economy transition and the broader theory of industrial path creation. First, it advances the understanding of China's knowledge economy transition by shifting the analytical focus from observable government actions (e.g., industrial policies) to the underlying causal mechanisms that make these actions effective. Moving beyond the debate over whether local government intervention is simply beneficial or detrimental, this research reveals that the effectiveness of government action is highly context-specific. It identifies that the formation of local government change agency, rather than merely the presence of pre-existing innovation resources or institutions, is the decisive causal force explaining why some cities successfully transition to the knowledge economy while others failed to do so. Furthermore, this research challenges the conventional assumption in Chinese political studies that local governments are driven solely by external economic incentives such as short-term economic growth. It demonstrates that, conditional upon the successful formation of change agency (and, in certain contexts, corresponding capabilities), local governments can effectively utilise resources from both within and beyond their regions to foster the creation of high-risk emerging industries and sustain long-term development. This thus offers a novel perspective and theoretical framework for understanding China's broader political economic transition and development.

Second, this thesis contributes to the theoretical development of regional industrial path creation by shifting the focus from the existence of change agency to its formation process. Existing theories often take change agency for granted or assume it is an innate, pre-existing trait within a region. This research challenges that assumption by demonstrating that change agency is not inherently given at the very beginning. Instead, the key actors' change agency can be acquired, transmitted, and diffused over time through learning and interaction, either

endogenously or exogenously. This theoretical shift broadens the analytical boundaries and provides a novel interpretation regarding the starting point of regional industrial path creation, particularly by recalibrating models predominantly derived from developed regions and countries (Morales *et al.*, 2025). Shifting the theoretical focus from change agency itself to its formation process implies that the genesis of industrial path creation may occur before any observable industrial phenomena emerge. Consequently, a broader range of institutional factors, specifically those facilitating the formation of change agency, should be explicitly incorporated into the analysis. Furthermore, this approach offers a novel explanatory framework for industrial path creation in peripheral or developing regions. For these regions, which typically lack initial innovation resources and conducive conditions, uncovering the origins of path creation requires prioritizing how key actors develop change agency, rather than merely examining the tools and methods they use to promote new industries.

This thesis is structured as follows:

Chapter 2 reviews existing literature on explaining China's knowledge economy transition. This chapter first discusses the conceptualization of the knowledge economy, explaining why the knowledge economy transition should be understood as a process of continually applying knowledge, technology, and innovation to create and develop new industries. Subsequently, literature explaining China's knowledge economy transition through regional innovation systems, national innovation systems, research and development (R&D), foreign direct investment, and industrial policy are reviewed, and the research gap is identified and discussed. This chapter then reviews the theory of industrial path creation and discuss how this theory can shed light on explaining China's knowledge economy transition. This chapter ends up with providing the analytical framework, based on insights generated from both from economic geography and China's politics.

Chapter 3 outlines the ontology and methodology, including the rationale for case study selection and the strategy for data collection. Process tracing grounded in critical realism, and its application to analysing strategic emerging industrial creation, is specifically discussed.

Chapter 4 traces the trajectory of Hefei's knowledge economy transition. This chapter argues that Hefei's knowledge economy transition is a process of anchoring and mobilising innovation resource from other regions. In this process, the local government became the key, and sometimes the only, actor for anchoring and mobilising resources: to facilitate SEI

creation in the absence of innovation resources, the local government actively explored and identified (local) markets, selected and anchored enterprises which had related technologies and innovative capabilities, and mobilised them into Hefei. The Hefei case broadens our understanding of the role local governments played in the knowledge economy transition.

Chapter 5 traces the trajectory of Hangzhou's knowledge economy transition. We can see that despite the presence of innovative leading companies such as Alibaba at the very beginning, Hangzhou's knowledge economy transition was far from straightforward: prior to 2014, the city vacillated whether innovation-intensive or traditional industries should be the main engine of economic growth. The critical juncture enabling Hangzhou's knowledge economy transition emerged when the local government decided to create SEIs and restructure its growth model. Hangzhou's case demonstrates that even for cities possessing innovation resources, transitioning to the knowledge economy is not straightforward. The change agency formation in the local government, rather than its in the private sector, is the trigger for knowledge economy transition. The window of opportunity in such cities may emerge during the decline of traditional labour-intensive manufacturing sectors and stagnation in local economic growth.

Chapter 6 analyses the reason why Tianjin lagged behind in the knowledge economy transition, despite possessing more abundant innovation resources and being supported by the central government. From Tianjin's case, we can observe that although enterprises possessing change agency, rich innovation resources, and policy resources initially pre-existed within the region, the local government's failure to form change agency ultimately resulted in Tianjin's transition lagging behind. Tianjin's case then demonstrates, from an opposite perspective, the critical importance of the formation of change agency in the local government in the knowledge economy transition.

Chapter 7 synthesises all empirical findings and engages with the literature on China's innovation and the theory of industrial path creation. This chapter concludes with two principal contributions. The first contribution lies in revealing the causal mechanisms of the creation of strategic industrial creation (SEIs) across three cities, thereby providing a comprehensive and systematic analysis of China's knowledge economy transition. This chapter then demonstrates that the varying mechanism of agency formation in the local government underpins the different outcomes and trajectory of knowledge economy transformation. The second contribution lies in extending the boundaries of industrial path creation theory through the analysis of Chinese cases. It emphasises that focusing on the

formation of change agency, rather than merely the agency itself, generates more potential for exploring the causal mechanisms on industrial path creation in the region.

Chapter 2: Literature Review

This chapter reviews the theories that have potential to demystify China's knowledge economy transition, and shows why it is necessary to shift our attention from identifying broad, macro-level factors that influence China's transition to a knowledge economy, to a more in-depth and micro-level exploration of the localized experiences of knowledge economy transitions in specific regions of China.

This chapter will be divided into four main sections. The first section will review the conception of the knowledge economy. Based on the conceptualisation of the knowledge economy, the second section will focus on theories that analyse the transformation of the knowledge economy, and how these theories cannot be directly adopted in China's context. The third section will focus on macro- and meso-level explanations related to China's innovation, economic growth, and transformation. Through a critique of these explanations, it will illustrate why emphasizing localized, micro-level experiences is more beneficial for understanding China's transition to a knowledge economy. Finally, the last section will focus on industrial path creation theories and their critiques, exploring how they can complement the study of China's knowledge economy transition.

2.1 The Conceptualisation of the Knowledge Economy

The knowledge economy is typically considered by scholars in three ways (Houghton and Sheehan, 2000; Carlaw *et al.*, 2006; Moisio, 2018). The first approach compares the knowledge economy with industrial capitalism; the second is based on the immaterial character of the knowledge economy; the third approach defines the knowledge economy by critically analysing the transformations in material and immaterial production in the knowledge economy.

The first approach to conceptualising the knowledge economy is to compare it with industrial capitalism (Peters, Marginson and Murphy, 2009; Peters, 2010; Thiem, 2017; Avkopashvili *et al.*, 2019). This approach argues that the knowledge economy differs fundamentally from industrial capitalism in terms of the raw materials of production, productivity and factors of production. First, in terms of raw materials, industrial capitalism relies primarily on the use and input of natural resources (e.g. land, fossil fuels). In the era of knowledge economy, on the other hand, the raw materials of production are transformed into knowledge, tacit knowledge and human resources (Peters, Marginson and Murphy, 2009;

Avkopashvili *et al.*, 2019). Land and natural resources no longer become the main determinant material of production. Second, in terms of productivity, industrial capitalism increases productivity mainly through large factory production and assembly line operations (Wilson and McKinlay, 2010). By increasing and improving assembly lines, industrial capitalism can effectively increase the output of manufactured goods and productivity. In a knowledge-based economy, however, the increasing size of assembly lines not only fails to increase productivity because of the diversity of consumers' demands, but also leads to the problem of diminishing marginal returns (Carlaw *et al.*, 2006; Peters, Marginson and Murphy, 2009; Thiem, 2017). In this context, innovation becomes the main approach to increasing productivity. Finally, in terms of factors of production, industrial capitalist production relies heavily on the input of factors of production such as land, labour, and capital. These are usually organised in factories, and production is carried out in a centralised manner. In a knowledge economy, factors of production such as land, labour and natural resources become less important. On the contrary, knowledge and information begin to function as the factor of production. The mode of production in a knowledge economy becomes spatially and temporally decentralised and the main vehicle for production changes from factories to information and communication technology (ICT) equipment. Consequently, the knowledge economy can be defined as those economies which are directly based on the production, distribution and use of knowledge and information. As Peters, Marginson and Murphy (2009) suggests:

“[The knowledge economy] highlight(s) the growing relative significance of knowledge compared with traditional factors of production — natural resources, physical capital, and low-skill labour — in wealth creation and the importance of knowledge creation as a source of competitive advantage to all sectors of the economy, with a special emphasis on R&D, higher education and knowledge-intensive industries such as the media and entertainment (p.4).”

This approach of conceptualising the knowledge economy through comparison with industrial capitalism highlights the role of knowledge as the different input in production. However, this conceptualisation ignores the kinds of products that knowledge generates and the processes by which these products generate profits. Smith (2002) criticises this definition of the knowledge economy:

“[...] is a widely-used metaphor, rather than a clear concept...All economies are in some way based on knowledge, but it is hard to think that any are directly based on knowledge, if that means the production and distribution of knowledge and information products (p.6).”

Carlaw et al (2006) argue that recognising knowledge as the main factor of production is not a sufficient reason to distinguish the knowledge economy from industrial capitalism, because in the era of industrial capitalist occupations entrepreneurs also use knowledge to create new products. Furthermore, Moisio (2018) argues that the knowledge economy was still in the early stages of development in the late 1990s. The knowledge economy was perceived in this period as more of a politically constructed discourse, or something that was hoped for, rather than a phenomenon that was actually taking place.

The second approach to conceptualising the knowledge economy focuses on the kinds of commodities that knowledge generates, the characteristics of these commodities and the processes of production, which are the primary dimensions for distinguishing the knowledge economy from other forms of economy (Coyle and Quah, 2002; Quah, 2002; Carlaw *et al.*, 2006; Moulier-Boutang, 2011; Thiem, 2017; Peters, 2019). In this approach, the transformation of the knowledge economy does not lie in its use of knowledge to produce new commodities, but rather in the production of immaterial commodities on the basis of ICTs that are heterogenous from those that follow the laws of rivalry, scarcity and diminishing marginal returns in industrial capitalism (Carlaw *et al.*, 2006). In the knowledge economy, the dominant form of consumption is no longer paying for material goods, but for knowledge-generating software, labels, advertising, videos, music, games and services on the internet, and these intangible conformities or services become the new invisible capital in the knowledge economy (Moulier-Boutang, 2011; Thiem, 2017). For this reason, the knowledge economy is also labelled as a “weightless economy” or “symbolic economy” (Stehr, 1994; Coyle and Quah, 2002; Quah, 2002).

Some scholars argue that the production and consumption of immaterial commodities derived from the input of knowledge has caused a paradigm shift in capitalism (Moulier-Boutang, 2011; Thiem, 2017; Peters, 2019). In the era of knowledge economy, the development of capitalism has shifted from a material basis to an immaterial basis of development. The production and consumption of material commodities has become less important. Instead, the general importance of symbolic, immaterial and digital goods and services become more important for the economy (Thiem, 2017; Peters, 2019). As a result, immaterial labour began to replace material labour as the dominant form of labour in the

knowledge economy. In industrial capitalism, the temporal and spatial parameters of labour are relatively fixed and identifiable. However, in the era of knowledge economy, the time and space of labour became relatively dispersed and decentralised as it relies primarily on ICTs rather than factories (Thiem, 2017). The division of labour in this period is no longer based on the rule of breaking the big task down into smaller, simpler, and repetitive ones, but relies more on the intellectual cooperation and complementarity of workers (Moulier-Boutang, 2011).

Some scholars argue that the reliance on the production and consumption of immaterial goods actually indicates that the knowledge economy is a service economy (Ansell and Gingrich, 2013; Wren, 2013; Wren, Fodor and Theodoropoulou, 2013; Hope, Durazzi and Diessner, 2020). For instance, the contribution of service-based industries to economic growth are increasing in different countries, while manufacturing's contribution is declining. Wren (2013) argues that the emergence of ICT technologies has broken the triple dilemma of "employment-equality-budget"³ that traditional service industries faced. Therefore, productive service economies which mainly focusing on providing immaterial commodities and services can also achieve high added value and become major driving forces of economic development⁴.

Although capturing the key differences between the knowledge economy and other forms of economy by putting an emphasis on immateriality, this approach of defining the knowledge economy has largely underestimated the transformation of manufacturing in the era of knowledge economy. Houghton et al (1999) argue that manufacturing can take advantage of productive services in the knowledge economy to transform itself into a high value-added industry. Some scholars argue that manufacturing can be transformed in the same way as the service sector by adopting ICT technologies. For instance, Hope et al (2020) found that ICTs contributes 30-40% to the total added value of automotive manufacturing and there is a million times more ICT equipment and software in automotive manufacturing today in Germany than there was in the 1970s. Therefore, the knowledge economy should include

³ The triple dilemma of "employment-equality-budget" means that given the difficulty in increasing productivity within (traditional) service industries, an inherent policy conflict (or trade-off) arises in service-based economies between the provision of fiscal constraints, wage/income equality, and employment growth: it is relatively easy to achieve two of these objectives, but achieving all three simultaneously is challenging (Iversen and Wren, 1998).

⁴ Scholars do not argue that all manufacturing has lost its importance in the knowledge economy. For example, Smith (2002) argues that the importance of microchip manufacturing is gradually increasing in the knowledge economy.

not only those high value-added services that are based on the immaterial commodities, but also high-end manufacturing that has capacity to take advantage of ICTs.

In summary, the conceptualisation of the knowledge economy has been dynamic and constantly evolving. When the knowledge economy was first proposed, scholars focused only on the role of knowledge in the process of production and economic development. It was unclear what kind of goods knowledge generated and how the knowledge economy differed from other forms of economy. As the knowledge economy continued to evolve, the uniqueness of the knowledge economy — driving economic development through ICT technologies and immaterial commodities (e.g., information, services, and software) — was discovered. The conceptualisation of the knowledge economy focused on the production and consumption of immaterial commodities and their impact on the service sector. This immateriality-based concept has been criticised for overlooking the transition of manufacturing in the knowledge economy. Some scholars argue that the knowledge economy has not only made a significant impact on the service sector, but that some ICT technologies have also reformed the production mode of the manufacturing sector. Both the high-end manufacturing producing material commodities and high value-added services sectors producing immaterial commodities should be considered important parts of the knowledge economy.

Accordingly, the third approach to conceptualising the knowledge economy is to define it as an economic transformation brought about by technological developments (especially ICTs), which include the upgrading of old industries and the birth of new ones. Iversen and Soskice (2019) argues that innovations in ICTs have given rise to new industries including life sciences and biotechnology, in robotisation and artificial intelligence, virtual and augmented reality. Scholars also find that ICT technologies have brought about varying industrial changes in different countries (Thelen, 2019; Hope, Durazzi and Diessner, 2020). For instance, ICT technologies have contributed to the innovation of the traditional German automotive industry (Hope, Durazzi and Diessner, 2020). In Sweden and the Netherlands, ICT has given rise to new high-tech industries and high-end business service sectors respectively (Thelen, 2019).

Indeed, the approach to defining the knowledge economy through ICTs does reflect some realities of industrial change in the knowledge economy. The upgrading of old industries and the birth of new ones as a result of technological progress is an indispensable feature of the knowledge economy. However, this definition only emphasises the role of technology

(especially ICTs), and the process of technology creation and innovation has been overlooked in this definition. Furthermore, this definition blurs the line between knowledge and information. In this approach, the premise of technologically driven economic development is that ICTs revolutionise the way information is processed and significantly reduce the cost of information flows, leading to increased efficiency and accelerated innovation (Boix, 2019; Iversen and Soskice, 2019). However, ICTs do not create new knowledge or carry out innovative activities by themselves; the role of ICTs is essentially to accelerate innovation by speeding up the process of information flow and processing, thereby generating more economic profits. In this process, it is the individuals and organisations that take advantage of ICTs to continuously produce new knowledge and accomplish innovation. Therefore, defining the knowledge economy in terms of ICTs focuses solely on the conditions that ICTs provide for knowledge and innovation, while neglecting the process of knowledge production and the transforming knowledge into profits. In other words, this definition neither describes how knowledge is created and produced, nor does it link knowledge, information and profits (Smith, 2002).

How, then, should the knowledge economy be defined? Research by economic geographers on explaining regional differences in development may shed light on this problem. Scholars in this domain have found that, with the exception of some cases that have long relied on the export of raw materials, those regions that have been able to sustain stable economic growth over the long term have mostly seen a transition towards a concentration of knowledge-intensive industries (Tödtling and Trippl, 2005; Asheim and Gertler, 2006; Storper, 2011; Balland and Rigby, 2017; Marques and Morgan, 2021). In these regions, knowledge is constantly being produced, stored, updated, and diffused, and production activities rely much more on knowledge.

Autio (1998) has established a framework to describe the dynamic process of economic development in these regions. Although this framework does not aim to clarify the definition of the knowledge economy, it undoubtedly highlights the three most important components that comprise the knowledge economy. The first is the knowledge creation-renewal-diffusion subsystem. It is clear that the “increased investment in knowledge” or “development of ICT technologies”, which have been emphasised in previous definitions, require the continuous creation and renewal of knowledge. In order to be able to innovate, invent and discover, the use of existing knowledge and the generation and acquisition of new knowledge are equally important. Innovation also involves sharing what has been learnt. Furthermore, if the new knowledge is confined on a small scale to just one or a few companies, it is insufficient to

support the economic development of a region or country. Therefore, this newly created knowledge also needs to be continuously diffused at a certain scale.

The second element highlighted in the Autio's framework is the flow of knowledge. In the knowledge economy, knowledge that is created and renewed is not simply stored. Instead, this knowledge flows to organisations such as enterprises, universities and research institutions (Autio, 1998; Tödtling and Trippl, 2005). In these organisations, knowledge is used to invent and innovate. Cumulatively, these inventions and innovations drive the advancement of products and technologies. The third element highlighted in the framework is that these technologies innovations can and should be converted through market into benefits for enterprises, thereby driving the growth of the economy (Autio, 1998; Tödtling and Trippl, 2005; Marques and Morgan, 2021). In general, there are three main ways in which knowledge and innovation can achieve this (Peters, Marginson and Murphy, 2009; Moulrier-Boutang, 2011; Hope, Durazzi and Diessner, 2020). One is through the sale of the final material product of knowledge and innovation; the second is through the provision of non-material services related to knowledge or innovation; and the third is through the transfer or sale of intellectual property rights and patents.

Storper (2008b) reveals the other side of these processes. He argues that, for a given country or region, the conversion of knowledge and innovation into benefits depends on the type of knowledge and the extent of knowledge diffusion. As part of the knowledge that facilitates innovative activities originates from tacit knowledge, this leads to innovations that may emerge preferentially in certain regions or clusters of firms. When these innovations enter the market and other regions are unable to replicate them, these first-mover regions will enjoy monopoly profits from technological progress for a period of time (Storper, 2008). This monopoly profit will continue until other regions are able to imitate or provide a competitive innovation. As tacit knowledge continues to be applied, this knowledge is gradually become codifiable.

In summary, the knowledge economy is the process by which organisations, regions or nations create, update, accumulate and diffuse knowledge to accomplish innovative activities and convert these innovations into economic profits. In this process, the types of knowledge involved in innovation include both codified and tacit knowledge, and these different types of knowledge lead to different types of innovation and technological progress, which ultimately lead to the birth, creation, and development of industries. Organisations, regions or countries gain not only the benefits of innovation and knowledge in this process,

but also the (potential) monopoly profits for a period of time until the technological superiority is broken.

2.2 Transition to the Knowledge Economy: Technology, Globalisation, or Institution?

Transformation to a knowledge economy is seen to rest on technology, globalisation, or institutions. In this section, I outline each perspective in turn.

The Technology-driven Thesis

Proponents of the technology-driven thesis argue that technological progress, which functions as an external shock, is the main driving force of a knowledge economy (Houghton and Sheehan, 2000; Boix, 2019). Houghton and Sheehan (2000) argued that development of a knowledge economy relied on rise in the knowledge intensity of economic activities, and that rising knowledge intensity was ultimately driven by the information technology revolution. Boix (2019) provided a more comprehensive theoretical framework to illustrate how technological progress has fostered the transition to a knowledge economy and societal transformation since the Industrial Revolution. By portraying the evolution from Manchester, to Detroit, and to Silicon Valley capitalism, Boix (2019) showed that technology defined the pattern of economy and society of each era by defining how human skills were complementary to the dominant productive machinery. Thus, the technological progress that changes the complementarity between skilled workers and production modes is considered to be able to promote socio-economic and political transformation.

However, from a historical perspective, not all technologically advanced countries (i.e. the Soviet Union) have successfully transitioned to a knowledge economy. As the only two superpowers after World War II, the Soviet Union possessed strong scientific and technological strength matched only by the United States. However, the Soviet Union never demonstrated a tendency to transition to a knowledge economy until its collapse in 1991. According to Iversen and Soskice (2019), failure to transition was largely due to its long-held restrictions on technological diffusion (the personal computer was not released until the late 1980s and owing to cost, was still not widely adopted).

The Globalisation-driven Thesis

Some scholars argue that development of a knowledge economy is driven by globalisation (Houghton and Sheehan, 2000; Archibugi and Iammarino, 2002; Olssen and Peters, 2005;

Amavilah, Asongu and Andrés, 2014). The impact of globalisation manifests in three aspects. First, globalisation facilitates the flows of foreign direct investment (FDI) and capital. These flows, either between developed countries or to developing countries, generate an enormous pool of funds for the development of a knowledge economy (Houghton and Sheehan, 2000). Second, the globalisation of innovation and technology transfers, which are driven by multinational enterprises, and global techno-scientific collaborations, provide the conditions for widespread knowledge economies (Archibugi and Iammarino, 2002). Finally, globalisation has induced peace and stability in the broad global context in the past forty years, which also positively affects governance and through governance of the knowledge economy (Amavilah, Asongu and Andrés, 2014).

While the importance of globalisation in the transition to a knowledge economy cannot be denied, two questions remain in the globalisation-driven thesis. First, this theory does not account for why most advanced countries began the transition to a knowledge economy before globalisation. In support of this query, Iversen and Soskice (2019) argue that globalisation was driven by countries that took the lead in the transition to a knowledge economy. The second question notes that globalisation did not bring a knowledge economy to all of its active participants. Stiglitz (2003) shows that some new rising economies with poor governance over their economies became poorer rather than richer in the process of globalisation and failed to transform into a knowledge economy.

The Institution-driven Thesis

Unlike commentators who identify technological change or globalisation as the main driving forces of a knowledge economy, proponents of the institution-driven thesis argue that it is change in institutions that allows the knowledge economy to take place (Durazzi, 2019; Hope and Martelli, 2019; Iversen and Soskice, 2019; Thelen, 2019; Hope, Durazzi and Diessner, 2020). These scholars can be divided into two camps: those arguing that democracy and electoral politics drive the knowledge economy by facilitating institutional change, and those that identify producer-group coalitions as the main driving forces of a knowledge economy.

Democracy as the main driving force

By shedding light on the symbiotic relationship between advanced capitalism, nation-states and democracy, some scholars argue that democracy is the central driving force of the knowledge economy. Iversen and Soskice's (I&S) theory is at the centre of this camp. Indeed,

they agree with the technology-driven thesis that the knowledge economy was promoted by immense technological evolution. However, they argued that technological change was enabled by changing institutions (Iversen and Soskice, 2019). In other words, decisive institutional changes in economics, politics, financial regulations, labour market policies and social protections, provided the platform for the development of a knowledge economy.

Democracy is a key driving force behind the institutional changes that promote a knowledge economy. Specifically, Iversen and Soskice (2019) argued that the essence of democracy was to realise the interest of decisive voters, rather than equality or distribution. Meanwhile, decisive voters, including highly skilled workers and aspirational families concerned with the future of their children, have strong incentives to promote a knowledge economy. This is because the interest of decisive voters is consistent with a knowledge economy: a decisive voting block can secure job opportunities in advanced sectors and better education for their children. Therefore, a well-functioning democratic system represented by highly skilled workers and aspirational families can be expected to promote the development of a knowledge economy.

By providing an explanation for the domestic roots of knowledge economies in advanced countries, Iversen and Soskice's theory extends beyond both the technology- and globalisation- driven theses. However, a deeper examination of its main assumption leads to one question: if highly skilled workers and aspirational voters constitute the majority (or decisive voters, as they defined), then the populism characterised by anti-technology, anti-globalisation, anti-expertism and anti-immigration should be less common in advanced countries (Boix, 2020). However, the fact is that the rise of populism is more prevalent in these advanced democracies. Moreover, Iversen and Soskice's theorisation is less convincing when focusing on the development of knowledge economies in the Global South (especially in mainland China). According to their theorisation, China would either become a western-style democratic country or fail to transition to a knowledge economy. In fact, China has neither stopped its transition into a knowledge economy, nor has it shown any tendency to transform into a western-style democracy (Brown *et al.*, 2008; Gat, 2010). While Iversen and Soskice's framework extends beyond what can be explained by considering technology and globalisation as the main drivers, the unexplained trajectory of economies in the Global South is evidence of the limitations of this theory.

Producer group coalitions as the main driving force

Scholars in this camp argue that producer group coalitions, which include employers and employer coalitions, investors, and highly skilled workers, are the main driving forces for institutional change that ultimately enable the transition to a knowledge economy. In recent contributions, scholars argue that the promotion of employer coalitions, the cooperation (or compromise) of trade unions and the organisation of workers with high skills, triggers transition towards a knowledge economy. Accordingly, Thelen (2019) identifies three examples of pathways to a knowledge economy: high- end manufacturing in Germany, high- end manufacturing and high-tech information and technology sectors in Sweden, and high- end business services in the Netherlands.

Regarding the role of technological change, Hope, Durazzi and Diessner (2020) provide an elaborate framework to explain the relationship between producer group coalitions and the knowledge economy. They argue that as most advanced countries were confronted with immense technological change, the extent of coalition between employers and highly skilled workers then played a vital role in promoting transition into a knowledge economy. They argue that many employers often actively lobby for destandardised education, deregulation of the labour market and for the retrenchment of social policy in order to reduce costs in low-end production. Meanwhile, employers often channel rewards and benefits to highly skilled workers, especially to those with skills complementary to ICT, by supporting higher education, concentrating wages for highly skilled workers and by selectively expanding occupational welfare benefits.

However, this framework has limitations. First, it should be noted that the producer group coalition is only applicable in the context of corporatist advanced countries, such as Germany, and does not apply to liberal countries. For example, employers in liberal countries often face collective action problems (Iversen and Soskice, 2019), they then lack the incentive and capacity to cooperate and form a political coalition owing to severe competition against each other. Second, in some new rising economies such as China, even if producer group coalitions can be observed, they hardly directly influence decision-making in the central government.

In summary, current theories of the main driving forces of knowledge economies remain limited. The technology-driven thesis cannot explain why some technologically advanced countries such as the Soviet Union, failed to transition to a knowledge economy. The

globalisation-driven thesis fails to explain the domestic root of knowledge economies in advanced countries. Moreover, this thesis cannot explain why some active participants in the globalisation process have difficulty in transitioning to a knowledge economy. By contrast, an institution-driven thesis is more convincing as it suggests that both technologically advanced countries and active participants in the globalisation process require institutional transformation to allow a knowledge economy to evolve. However, setting democracy or producer-group coalitions as the main driving forces for institutional change does not explain the transition to a knowledge economy in the context of liberal countries and in some new rising economies, such as China.

2.3 China's Transition to the Knowledge Economy: Why and How Government Matters?

This section will primarily review the literature and theories that attempt to explain China's knowledge economic transition. First, this review demonstrates the necessity to focus on the role of (local) government in the knowledge economy transition⁵; second, despite not aiming at explaining knowledge economy transition, some theories on China's politics provides the base for analysing local government's behaviour and its agency in the knowledge economy transition.

Market or Government

Many scholars seek to demystify China's knowledge economy transition from the economic perspective. Some scholars argue that China's transition is the outcome of the agglomeration of economic activities and the externalities it produces, whereby the metropolitan cities siphon innovation resources from surrounding areas to create such an agglomeration and realise the knowledge economy transition (Crescenzi, Rodriguez-Pose and Storper, 2012; Rodríguez-Pose and Wilkie, 2016; Crescenzi and Rodríguez-Pose, 2017). However, this explanation obviously overlooks the fact that China's knowledge economy transition has also occurred in non-core cities and even in some peripheral regions (Gong et al., 2024). Other scholars argue that China's large domestic market creates unique opportunities for this transformation. First, the large market endows China with bargaining power over foreign technologies (Lee, 2021). Second, it provides a space for trial and error in technological innovation, allowing technologies that align with market demand to be retained and developed while eliminating those that do not (Liu, 2005; Li, Ji and Zhang, 2020; Zhang,

⁵ This does not imply that the market is unimportant in China's knowledge economy transition. What is being argued here is why relying solely on market forces to explain this transformation is insufficient.

Dodgson and Gann, 2021). Nevertheless, despite acknowledging the role of the market, important gaps remain. For instance, we still lack a clear understanding of why some regions or cities are more effective than others at identifying and capturing these market opportunities.

Consequently, some scholars attempt to incorporate government and political processes into the analysis of China's knowledge economy transition (Gao and Yi, 2021; Lan, 2021; Jin, 2023; Liu, 2025). Among all these factors, *industrial policy* is the most frequently discussed concept. Industrial policy, as defined by Pack and Saggi (2006) as:

“...any type of selective government intervention or policy that attempts to alter the structure of production in favor of sectors that are expected to offer better prospects for economic growth in a way that would not occur in the absence of such intervention in the market equilibrium. (p. 267)”

Thus, industrial policy is generally seen as a tool for government to facilitate the industrialisation of innovation and knowledge economy transition through subsidies and procurement to create markets, and reduce the investment risks of private sectors (Kenderdine, 2017; Zhao *et al.*, 2019; Gao and Yi, 2021). However, critiques of industrial policy argue that it can also lead to actions such as profit-seeking, government corruption, or low-quality in innovation (Gao, 2018; Ang *et al.*, 2023). This critique arises because, as Gao (2018) suggests, previous research often treats industrial policy as an independent variable rather than the dependent one, and thus overlooking the political, economic, and social context necessary for industrial policy to achieve its intended objectives. This oversight also explains why research on industrial policy struggles to address regional differentiations. For example, why do certain regions, such as Tianjin (see Chapter Six), continue to struggle with achieving breakthroughs in innovative industries and transitioning to the knowledge economy, despite receiving extensive support from numerous industrial policies?

The explanations of other individual factors, such as government's endeavours on science parks, high-tech zones, and R&D, face similar dilemmas. Despite the frequent references to the roles of these factors in China's knowledge economy transition (e.g., Bazavan, 2020; Fu, Chen and McKern, 2021; Zhang, Bi and Jin, 2021), a persistent unresolved question remains: for a country like China, characterised by significant regional disparities, can merely increasing the investment in a single factor lead to the accumulation of innovation and the

transformation of the knowledge economy? For instance, while it is well-established that enhancing R&D investment can foster innovation, in regions with weak industrial foundations and innovation capabilities, will enterprises' attempts to forcibly increase R&D investment result in an increase in innovation or disrupt their operational capacities? If the government promotes R&D investment through administrative orders or industrial policies, will this enhance regional innovation capabilities or increase the likelihood of ethical and moral risks (such as subsidy cheating, data falsification, or corruption)? Obviously, although these individual factors are positively correlated with innovation capabilities and the knowledge economy transition, whether they will produce the desired effects is determined by the broader political, economic, and social contexts in which they are embedded. In other words, a more holistic framework that encompasses these elements while aiming to understand the broader political and economic context they inhabit needs to be integrated into the analysis.

How Government Matters?

Political economy analyses of China's development initially focused on the period of rapid economic growth that began in the 1980s following the Reform and Opening-up. During this era, mainstream theories posited that rapid local development was primarily driven by two factors: administrative decentralisation and the reform of the fiscal system (Qian and Weingast, 1997). Decentralisation reforms endowed local governments with residual control rights over economic affairs, facilitated the entrepreneurship of local government (Duckett, 2006). Concurrently, the fiscal contracting system allowed local governments to retain residual revenues after fulfilling the quotas assigned by the central government. This institutional arrangement provided substantial incentives for local governments to aggressively attract investment and stimulate economic growth (Zhou, 2007). However, the limitation of this theoretical perspective lies in its inability to explain why the momentum of local development remained largely unabated even after the central government recentralised power during the 1994 tax reform (Cai and Treisman, 2006).

In addition to macro-level analyses, scholars also deconstruct China's development from a micro-level perspective, for instance, the promotion tournament theory (Zhang, 2005; Zhou, 2007, 2009, 2017; Wang, 2019). Zhang (2005) suggested that the institutional foundation of China's development lies in the "competition for growth" mechanism among local governments. Specifically, the central government tied limited promotion opportunities to local economic performance, which incentivised local officials to continuously drive

regional economic growth to compete for these scarce advancements. Zhou (2017) further integrated the promotion tournament with the administrative subcontracting system. Zhou (2017) argued that the relationship between higher and lower levels of government in China was not the Weberian bureaucracy, but rather functioned as a contracting and subcontracting relationship. The higher-level government bundles complex governance and economic tasks and delegates them to the lower-level government, granting the latter substantial discretionary power and residual control rights. Instead of intervening in the specific implementation process, the higher governments evaluate subordinates solely based on final outcomes, such as GDP growth rates or fiscal revenue (Zhou, 2017). Consequently, an official's prospect for promotion is determined not merely by absolute performance, but, more importantly, by whether they outperform their peers at the same administrative level. By deeply binding local economic development (especially GDP) with the individual political futures, this institutional setting produces strong incentives for local officials (especially government leaders) to promote regional growth.

While the promotion tournament theory offers profound insights into the institutional drivers of China's economic development, it exhibits theoretical blind spots when deployed to explain China's knowledge economy transition. A fundamental issue is that while the tournament model explains one of the sources of officials' developmental incentives and the formation of "regional growth coalitions" between local governments and enterprises (Zhou, 2021), it fails to explain why certain regions would choose high-risk but slow-return innovative industries as the primary engine for regional development. This is because, while transitioning the knowledge economy promises robust long-term growth, this trajectory inherently contradicts with the short-term political horizons of career-driven officials. Innovation-intensive industries are characterised by high input, uncertainty, and long-term return. Anchoring regional development on such industries risks not only failing to deliver immediate economic dividends but potentially triggering short-term growth stagnation. Such an outcome would severely penalise local officials in a rigid promotion tournament⁶. Consequently, strictly applying the promotion tournament framework leads to a theoretical paradox: local officials would systematically eschew investments in innovation-related industries to avoid potential failures, thereby hindering rather than consciously promoting the regional transition toward the knowledge economy.

⁶ This is also empirically tested in fieldwork. When starting their career in related department in Hefei and Hangzhou, some leaders showed hesitation on creating innovation-related industries, as they were worried on the heavy investment in these industries would fail or could not bring economic growth in their term (HF05; HZ01).

Recent discussions on this theory argue that the promotion tournament and its accompanied “multi-task incentive distortion”⁷ are increasingly inadequate to capture current realities (Zhou, 2022). As the central government tried to enter the era of “high-quality development (gao zhiliang fazhan, 高质量发展)”, the cadre evaluation system has evolved into a multi-objective tournament (Zhou, 2022). For instance, Yu, Sun and Xuan (2020) find that the central government has included environmental performance in official evaluations following the 18th National Congress. This adjustment led local governments to strengthen environmental regulations, adjust industrial policies, and restructure fiscal expenditures, thereby facilitating local industrial upgrading.

However, this shift of multi-objective tournament, even if is true, can only explain recent knowledge economy transitions⁸ driven by top-down structural pressures. It cannot fully explain the trajectories of regions that had already initiated their transitions before the central evaluation criteria formally changed. Furthermore, Jian *et al.* (2025)’s empirical research reveals that grassroots cadres are “active actors” driven by complex, multi-faceted internal goals. This challenges the traditional promotion tournament theory, which overlooks these diverse motivations and treats cadres merely as institutional appendages singularly driven by political promotion.

Moreover, simply altering the evaluation criteria for officials does not absolutely guarantee the success of a regional transition. Empirical studies indicate that the development of innovative industries in some regions in China faces practical dilemmas such as industrial homogenization, redundant construction, and vicious competition for resources (Li and Guo, 2022; He and Sheng, 2025; Xiao, Wang and Yang, 2025). For instance, some local governments, driven by leader’s promotion incentives, spent massive funds to import technologies, knowledge, and enterprises that are mismatched with their regional endowments (He and Sheng, 2025), which in turn caused the difficulty for them to make progress in the knowledge economy transition. Therefore, even if the multi-objective tournament theory provides insights for understanding institutional incentives, we still need to explain why and how these incentives can be translated into appropriate actions that effectively drive the regional knowledge economy transition.

7 Officials merely pursue easily measurable GDP targets at the expense of other goals.

8 Specifically, after the publication of the 15th Five-Year Plan for National Economic and Social Development, the central government is highly likely to officially incorporate knowledge economy-related indicators into official evaluations.

Another pounced and complementary theory aiming at explaining China's transformation is *directed improvisation*. By understanding the notion of development (including economic growth and transition) from the coevolutionary perspective, Ang (2016) provides such a framework. The building block of Ang's framework lies in its assertion that development is a process of "coevolution" between the state and the market. Effective adaptation, specifically, how to ensure that the economy and institutions, as well as the state and market, can collaboratively evolve, is crucial for securing growth, transformation, and then development. In the context of China, this capacity for effective adaptation is realised through the *franchising the bureaucracy*, the pragmatic philosophy of *using what you have* at the local level and the *directed improvisation* in terms of the central-local relations (Ang, 2016). In contrast to the promotion tournament theory, which primarily emphasises the impact of external institutional arrangements on individual local leaders, Ang's framework expands its analytical focus to how incentives for driving local development are endogenously generated and distributed across different groups of officials in the local government.

First, through the counterexample of North Korea, Ang (2016) argues that China's development should not be attributed to the strong government or authoritarianism that other scholars have repeatedly emphasised. Instead, it should be viewed as a result of China's adaptive and entrepreneurial public bureaucracy, specifically termed as franchising the bureaucracy. Although the entrepreneurial nature of local governments in China has been mentioned and well-explored in earlier research⁹, fewer studies focus on why local governments possess entrepreneurial agency and can act like an entrepreneur. This may be related to the fact that most studies concentrate on the heroic narratives surrounding local leaders such as mayors or secretaries of the municipal party committee, which inherently equate the ambitions of these leaders with the operational modalities of local governments¹⁰. However, this perspective overlooks the reality that local leaders constitute only 1% of all local officials (Ang, 2016).

In Ang's view, the franchising of the bureaucracy, which serves as the significant source of entrepreneurial agency of local governments, is comprised of two main ingredients: one is the evaluation and assessment system for local leaders; the other is the dual-track salary system for mid-level cadres and grassroots officials. In this way, China runs the government

⁹ See Duckett (2006) "state entrepreneurialism", Oi (1999) "local state corporatism" and Zhao (2010) "corporatization of local government."

¹⁰ For example, the concept of "Mayor Economy" proposed by Jin (2023).

“like a franchised corporation, where local leaders are evaluated like CEOs and regular cadres (employees of the public administration) are paid like corporate employees.” (Ang, 2016, p. 18). On the one hand, the local leaders, typically assessed and promoted by the higher-level government, are evaluated by how they can improve local economic growth. In other words, economic performance is often given the highest priority in evaluations. Therefore, local leaders tend to behave primarily as CEOs, focusing their efforts on local economic and fiscal growth (Ang, 2016).

On the other hand, non-leadership cadres and grass-roots officials have less agency to fulfil their leaders’ ambitions to drive local economic development, as the opportunity of promotion is scarce (Kostka and Yu, 2015; Ang, 2016). Thus, the dual-track compensation system, which consists of a fixed formal salary and performance-based allowances, is designed to incentivise cadres and grass-roots officials. To put it simply, if they engage in activities that contribute to local economic growth, such as successfully attracting investment, they can receive allowances, bonuses, or other forms of benefits. The more contributions they make, the more benefits they will take, potentially exceeding their formal salaries (Ang, 2016). As a result, local leaders, driven by opportunity of promotion, and cadres and grass-roots officials, motivated by monetary incentives, exhibit an extraordinary entrepreneurial agency at the local level, albeit this inevitably raises the potential for corruption.

Two additional elements — the pragmatism of *using what you have* and the notion of directed improvisation — complement franchising the bureaucracy. When studying the behaviour of local governments, Ang (2016) found that Chinese local governments did not imitate Western institutions or growth models but instead adhered to the principle of *using what you have*. As exemplified by Ang, at the initial stage of market reforms, some local governments effectively transformed the existing communist bureaucratic structure into an investment recruitment machine through private relationship networks and commission-based incentive mechanisms, in order to proactively seek the initial funds for economic growth (Ang, 2016, 2021).

The other element is *directed improvisation*, which is adopted to portray central-local relations in China. Instead of following the strands of control theory to explain central-local relations, Ang (2016) argues that after Reform and Opening Up (gaige kaifang, 改革开放), the central-local relationship has evolved to “central directs local”. This is because, in the reform era, the central government often faced situations where clear targets or solutions

were lacking. Rather than setting specific goals or solutions like it usually did in the Mao's era, the central government started to adopt a strategy of setting broad, sometimes vague, directions and creating a flexible institutional environment, which allowed the local governments to seek context-specific solutions, and develop adaptive development models based on local resource endowments. In other words, the shift from "control" to "direct" implied a (partial) delegation of authority from the central to local governments. This allowed local governments to gain (moderate) autonomy to implement the principles of "using what you have" and "franchising the bureaucracy."

Now the question shifts to the extent to which Ang's framework can explain China's transition to a knowledge economy. Again, the knowledge economy transition is also considered a form of development. Following the political slogan of the "indigenous innovation (zizhu chuangxin, 自主创新)" in 2006, indicators related to knowledge economy transformation, such as innovation, patents, and industrial upgrade, were incorporated into the local leader's evaluation system (Ang *et al.*, 2023). Moreover, with innovative political campaigns, such as "high-quality development", "new quality productive forces (xinzhi shengchanli, 新质生产力)" became more prevalent and favoured by leadership, these indicators have been given even greater weight in the assessment and promotion¹¹.

Thus, an important question emerges: does the partial revision of franchising the bureaucracy, for instance, adding innovation indicators into officials' evaluation system, adequately explain China's knowledge economy transition?

The answer is negative. This is because we can see that Ang's explanation of local government behaviour is to some extent based upon officials' profit-seeking motivation. That is to say, if we seek to use Ang's theoretical framework to explain China's knowledge economy transition, we must admit that grassroots officials in the local government both seek and are able to gain monetary benefits from regional knowledge economy transition. However, after the 18th National Congress of Chinese Communist Party (18th National Congress) in 2012, the central government comprehensively reinforced its control over local governments, and started to reclaim power from the local level. While curtailing local government autonomy, the central government also imposed stricter expectations regarding the maintenance of the authority of the Central Party leadership (Zhao, 2019; He, 2021).

¹¹ For example, Xinhua Daily, 2024, Empowering *new quality productive forces* Through High-Quality Performance Evaluations, http://www.zgjssw.gov.cn/dangjianxinlun/202403/t20240327_8238296.shtml

One of the most profound changes is the transformation of the accountability system. After the 18th National Congress, the accountability system for government officials shifted from result-oriented accountability to process-oriented accountability (Tu, 2025). This requires officials to strictly adhere to rules, procedures, and discipline, which effectively curtails the discretionary power of local governments in critical matters (Tu, 2025). Although this shift has suppressed corruption and malfeasance, it has concurrently exerted a negative impact on officials' willingness in driving local development (Tu and Gong, 2022; Tu, 2025). To avoid political risks, many officials are increasingly inclined toward conservative rule compliance, actively avoiding innovation or transformative actions (Tu and Gong, 2022). In this scenario, local leaders and grassroot officials' behaviours are being fundamentally changed. For local leaders, the risks of relentlessly pursuing economic growth may have come to outweigh its potential benefits (Zhao, 2019). For grassroot officials, anti-corruption efforts and accountability since the 18th National Congress has largely prevented them from rent-seeking by participating in and facilitating economic growth at any cost (He, 2021). For instance, He (2021) observed that after the 18th National Congress, some local officials showed more tendency to avoid making mistakes, rather than finding solutions for economic growth. On the other hand, facilitating the knowledge economy transition within the region does not always bring benefits, as the risks of industrialising and commercialising knowledge and innovation are considerably higher than traditional industries such as real estate industry. Under such institutional constraints, bureaucratic risk aversion and rigid adherence to routine actively obstruct rather than facilitate the cultivation of innovation-intensive industries. Consequently, as officials settle for the status quo and lose the proactive drive to pioneer emerging industries, the knowledge economy transition in these regions becomes highly vulnerable to stagnation.

The establishment of a "fault-tolerance mechanism" (rongcuo jizhi, 容错机制) is considered a potential solution to reconcile this dilemma (Tu and Gong, 2022; Tu, 2025). Indeed, around 2016, the central government started to institutionalise the fault-tolerance to protect official's agency in development (Tu and Gong, 2022). However, studies reveal that, unlike the explicit and rigid accountability system, the implementation of the fault-tolerance mechanism remains highly ambiguous and uncertain in most scenarios. Consequently, officials' fear of being penalised far outweighs their confidence in the fault-tolerance institution (Tu, 2025). As a result, local officials tend to evade tasks carrying potential compliance risks, and "are reluctant to dedicate time and resources to justify their actions, particularly when there is no assurance of leniency" (Tu, 2025, p. 248).

Overall, compared to analyses based on economics or single-variable approaches, a holistic political economy framework that integrates innovation, policy, industrialization, and government is clearly better suited for explaining China's knowledge economy transition. As Ang's work has shown, starting from analysing the local government and its behaviour, central-local relations can be a reasonable choice for studying China's knowledge economy transition, as most targets and commands are launched by the central government, but are ultimately realised at the local level. More importantly, this understanding shifts our focus from merely identifying the factors influencing the knowledge economy transition, to a deeper investigation of the contexts in which these factors operate. Given the complexity and regional diversity of China's development, this strategy has potential to reveal the causal mechanisms underpinning this process.

However, what is still unknown is how elements related to knowledge economy transition — such as innovation, knowledge, technology, and industrialisation — can be effectively incorporated into the study of China's local government behaviour and institutions. Therefore, the next section will review industrial path creation (development) theory and illustrate how this theoretical perspective can inform our understanding of China's knowledge economy transition.

2.4 Industrial Path Creation Theory: How to Analyse China's Transition

Industrial path creation (or industrial path development), defined as “the emergence and growth of new industries and economic activities in regions” (Hassink, Isaksen and Trippel, 2019, p. 2), offers valuable insights for studying China's transition to a knowledge economy. As shown above, exploring China's knowledge economy necessitates a deep dive into the local level. Industrial path creation theory, not only aims at exploring how to “... create[s] hope for the creation of new employment and economic growth” for the region (Hassink, Isaksen and Trippel, 2019, p. 2), but also provides a systematic analytical framework for examining how knowledge, innovation, and technology become industrialised at the local level. Therefore, this section will first review the development of industrial path creation theory, and through the review and critiques of this theory, propose the analytical framework adopted in this study.

Related Diversification

Initially, scholars' understanding of industrial path creation mainly considered regional industrial paths to be randomly occurring, mostly stemming from "historical accidents" (Martin and Sunley, 2006; Boschma and Frenken, 2009; Zhu, He and Zhou, 2017; MacKinnon *et al.*, 2019). However, this argument has been criticised. Initially, the development of regional industries is dynamic rather than static, and empirical research shows the dynamic adjustments of industries in some regions and their departure from original paths. Moreover, this argument fails to explain why some regions can generate new industries while others cannot.

Accordingly, some scholars in evolutionary economic geography (EEG) argue that regional path creation should not only be viewed as coincidental events; instead, the emergence of new industries in specific regions requires a "window of locational opportunity" (Boschma and Frenken, 2003; Storper, 2010). They argue that although many regions possess similar conditions for nurturing new technologies and generating new industries, path creation only occurs when a specific region has a "window of opportunity". For instance, an extreme version of the explanation for why Silicon Valley was able to generate the semiconductor industry is that William Shockley, the inventor of the chip, moved to Silicon Valley because he wanted to be closer to his mother, which opened up the locational opportunity for Silicon Valley (Kenney and Von Burg, 2001; Storper, 2010). Martin and Sunley (2006) suggest that this point at times conflates *ex ante* unpredictability with *ex post* inexplicability¹², and as a result, may lead to different interpretations of the opportunity window and the development path of industry. For instance, the emergence of the semiconductor industry in Silicon Valley can even be traced back to the development of the electronics industry during the interwar period in others' explanations (Martin and Sunley, 2006). Therefore, Martin and Sunley (2006) contend that the emergence of industrial path should not be solely understood as a historical accident or accidents occur in regional conjuncture; instead, path creation is more likely to be a process involving strategic purpose and deliberate action, in which different types of agencies deliberately drive the industry away from its original trajectory, ultimately leading to the emergence of new industries within the region.

Based on this understanding, scholars in EEG raised the concept of relatedness and a theory of related diversification to better explain the process of path creation and its underpinning

¹² This means that, from Martin and Sunley's perspective, an over-reliance on the "window of opportunity" concept is actually an explanation that attributes industrial path creation primarily to historical contingency, thereby abandoning the exploration of causal mechanisms beneath this process.

mechanisms (Boschma and Frenken, 2009; Neffke *et al.*, 2011; Neffke, Henning and Boschma, 2011; Boschma, 2017). Boschma and Frenken (2009) argue that, compared to industries that are technologically unrelated, it is easier for industries formed by technologically related companies to cluster within a region. This is because, for companies, knowledge spillover and accumulation within a region only make sense when cognitive levels are similar but different. Therefore, technologically similar companies are easily motivated to form geographical proximity within a region (Boschma and Frenken, 2009; Neffke *et al.*, 2011; Neffke, Henning and Boschma, 2011). In such cases, companies engaging in technologically similar new industries face fewer risks. Therefore, through economic activities such as opening branches or diversifying production lines, new industrial paths will emerge from technologically related old industries.

Although industrial path creation is emphasised as an agency-driven process, the related diversification theory requires two important prerequisites. One is the presence of multiple technologically related firms within the region. In other words, after a long period of development, a considerable number of technologically related firms have been clustered within the region. Second, the primary driving force for regional path creation is the firm rather than other agencies. These two prerequisites substantially limit its capacity to explain the regional path creation in EEG in two aspects. First, the related diversification theory has a bias towards enterprises and thus overlooks the role of other agencies, such as the government, universities and research institutes in the path creation process (Hassink, Isaksen and Trippel, 2019; MacKinnon *et al.*, 2019). Second, this theory cannot explain why some industries that are unrelated to existing industrial profiles can also emerge in the region (Zhu, He and Zhou, 2017).

Boschma *et al.* (2017) attempted to incorporate other agencies and unrelated diversification into the theoretical framework of related diversification to address these limitations. To do so, they introduced the concept of niche from the transition literature. In the transition literature, niche refers to entirely new technologies or practices with incubation space and high uncertainty. By protecting, nurturing, and empowering the niche and freeing it from market selection or existing institutional pressure, new industries may emerge in this region. In this process, Boschma *et al.* (2017) argue that agencies such as businesses, universities, research institutions, and local governments need to form the optimal combinations to support the niche and relevant market to drive the regional path creation. In terms of peripheral regions, Boschma *et al.* (2017) argue the path creation in these regions usually

takes the form of unrelated diversification by transplanting industrial paths from other advanced regions.

The problem with Boschma *et al.*'s argument is that the causal linkages to the process of industrial path creation are still ambiguous. In other words, even if a niche arises in a region, it remains unclear which agencies or their combination can promote the protection and development of the niche into an industrial path. Furthermore, Hassink, Isaksen and Trippel (2019) argue that the negative side of related diversification should not be overlooked. Specifically, situations in which existing industries restrict rather than promote the emergence of new industries should also be considered. Additionally, the bias towards technology and the niche limits this theory's understanding of path creation in developing countries or peripheral regions. In their theory, due to the difficulty for developing countries or regions of becoming technologically advanced and generating niches, their only way of industrial creation is through imitation of existing industries in the developed world (Boschma *et al.*, 2017). This pessimistic view suggests that developing countries or peripheral regions can only establish comparative advantage and achieve path creation through low labour costs or abundant natural resources (Boschma *et al.*, 2017). Indeed, peripheral regions or developing countries often need to import external resources to achieve technological progress (Isaksen, 2015). However, this argument cannot explain why some peripheral regions can quickly achieve technology catch-up and jump into technologically advanced industries in the short term (Binz, Truffer and Coenen, 2016; Zhu, He and Zhou, 2017; Binz and Anadon, 2018).

A more fundamental question regarding the theory of related diversification is whether the binary division of related and unrelated can truly encompass the full range of industrial path creation scenarios (Hassink, Isaksen and Trippel, 2019). Some empirical studies have found that certain regions can foster path creation by mobilising unrelated knowledge and facilitating the upgrading and expansion of industries, which are not included in the theoretical framework of related diversification. Therefore, Hassink, Isaksen and Trippel (2019) argue that to deepen the understanding of industrial path creation, there is a need for a typology and establishment of a comprehensive analytical framework that includes factors such as agencies, institutions, market, and expectations.

Path Creation as A Process: Towards a Comprehensive Framework

Scholars in economic geography (EG) and geographical political economy (GPE) have called for a more comprehensive understanding of path creation. Building on criticisms of related diversification theory, Hassink, Isaksen and Trippel (2019) argue that research on path creation should include three key elements. First, a multi-actor perspective should be employed to investigate the role of agencies. In addition to firms or firm-level actors directly involved in innovation or entrepreneurial activities, those actors capable of “mobilising resources, competence, and power to create new institutions or to transform existing institutions” (Hassink, Isaksen and Trippel, 2019, p. 4), should also be included in the analysis. Second, studies on path creation should focus not only on internal resources, but more attention should be paid to the inflow of external resources and the national/international institutional environment. Finally, the role of expectations, visions, and conventions were often overlooked in EEG studies. The expectations of new paths and the contextualised conventions that shape these expectations directly drive or hinder decision making on path creation.

In line with Hassink, Isaksen and Trippel (2019), MacKinnon *et al.* (2019) proposed a theoretical framework to systematically analyse the process of path creation. Following up on the typology proposed by Martin and Sunley (2006), they identify four heterogeneous types of path creation: indigenous creation, transplantation, diversification into related industries, and upgrade of existing industries. Specifically, indigenous creation refers to the creation of a new path in a region through the creation and exploitation of new knowledge, technology and innovation. This process may involve the commercialisation of knowledge and research. Transplantation refers to the importation of knowledge, technology, innovation and industries that are well established in other regions to create new industries within the region. The difference between these two types is that indigenous creation relies on endogenous knowledge and innovation, whereas transplantation relies on resources from outside the region.

Both upgrade and diversification involve the process of combining existing regional industries with related or unrelated knowledge. Path upgrade refers to the upgrading of existing industries by learning and applying new knowledge, with the result that this process does not generally result in new industries. Path diversification, however, is the process of combining related or unrelated knowledge with existing industries, consequently generating new sectors and industries.

Regardless of the type of path creation, MacKinnon *et al.* (2019) suggest that path creation include the interplay of key actors, the institutional environment, market construction and regional and extra-regional assets (shown in Figure 2-1). Following up on Grillitsch and Sotarauta (2018), three types of actors influence path creation are identified: innovative entrepreneur, institutional entrepreneur, and path advocates. First, the innovative entrepreneur mainly refers to firms or correspondent entrepreneurs in their framework. Second, path creation is not an isolated economic action but embedded in a social and political context (Grillitsch and Sotarauta, 2020), which may involve the reform of pre-existing institutional environments. Therefore, institutional entrepreneurs, acting to “challenges to existing rules and norms, and attempts to institutionalise alternative rules and practices” (MacKinnon *et al.*, 2019, p. 12), should be included in the path creation process. Third, a path advocate mainly focuses on the actor who attracts, encourages and coordinates other actors and then facilitates the formation of collective expectations and visions, thus playing a significant role in legitimising new paths in the region (MacKinnon *et al.*, 2019; Grillitsch and Sotarauta, 2020; Uyarra and Flanagan, 2022).

This understanding is further developed by shifting the focus from actor to actor’s change agency, which avoids overly binding specific actors to certain actions (e.g., assuming that innovative entrepreneurship is and must come from firms). The most prevalent framework is “the trinity of change agency” developed by Grillitsch and Sotarauta (2020). In their framework, human agency refers to “intentional, purposive, and meaningful actions, and the intended and unintended consequences of such actions” (Grillitsch *et al.*, 2022, p. 249). Change agency then refers to “human actions that aim at making a change” (Grillitsch and Sotarauta, 2020, p. 707). In any region, there will be agents who aims at maintaining or strengthening existing industrial paths; conversely, change agency represents the opposing side of will and actions that seek for change in industrial paths (Grillitsch and Sotarauta, 2020).

Based on this understanding, the trinity of change agency framework conceptualises three types of change agency: innovative entrepreneurship, institutional entrepreneurship, and place-based leadership (Grillitsch and Sotarauta, 2020). First, innovative entrepreneurship, concerns “breaking with existing paths and working towards the establishment of new ones” (Grillitsch and Sotarauta, 2020, p. 710). In the Schumpeterian sense, the innovative entrepreneurship is conceptualised base on economic actions that are driven by “a belief in future opportunities” (Grillitsch and Sotarauta, 2020, p. 710). Therefore, the essential trait

of the innovative entrepreneurship is “the *will* to realise something new, to ‘map unknown terrain, to move where no-one dared venture before’” (Grillitsch and Sotarauta, 2020, p. 711).

Secondly, as innovative entrepreneurs are embedded within and conditioned by pre-existing structures and institutions, actions aiming at transforming place-based institutions to favour innovative entrepreneurial activities and industrial creation is conceptualised as “institutional entrepreneurship”. Finally, Grillitsch and Sotarauta (2020) emphasise the significance of place-based leadership, positing that regional industrial path development is a collective endeavour involving multiple actors rather than merely “the implementation of individual intentions (Grillitsch and Sotarauta, 2020, p. 710)”. They suggest that different individuals, organisations, or other actors engage in the process of industrial path creation based on their various interests, which may lead to “possibly conflicting encounters of various visions (Grillitsch and Sotarauta, 2020, p. 712)”. Reconciling or coordinating these interests is not an easy task. Therefore, the actions of convening, motivating, guiding, and coordinating the interests of different agents, ensuring their collective efforts align towards the same industrial path creation, are conceptualised as place-based leadership. These activities typically cross the “organisational boundaries and professional cultures” of various stakeholders in the regional industrial path creation (Grillitsch and Sotarauta, 2020, p. 713).

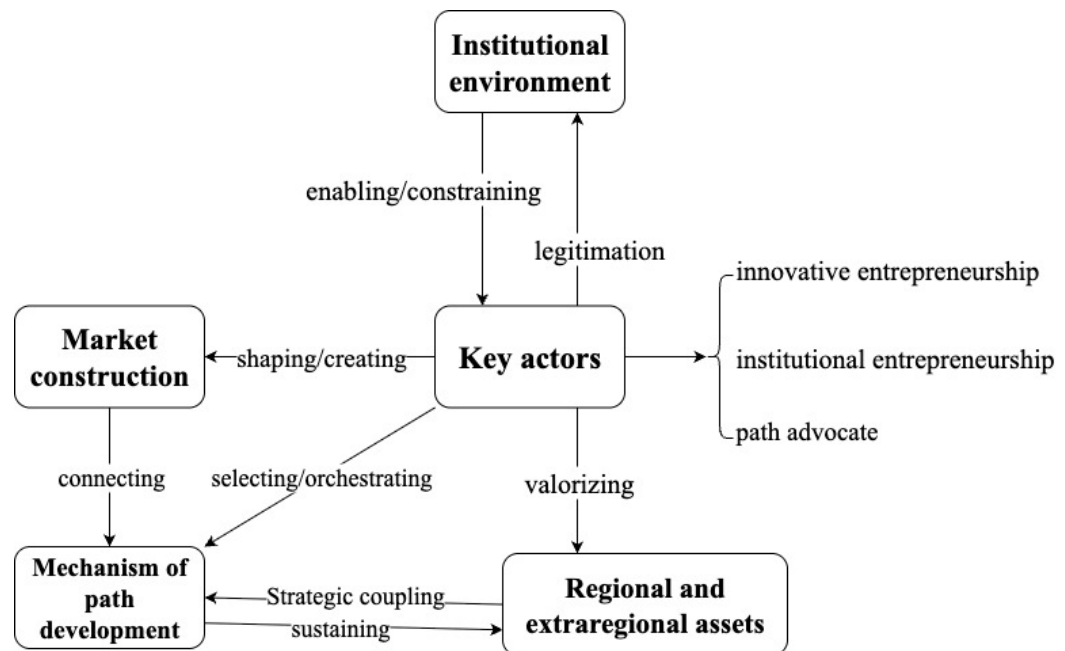


Figure 2-1 Dominant Factors in Regional Path Creation (Source: MacKinnon et al. (2019, p. 121), revised by the author)

The second key element in MacKinnon *et al.*’s framework is the institutional environment. In the process of path creation, the behaviour of agencies is impacted by and embedded in

an institutional environment consisting of multi-level rules, such as rules formed by the local government or broad industrial standard. Therefore, institutional entrepreneurs need to engage with the broader institutional environment to acquire sufficient support, or change the institutions to make sure they are conducive to new paths (MacKinnon *et al.*, 2019). Otherwise, the existing institutional environment may impede the emergence of new paths, especially when it conflicts with the interest groups formed in old industries.

Besides the institutional environment, regional and extra-regional assets are portrayed as crucial for path creation (Zhu, He and Zhou, 2017; MacKinnon *et al.*, 2019). These assets, including natural, infrastructural, physical, institutional, and human resources, are used, modified, and reorganised by key actors in the region to drive path creation. MacKinnon *et al.* (2019) argue that both endogenous and exogenous resources are important sources for path creation. Moreover, agencies embedded in the region normally need to import appropriate knowledge or technologies and then internalise these resources through continuous learning to facilitate path creation (MacKinnon *et al.*, 2019).

The last but not the least element is the creation of markets for locally based firms. MacKinnon *et al.* (2019) argue that no matter how the new path is locally or regionally created, it always involves the process of capital accumulation, which refers to “generation and circulation of value through the sale of commodities in markets” (MacKinnon *et al.*, 2019). Therefore, path creation typically needs to be linked with regional, national, and international markets and gains support by generating scale effects. In addition, the state can provide significant support to the market, especially for niche market construction, through procurement, tax reduction, and specific policies.

In summary, as emphasised in Section 2.3, examining China’s knowledge economy transition not only requires considering the regional differences at the local level, but also needs to link local governments’ behaviour with knowledge, innovation, markets, and industrialisation. MacKinnon *et al.*’s framework for industrial path creation, coupled with the trinity of change agency, provides a useful building block in this regard.

2.5 The Analytical Framework

Although their framework is highly insightful, MacKinnon *et al.*’s framework is still warrants adaption and expansion as it points out static relationships and variables. However, if we take the industrial path creation, as many scholars have emphasised, as a “process” rather

than a static outcome where independent variables cause dependent variables (Gong and Binz, 2023), then focusing solely on static variable relationships cannot answer questions such as at which stage the innovative entrepreneur should emerge, nor can it accurately answer should we change the institution before engaging in innovative entrepreneurship or vice versa? For example, Fu *et al* (2024) found that in China's well-developed core districts, innovative entrepreneurs act as the initial drivers at the very early stages of industrial path creation. However, in less-developed peripheral districts within the same city, institutional entrepreneurs play their roles much earlier than innovative entrepreneurs. Obviously, focusing only on how innovative entrepreneurs shape or create markets, or how institutional entrepreneurs reform institutions, fails to explain such differences.

Therefore, a process-based framework, "not based on a set of static independent variables, but rather by analysing the dynamic interplay of key mechanisms" (Gong and Binz, 2023, p. 11), should be developed. Such a framework would reveal the sequence of the emergence of different elements (and their combinations) in industrial path creation, as well as the underlying causal mechanisms.

Moreover, although scholars have increasingly shifted their focus to the notion of agency, a critical challenge still exists: how to avoid attributing the entire changing process to agency, a concept that may still seem "too abstract and intangible" (Li and He, 2020, p. 20). In MacKinnon *et al*'s framework (as well as the trinity of change agency), scholars attempt to address this problem by introducing the relationship between agency and institution, thereby enriching the understanding of agency in path creation. For instance, Grillitsch and Sotarauta (2020) argue that agency and institution should be understood from the relational perspective, which emphasises the varying capabilities, resources, and powers of agents, aiming to uncover how agency influences institutions and vice versa in their interactions.

Indeed, the relational perspective is crucial for understanding the relationship between the institution and agency in industrial path creation. However, no matter from which perspective, what is taken granted is that agency is pre-existing within the region, and manifests itself when actors exhibit relevant behaviours. This may be the case for some developed countries or regions, where abundant resources, knowledge, and institutions already exist. However, for those developing countries or regions, the formation of agency is more likely to be a gradual process, akin to path creation, due to the lack of assets, knowledge, or institutions at the very early stage. For instance, we can find the local government without change agency pre-existing in these countries or regions, and it is the

process of agency formation that allows the government to become the key agent in path creation. Whether exists this agency formation process, or the differences in the mechanisms of agency formation, may explain the disparities in industrial path creation outcomes observed in developing countries or regions.

Based on the above review and critique of the literature, this section provides the analytical framework for the whole thesis (shown in Figure 2-2). Building on Ang's analysis of China's development and transformation, this thesis conceptualises China's knowledge economy transition as the process that are driven by local governments (influenced by the central), enterprises, research institutions, or other actors with change agency, to realise and industrialise knowledge, innovation, or technology to develop innovation-intensive industries at the local level.

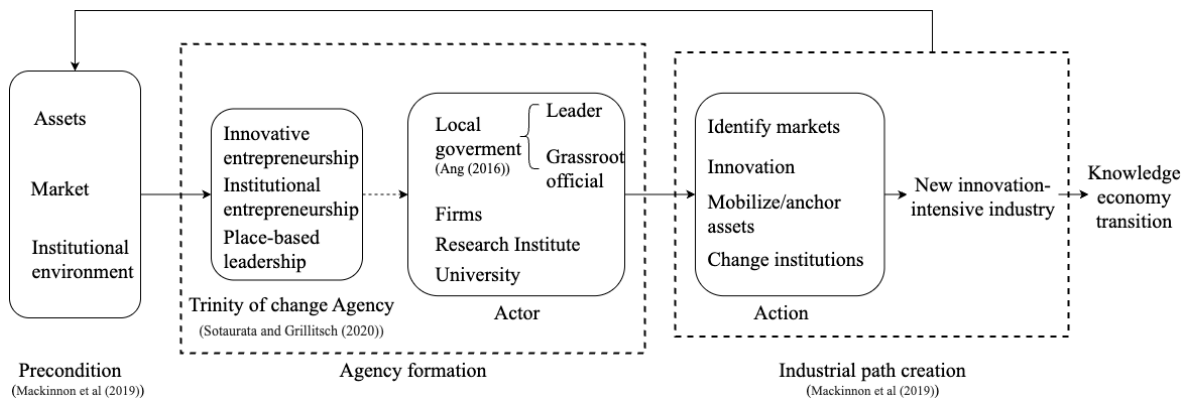


Figure 2-2 The Analytical Framework (Source: the Author)

This process can thus be decomposed into the iteration of three key elements: preconditions, agency formation, and industrial path creation:

(1). **Precondition:** the precondition mainly refers to the industrial legacies (pre-existing industries in the region), assets (infrastructure, technologies, and knowledge), institutional environment (regulations, norms, and routines), and markets pre-existing in the region, the combination of which constitutes the foundation for future path creation in the region. In other words, a region's industrial path creation is deeply embedded in its historical and structural context.

(2). **Agency Formation:** the agency formation refers to the process through which pre-existing or newly entered subjects acquire change agency and become active actors in the

knowledge economy transition. In this framework, change agency is not treated as given or spontaneously emergent, but can be built or acquired by actors in the region (Laasonen, 2024). Specifically, this part focuses on unpacking the constituents of change agency by examining why certain actors (both intra- and extra-regional) acquire the willingness, mindset and vision to facilitate innovation-intensive industries (innovative entrepreneurship), participate in reforming regional institutions (institutional entrepreneurship), or coordinate the actions and conflicting interests of other actors (place-based leadership). The focus thus shifts from merely examining how actors demonstrate their change agency to exploring how actors acquire it. Consequently, the analytical framework enables us to investigate which subjects' acquisition of change agency plays a decisive role in the region's knowledge economy transition, and whether and how the same subject exhibits different types of change agency at various stages of industrial path creation, aligning with the Grillitsch and Sotarauta (2020).

Regional preconditions, particularly structural elements like resource endowments and institutional environments, significantly shape the process key actors form their change agency. Although recent research on the process of agency formation remains scarce, existing studies indicate the change agency formation could be fundamentally distinct in different types of regions. For instance, in regions with dense innovation resources or supportive institutions, the actors initially exhibiting innovative entrepreneurship are more likely to be linked with market or market-related actors, whereas in peripheral regions, this role is more frequently linked with the local government (MacKinnon *et al.*, 2019; Uyarra and Flanagan, 2022; Gong *et al.*, 2024). This situation may also exist in the Chinese context.

In the Chinese context, as the literature suggests, economic development is inextricably linked to the government, yet the structural mechanisms through which government officials acquire the change agency are not uniform. For instance, the institutional structures related to evaluation and promotion diverge significantly between top leaders and grassroots officials, top leaders may easily gain profits from regional development than grassroots officials, which subsequently generates distinct pathways for their agency formation. Thus, following Ang's (2016) perspective, this framework will differentiate between the behaviours, motivations, and agency of leaders and grassroots officials when analysing the actions of the local government. As discussed above, leaders and grassroots officials in the local government have distinct interests in the regional development. Moreover, recent quantitative analysis shows that grassroots officials in the local government are "active actors" driven by complex, multi-faceted internal goals (Jian *et al.*, 2025). Thus, this framework will specifically

examine how agency is formed at these two levels within the local government and may further explore how the change agency of leaders diffuses down to grassroots officials.

(3). **Industrial path creation:** the process of industrial path creation, following up on the conceptualisation from EG and EEG, primarily refers to the process in which local actors materialise knowledge and technology to create new innovation-intensive industries within a region. In this process, in line with MacKinnon *et al*'s framework, particular attention will be paid to how various actors, driven by different types of agencies, act to modify regional conditions. For instance, how existing local assets and markets are perceived, how resources are introduced from external sources, or the process of institutional modification to meet the requirements of industrial path creation. The outcome of these actions will be the precondition for the next phase of regional industrial path creation.

With the iteration between preconditions, agency formation, and industrial path creation, innovation-intensive industries will be created, developed, and clustered in a certain region, and thus enabling the transition to the knowledge economy.

Chapter 3: The Methodology

This chapter will provide an overview of the methodology of this research, including the ontology and the justification of methods. After presenting the research question and sub-questions, this chapter will first introduce the case selection strategy. The chapter will then introduce the critical realism and process tracing, and justify why and how they can be used to research China's knowledge economy transition. Furthermore, this chapter will illustrate how relevant qualitative data was collected by using documentary research and in-depth interviewing. Finally, this chapter will conclude with how the data is analysed by using qualitative content analysis.

3.1 Research Questions

This research aims to explore the political economy of China's knowledge economy transition relating to government, entrepreneurship and institutions. Its objective is to uncover the process of the knowledge economy transition in China and the underpinning mechanism behind this transition. The main research question is "what factors drive the transition of China's knowledge economy?". In order to better discuss which methods can answer this question, I raise two sub-questions based on the main research question:

- (a). What principal factors and how they drive the transition of China's knowledge economy?
- (b). Why can some cities make the knowledge economy transition but others cannot?

RQ1 and RQ2 aims to uncover the causal mechanism behind China's knowledge economy through identifying what principal factors and how did they work in this process at the city level. The following sections in this chapter will explain how I plan to address these research questions.

3.2 In-depth Case Study

A potential research method for answering the two sub-questions is case study method. First, case study research is more likely to be appropriate for "how" and "why" questions (Yin, 2018). Second, case study research is suitable for answering questions that seek to explain contemporary circumstances (or cases) with intensive and in-depth description (Yin, 2018). Through the selection, evaluation and explanation of some cases, the characteristics of the larger cases and phenomena can be revealed (Seawright and Gerring, 2008; Vennesson, 2008;

Miles, 2015). Accordingly, case study research enables the research to thoroughly depict and analyse how knowledge economy transition emerged and developed within a particular socio-economic context.

Although being criticized for the lack of generalizability of findings of a single case, the strength of conducting case study lies in providing a “thick” description of the phenomenon and thus a real-world context within which can be discussed and analysed (Yin, 2018). In terms of the generalizability, Yin (2018) argues that a good case study can achieve analytical generalisation (or generalising theoretical propositions) rather than statistical generalisation.

Case selection: Selection of Industry

As the knowledge economy transition is defined from an industrial perspective, then, the question turns to: which industries should be selected to represent the knowledge economy? There are two available options: one is choosing China’s “high-tech industry”. The Chinese central government defines the high-tech industries as those “technology-intensive industries with high investment in research and development, high value-added products and good prospects in the international market, with intellectual, innovative, strategic and low resource consumption characteristics”, which including high-tech manufacturing¹³ and high-tech service industries¹⁴ (National Bureau of Statistics, 2021).

The other available option is the strategic emerging industry (SEI), which was proposed by the State Council in 2010 for the first time. In 2010, the State Council issued the Decision on Accelerating the Cultivation and Development of Strategic Emerging Industries, and defined the SEI as “those industries which are based on major (domestic) technological breakthroughs and significant development needs, with significant leading and driving roles in the overall and long-term development of the (Chinese) economy and society, and intensive in knowledge and technology, low in material resource consumption, with great growth potential, and good comprehensive benefits” (State Council, 2010). Seven major SEIs, including both manufacturing and service, are listed in the Decision: energy conservation and environmental protection industry, new generation information technology

¹³ High-tech manufacturing includes pharmaceutical manufacturing, aviation, spacecraft and equipment manufacturing, electronics and communication equipment manufacturing, computer and office equipment manufacturing, medical equipment and instrumentation manufacturing, and information chemicals manufacturing.

¹⁴ High-tech service industry includes information services, e-commerce services, inspection and testing services, high-tech services in professional and technical services, R&D and design services, science and technology achievement transformation services, intellectual property rights and related legal services, environmental monitoring and management services and other high-tech services.

industry, biotechnology industry, high-end equipment manufacturing industry, new energy industry, new materials industry, and new energy vehicle industry¹⁵.

SEI is more suitable as the case for researching China's knowledge economy transition. When comparing these two definitions, we can find that although both definitions emphasise the innovation-intensive feature of the industry, the discourse of "(domestic) technology breakthrough" can be found in the definition of SEI rather than in high-tech industry. Therefore, if the high-tech industry defined in the central government is selected as the case, some industries dominated by foreign or multinational enterprises owned technologies will also be included in the analysis. This results in a situation where, despite being technology-intensive, the technology-intensive part of these industries is not located in China, with only the labour-intensive part can be created and developed. For instance, production of computer is categorised as high-tech industry by the central government (National Bureau of Statistics, 2025a). However, the knowledge and technology for computer production were initially predominantly owned by foreign or multinational enterprises, with China participating solely in the assembly of computer components by providing labour. In such a circumstance, although computer manufacturing is classified as a high-tech industry, only its labour-intensive part can be observed in China. Consequently, it is difficult to characterise this as "China's" knowledge economy transition achieving through technological progress and industrialisation.

Consequently, in the subsequent definition of SEI, we can see that a deliberate emphasis on "(domestic) technological breakthroughs" by the central government. This shift in discourse indicates the central government's expectation that China should achieve industrial creation and development, and economic growth and transformation, through its own technological progress, rather than relying on technologies from other nations (State Council, 2010). In the 12th and 13th Five-Year Plans, "cultivating and developing strategic emerging industries" replaced the discourse of "accelerating the development of high-tech industries" mentioned in the 11th Five-Year Plan, and the industrial development goals, tasks, and plans related to innovation and knowledge economy were revolved around SEIs rather than high-tech industries. Therefore, the SEI is more suitable than high-tech industry for studying China's knowledge economy transition¹⁶.

¹⁵ Some subtle adjustments were made by the central government over the past decade.

¹⁶ The distinction between SEI and high-tech industry leads to variations in specific industrial selection, as they are distinctively classified and calculated according to differing criteria and policy documents. Therefore,

Case Selection: Selection of Cities

Then, which cities should be selected for researching the creation of SEIs and the transition of China's knowledge economy? Typically, Beijing, Shanghai, or Shenzhen, which possess large-scale agglomerations of SEIs, are considered to be the most innovative cities in China. However, these three cities represent only one developmental model, namely, how mega-cities create SEIs under the condition of concentrated resources (including innovation and policy). As demonstrated in Chapter 1, the creation of SEIs can also be observed within smaller cities, including those in central and western regions. The mega-city model exemplified by Beijing, Shanghai, or Shenzhen clearly cannot represent these areas. Solely selecting Beijing, Shanghai, or Shenzhen would inevitably diminish our understanding of the diversity and complexity of SEI creation and knowledge economy transition across China. Therefore, this research avoids focusing on cities like Beijing, Shanghai, or Shenzhen, which *ought to* perform well in the knowledge economy transition and are also well-researched¹⁷, instead selecting Hefei, Hangzhou, and Tianjin as the cases. As discussed below, Hefei and Hangzhou performed well in knowledge economy but demonstrates different trajectories of SEI creation; on the other hand, Tianjin possessed enormous innovation resources but was lagging behind the SEI creation and knowledge economy transition. Comparing these three cities thus can provide insight into the actors and their importance in China's SEI creation, and reveal the causal mechanisms behind this process.

The rationale for case selection is structured as follows. First, cases should be comparable to minimise the impact of differences in city size, administrative level, and accessible resources on the creation of SEIs. In China's context, a city's administrative level is particularly likely to impact the outcome of industrial path creation, as cities like provincial capitals tend to have greater access to innovation resources than other prefecture-level or county-level cities (Yang, 2023). Hefei and Hangzhou are provincial capitals of Anhui and Zhejiang, and although Tianjin is not a provincial capital, it is a direct-controlled municipality. In 2023, these three cities are ranked as "New Tier-One Cities (xin yi xian chengshi, 新一线城市)" in the "City Business Charming Ranking" published by the New Tier City Research Institute (China Business Network, 2025). Therefore, when attempting to map out which factors contribute to the success of SEI creation in cities, selecting Hefei,

choice of either SEI or high-tech industry influences assessments of which cities have a better performance in knowledge economy transition, thereby further affecting the collection and screening of data and ultimately influencing the choice of specific city to represent China's knowledge economy transition.

¹⁷ For instance, see Rodríguez-Pose and Wilkie (2016)'s analysis how megacity realised the knowledge economy transition through the agglomeration of economic activities and the externalities it brings.

Hangzhou and Tianjin as case studies prevents differences in administrative level (and their consequent impact on cities' ability to anchor and mobilise innovation resources) from influencing the explanation.

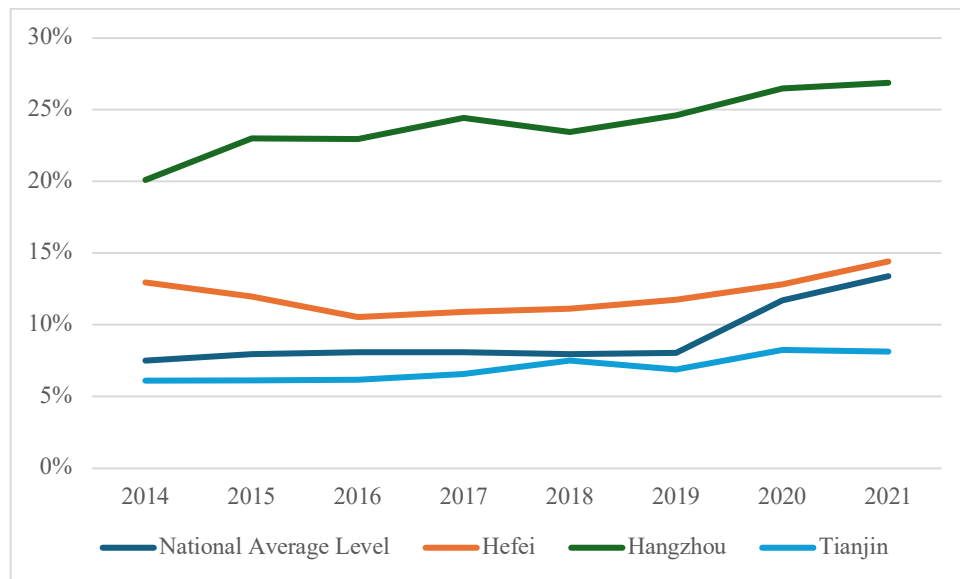


Figure 3-1 Proportion of Added value of SEIs to City's GDP from 2014-2021¹⁸ (Data Source: Statistical Communiqué of the People's Republic of China on National Economic and Social Development (2014-2021), Statistical Communiqué of the Hefei, Hangzhou and Tianjin on National Economic and Social Development from 2014-2021)

Second, the data related to SEI of each city should be quantitatively accessible, measurable and comparable¹⁹. The evaluation of the performance of SEI creation is mainly judged by two indicators, one is the proportion of the added value of SEIs to the city's GDP, and the other is the location quotient of SEIs in these three cities, which is mainly used to judge the degree of agglomeration of strategic emerging industries (Billings and Johnson, 2012). As shown in Figure 3-1, the proportion of the added value of SEIs to GDP in Hefei and Hangzhou has consistently exceeded the national average since 2014, but the proportion of which was lower than national average level in Tianjin. Moreover, from 2014 to 2021, the location quotient score in Hefei and Hangzhou has been greater than 1, indicating a high

¹⁸ Statistical Communiqué of the People's Republic of China on National Economic and Social Development can be found on: <https://www.stats.gov.cn/sj/tjgb/ndtjgb/>. Hefei's Statistical Communiqué on National Economic and Social Development can be found: <https://tjj.hefei.gov.cn/tjyw/tjgb/index.html>. Hangzhou's Statistical Communiqué on National Economic and Social Development can be found: <https://www.hangzhou.gov.cn/col/col805865/index.html?uid=6801598&pageNum=-10>. Tianjin's Statistical Communiqué on National Economic and Social Development can be found: https://stats.tj.gov.cn/tjsj_52032/tjgb/.

¹⁹ Data reflecting SEI creation and development of each city is currently mandated to be calculated. But the local governments now can decide whether to publish its data to public or not. This leads to despite we can find some SEIs were created and developed in some cities, the data of these SEIs is not available for research.

level of concentration of SEIs in these two cities during this period. However, Tianjin's the location quotient score was below 1 between 2014 and 2021, indicating that Tianjin's SEIs was less concentrated and under-developed (as shown in Figure 3-2).

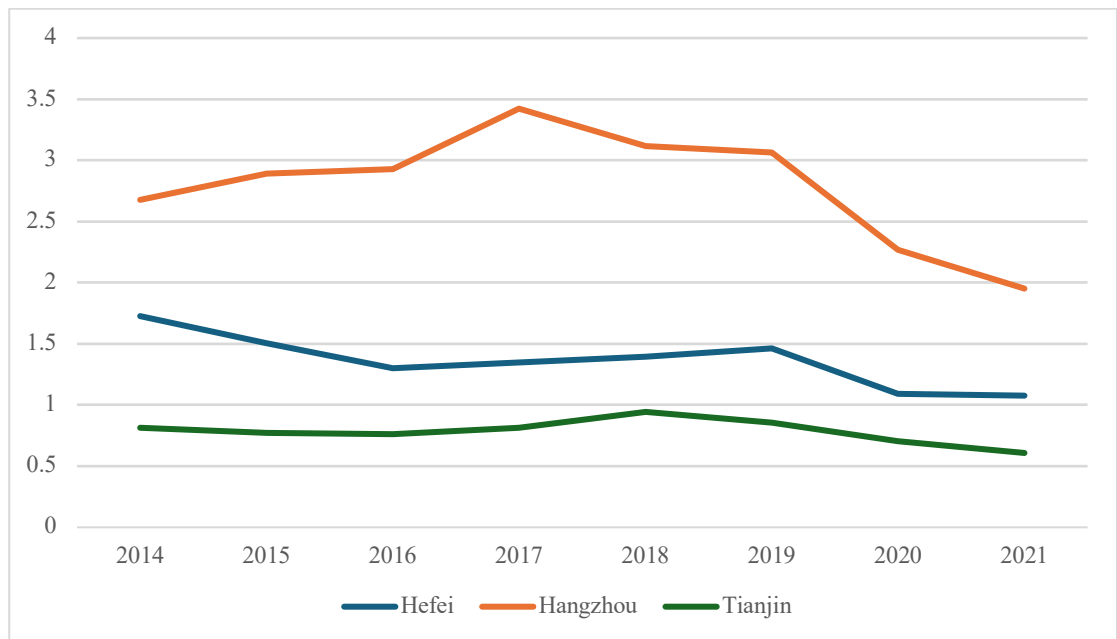


Figure 3-2 Score of Location Quotient of SEIs in Three Cities (Data Source: Statistical Communiqué of the Hefei, Hangzhou and Tianjin on National Economic and Social Development from 2014-2021)

Lastly, these three cities exemplify three distinct scenarios of SEI creation in China's context. Hefei represents how a city can facilitate the creation of SEIs and transition to the knowledge economy despite very limited innovation resources pre-existing in the city²⁰. Hangzhou, on the other hand, exemplifies the other scenario of how a city with relatively abundant innovation resources and the presence of giant innovative enterprises facilitated the creation of SEIs. The case of Tianjin serves to explore why some cities, despite having abundant innovation resources, failed to realise the knowledge economy transition. As discussed above, by analysing Tianjin's failure and comparing it with the other two cases, this research can open the gate of identifying which actors or factors are more important, and the absence of which will lead to the failure of SEI creation and the interruption of knowledge economy transition.

²⁰ As discussed in Chapter 4, although Hefei initially had cutting-edge research organisations such as the University of Science and Technology of China, innovations originating from these organisations were far away from the local industrial base and thus initially being difficult to commercialise locally.

3.3 Critical Realism and Process Tracing

The two key questions, as listed above, of this research are: “What principal factors and how they drive the transition of China’s knowledge economy?” and “Why can some cities make the knowledge economy transition but other cannot?”. These two questions essentially explore whether there is a causal mechanism between the factors and China’s knowledge economy transition, and if so, how the causal mechanism operates to drive this process. This research adopts the critical realism rather than positivism or constructivism. This is because the positivism confines reality to what is empirically observable and thus struggles to uncover underlying causal mechanisms (Gorski, 2013; O’Mahoney and Vincent, 2014; Fletcher, 2017). On the other hand, constructivism denies the existence of an external reality and focuses solely on discourse and meaning (Gorski, 2013; O’Mahoney and Vincent, 2014; Danermark and Ekström, 2019). In contrast, critical realism, which recognises both the socially constructed nature of social phenomena and the existence of objective causal mechanisms, is better suited to revealing the deeper structures and mechanisms underlying social phenomena (Elder-Vass, 2012, 2021; Danermark and Ekström, 2019). Linked to the critical realism, the method of process tracing is a potential method tool to explore the mechanism behind China’s knowledge economy transition, as it provides detailed descriptive stories allowing to set out of different temporal period of what is happening. This section starts by introducing critical realism, and then discuss the relationship between the critical realism and process tracing. This section then provides a detailed description of how process tracing is adopted to analyse the creation of strategic emerging industries in Hefei, Hangzhou, and Tianjin.

The Ontology of Critical Realism

In critical realist ontology, reality is recognised as “a stratified, open system of emergent entities”, which contains three domains (O’Mahoney and Vincent, 2014, p. 4). The surface level is the empirical domain. This domain includes events and objects that we can perceive empirically, which are usually mediated by discourses. The middle level is the actual domain, which consists mainly of events that occur, but which are not always perceived. The deepest level is the real domain, which consists causal structures and mechanisms which guide the occurrence of events in the actual and empirical domain. Critical realism argues that events are not caused by deterministic causality. Rather, events occur fundamentally from the causal forces of social agency and structure in particular contexts (Elder-Vass, 2021). Events are determined by an interplay of different causal forces in a particular context, in which some causal forces may have an impact, but others may be inhibited from producing an observable

outcome by opposing forces (Elder-Vass, 2021). Moreover, critical realists argue that there are many mechanisms beneath the phenomena acting at the same time at the level of actual domain (Danermark and Ekström, 2019). Therefore, the event, as the outcome, is “a complex compound effect of influences drawn from different mechanisms, where some mechanisms reinforce one another, and others frustrate the manifestations of one another” (Danermark and Ekström, 2019, p. 47; Furnari *et al.*, 2021).

The ontology of critical realism, trying to make sense from the perspective of causal forces, reminds us to pay attention not only to observable phenomena in causal analysis, but also to those unobserved and absent phenomena that are equally important. Moreover, a multiple causal forces analysis provides an important ontological foundation for this research, as China’s knowledge economy transition is a complex process that includes multiple factors. Therefore, exploring the causal mechanisms behind China’s knowledge economy transition should avoid determinism or singular, reductive explanations. For instance, scholars have identified several factors, such as human capital in knowledge economy transformation, but the role of these factors in the process of knowledge economy transition is not deterministic (Storper and Scott, 2008). We cannot assume that once a country or region possess sufficient human capital, the knowledge economy transition will occur. Rather, the knowledge economy transition is the result of an interplay of different causal forces and mechanisms, including human capital.

The other ontological foundation that critical realism provides for this research is its understanding of social structure and agency. In previous research, the confusion of social structure and agency usually leads to studies focusing on only one side of the two (Danermark and Ekström, 2019). For instance, some studies have argued that social facts only include social structures such as the state and the market, and that the behaviour of agents is merely subordinate to institutions (Danermark and Ekström, 2019). On the contrary, some scholars argue that social structure is mere the aggregation of agents’ action, which shows limited capacity to explain the relative stability of institutions over the long period (Danermark and Ekström, 2019).

Anthony Giddens developed the structuration theory to solve this problem, which treats social structure and agency as two sides of the same coin. Giddens argues that the key element of agency is the ability to act. When deciding to act, agency generally need to take advantage of resources and face the sanction from taking-for-granted rules (Danermark and Ekström, 2019). These resources and existing rules, as Giddens argues, constitute the social

structure (Archer, 1982; Danermark and Ekström, 2019). Therefore, social structure can restrict and facilitate agent's behaviour by influencing their daily practices, but it cannot exist independently of agency (Archer, 1982; Danermark and Ekström, 2019). Social structure develops, reproduces, or transforms when agency constantly reproduce or transform their practices. Although rightly emphasising the interactive relationship between social structure and agency, Archer (1982) offers the critique that the structuration theory cannot explain *when* will the agency reproduce or transform the social structure. Specifically, this duality of structure and agency's ontology cannot explain when the agency is transformative and when they are constrained by structure, which undermines its ability to explain social change (Archer, 1982). Danermark and Ekström (2019) suggest Giddens's theory also brings up a methodological problem. Recognising structure and agency as two sides of the same coin implies that when focusing on one side of structure or agency, the research must preclude the role of the other.

Like the structuration theory, critical realists also emphasise the interactive relationship between social structure and agency, for instance, structure can constrain or facilitate the behaviour of agency, and agents' behaviour in turn regenerate structure. However, critical realists argue that structure and agency are not two sides of the same coin, but two entities belonging to different social strata. Specifically, structure and agency are two entities with their own properties and causal powers. Therefore, on the one hand, agency can be constrained or enabled by pre-existing structure. On the other hand, agency can reproduce or transform the structure with their own causal powers.

Considering the structure and agency as two entities also allows for introducing the temporal dimension into the analysis, which answers the question of when agency reproduce or transform structure (Archer, 1982; Zeuner, 1999). Archer argues that there are three phases in the process of interaction between structure and agency (Archer, 1982; Danermark and Ekström, 2019). In the first phase, structure, which originates from previous agents' interaction and behaviour, already exists prior to agency. Consequently, the pre-existing structure provides the context and condition for agency by shaping the environment in which people find themselves and by influencing the interests that they have (Danermark and Ekström, 2019). In other words, pre-existing structure generates different types of agency with variant purposes and interests. In the second phase, the agency with different purposes and interests react and interact to the condition and context in which they are placed, which implies the social change does not occur to agency, but is made by agency (Danermark and Ekström, 2019; Sotarauta and Grillitsch, 2023). In this phase, some agents tend to maintain

the pre-existing structure, but others may tend to challenge or transform it. Therefore, in the third phase, structure will be maintained, reproduced, or transformed according to agents' action in the second phase. These reproduced or transformed structures will become the pre-existing structure for the next cycle of the interplay between structure and agency (Archer, 1982; Danermark and Ekström, 2019).

Bridge the Critical Realism and Process Tracing

Critical realism provides the ontological root for this research. Ontologically, this research sees China's knowledge economy as an open stratified industrial path creation process with emergent entities, complex causal forces, and mechanisms. Various actors emerge in this process, and exercising causal powers with their own intentions. Therefore, as critical realists suggest, exploring the process of China's knowledge economy transition should not focus only on agency or structure. The research should explore what and how agencies are conditioned by what structures, and how agencies interact and intervene this process with their causal powers.

This ontological stance therefore directs the analysis towards identifying what causal powers are play in China's industrial path creation (Sotarauta and Grillitsch, 2023). Taking China's knowledge economy as an open stratified industrial path creation process is actually examining how actors are conditioned, enabled, and constrained by existing structures, and change the economic, political and social structures over time, and thus investigating and exploring the causal forces and their interplay that influence and underpin the process of industrial path creation in China.

The process tracing, as an empirical method, can be particularly useful for such purposes (Sotarauta and Grillitsch, 2023). Process tracing is generally used for within-case analysis based on qualitative data, which aims at creating descriptive, causal inferences and causal mechanisms from diagnostic pieces of evidence, and illustrates how a potential cause or causes influence a specific process or set of changes (Collier, 2011; Bennett and Checkel, 2015). Although scholars have different definitions of process tracing, most of them agree that process tracing is a method about causal and temporal mechanisms (Trampusch and Palier, 2016). Using the process tracing in the industrial path creation enables the researcher to identify "sequences of events, phases of change, intentional activities and events by which paths unfold for developing or testing propositions about causal mechanisms" in an open-end and stratified world (Sotarauta and Grillitsch, 2023, p. 90).

The leverage of using process tracing to analyse China's knowledge economy transition lies in its capacity to build up the observable pattern of actors' action in the temporal dimension, based on abundant materials collected from documents, news, and interviews. This provides the foundation for analysing the relationship between agency and structure, and the causal forces that (in)activate the industrial path creation in China's context. The recurring causal tendencies found in several scenarios thus have the tendency to be formulated into general causal mechanisms (Sotarauta and Grillitsch, 2023). Thus, the method of process tracing shed light on understanding the industrial path creation by investigating and tracing the periodisation of industrial path creation and the main actors and their strategies in every period, and thus reveal the change in material and social world (Sotarauta and Grillitsch, 2023).

Steps of Process Tracing

The tracing of SEI creation and knowledge economy transition in Hefei, Hangzhou and Tianjin is structured as follows²¹. First, following up on theories on industrial path creation, the causal diagram, which posits that under specific preconditions, actors possessing change agency undertake actions that facilitate the creation of SEIs, was constructed (as shown in Figure 2-5). Moreover, Sotarauta and Grillitsch (2023) propose that tracing industrial creation should decide the starting point of path creation in time and justify it. Therefore, based on these premises, several sub-questions were raised and used to guide the data collection. These sub-questions primarily concern the city's preconditions for SEI's emergence, the actors involved in SEI creation, and their actions to facilitate the SEI creation; raising of which is not only an essential procedure for process tracking, but also provides guidance for subsequent data collection (Ricks and Liu, 2018). Specifically, some of the questions are used to identify the precondition of the city and trace the actors and their actions involved in SEI creation, which guide the data collection from policy document, yearbooks, reports and newspaper articles. Other questions are used to make up interview questions to trace actors' mindsets and intentions, which can be used to reveal actor's agency and its formation (see Appendix 2).

The questions used to identify the precondition of the city, trace the actors and their actions involved in SEI creation include:

²¹ This primarily referencing the step-by-step guideline in conducting process tracing method proposed by Ricks and Liu (2018), and path tracing proposed by Sotarauta and Grillitsch (2023).

- (a). What was the starting point for the creation of the first SEIs in these cities? What events marked the emergence of SEIs in the cities?
- (b). What markets, innovation resource stocks and institutional environment existed in cities prior to the emergence of SEIs?
- (c). Which actors emerged in the creation of the city's SEIs? How did these actors interact with pre-existing markets, resource stocks, and the institutional environments?
- (d). What marks the successful creation of an SEI?
- (e). What actions facilitated the creation of SEIs? Specifically, how did these actions facilitate the creation and development of SEIs?
- (f). After the first SEI was created, how did it impact the subsequent creation of SEIs in the city?

The questions used to trace actors' mindsets and intentions involved in SEI creation include:

- (g). Why did these actors have the mindset for creating SEIs?
- (h). Where did their agency come from?
- (i). How did institutions influence actors' agency and its formation?

According to the sub-questions list, three timelines demonstrating sequence of events of SEI creation in Hefei, Hangzhou and Tianjin were established, basically based on data collected from document and interview. The timeline of each city documents involved four elements: the exact date when an event occurred, the content of an event, actors involved in the event and notes of an event (i.e., why it was important, what was the relation between multiple events, how actors was actively or passively involved in the events). The timelines of city's SEI creation is developed to shows whether change happened and how and why changes occurred, as Sotarauta and Grillitsch (2023) suggest.

3.4 Data Collection Methods

This research mainly adopts the documentary research and in-depth interview as the data collection strategy. This documentary research is used for collecting data on the precondition

(innovation resource stock and institutional environment for instance) of each city and relevant events in their creation of SEIs. The particular attention is paid to identify actors evolved in these events, which enables the documentary research to provide the proof for identifying potential interviewees. The data collected from the documents are thus used to create the timeline of each city, thus providing the context for analysing the causal mechanisms of the creation of SEIs in each city. The in-depth interview is used not only to collect data on actions of key actors identifying in the documents (for cross-check and triangulation), but to collect data on the motivation of actors, which provides the base for analysing the agency formation process in the process of SEI creation in each city.

Documentary data collection

In terms of the documentary research, 576 documents in total were collected (shown in Table 3-1). These documentary materials mainly include three categories (five sub-categories specifically): the policy document published by the government²², these documents are used to understand the specific institutional environment of each city, as well as their strategies and formal institutional arrangements when facilitating the creation of SEIs. The policy documents basically collected through Pkulaw database and the official websites of each local government by using keywords like “industrial plan” (chanye guihua, 产业规划), “strategic emerging industries (zhanluexing xinxing chanye, 战略性新兴产业)”, “emerging industries (xinxing chanye, 新兴产业)” and the name of specific SEI²³, such as “Hefei flat-panel display (Hefei xinxing xianshi chanye, 合肥新兴显示产业)” or “Hangzhou digital economy (Hangzhou shuzi jingji, 杭州数字经济)”, in each case.

The yearbooks, including statistical yearbook and historical yearbook, provide rich urban data and historical materials for understanding SEI creation in each city. The statistical yearbook, issued by the local government and annually providing authoritative statistical data to reflect city’s economic and social development, offers data on each city’s population, GDP, area, and data related to SEIs such as output and added value. The historical yearbooks are also published by each city’s local government and used to record the significant events that occurred within the region during that year. The historical yearbooks can offer rich historical materials which enabled the understanding of each city’s precondition and search

²² In Hefei and Hangzhou’s case, this also includes the related policy documents published by the Anhui and Zhejiang provincial government.

²³ For instance, in Hefei’s case, flat-panel display industry is used as the keyword to search which documents are potentially related to the creation of flat-panel display industry in Hefei.

for the evidence to identify the starting point of SEI creation; Additionally, these yearbooks primarily document significant events related to social and economic development of city in every year. Thus, the historical yearbook provided the channel for identifying key events related to the creation of SEIs, the actors involved, and their actions in this process, constituting an important source for constructing timelines for three cities. When extracting data from historical yearbooks, beyond searching using keywords such as “emerging industries (xinxing chanye, 新兴产业), “innovation (chuangxin, 创新)”, or strategic emerging industries (zhanluexing xinxing chanye, 战略性新兴产业), more specialised search strategies was used, such as searching the names of specific emerging industries, the names of enterprises associated with those emerging industries, or the names of relevant actors derived from other data.

The reports and newspaper articles, mainly collected through online website searching, were strategically used to search for more events related to SEI creation, thereby helping to establish a more comprehensive timeline of each city’s SEI creation. Reports primarily include those delivered by specific leaders in the local government at government work conferences, sessions of the People’s Congress, or other formal occasions. Given the difficulty in directly conducting interviews with leaders in the local government, these reports are sometimes the most direct approach to know leaders’ mindsets and agency²⁴. For instance, in some reports, innovation and creating SEIs are explicitly proposed by the local leader(s) as the priorities for the local government’s economic work (in the coming year). Meanwhile, these reports provide channel for analysing the local leader(s)’ perspectives about economic and industrial development within the cities, and how they think the relationship between emerging and traditional industries. This can provide evidence for identifying whether local leaders wish to facilitate the creation of SEIs or not.

Newspaper articles are used to gather data regarding actors and their activities, thereby facilitating the process of identifying potential interviewees and enabling the establishment of a more comprehensive timeline of SEI creation in each city. Data collected from newspaper articles in some instances also reveal the mindset and agency of specific actors. For instance, officials in the local government may mention why they wished to facilitate the creation of SEIs under what circumstances. Moreover, the reports and news are used to cross-check data gathered from other sources. These reports and newspaper articles are all

²⁴ The other approach basically includes conducting interview with officials in the local government who are familiar with these top leaders.

published by government, government-led official media organisations, and reputable and widely recognised news organisations. The keywords used for searching reports were based on leader's name, and some leaders' reports were also included in the historical yearbooks. The keywords for searching for newspaper articles included the city's name with strategic emerging industries, emerging industry, or innovation (e.g., Hefei zhanluxing xinxing changye, 合肥战略性新兴产业), the city's name with the specific SEI (e.g., Hefei's chip industry), the city's name with the specific enterprise (e.g., Hefei and BOE, Hangzhou and Alibaba), or key events extracted from other sources. Reports and newspaper articles from independent or individual media sources have been deliberately eliminated to ensure data's reliability.

City	Policy document	Yearbook		Reports	Newspaper articles	Interview
		Statistical yearbook	City yearbook			
Hefei	68	7	27	7	144	7
Hangzhou	30	7	15	10	146	5
Tianjin	37	7	3	3	79	6

Table 3-1 Primary Data Collected for Case Studies

Semi-Structured Interviews

This research also adopted the semi-structured interview as the data collection strategy. The specific reason for using semi-structured interview for data collection is that despite data gathered from documents can be used to identify events and actors involved in the SEI creation, it is difficult to judge which events or actors are perceived by stakeholders as more significant for industrial path creation. Moreover, this research also aims to understand why change agency can be locally formed. Consequently, data concerning why actors involved in SEI creation were initially willing (or unwilling) to facilitate SEIs becomes exceptionally crucial. The in-depth interview provided such a channel: through interviewing with actors who (directly and indirectly) participated in SEI creation, and investigating not only their actions but their experiences, data related to how actors had change agency, and why they can possess such an agency can be collected.

18 in-depth interviews were conducted in three cities separately, including 7 interviews in Hefei, 5 interviews in Hangzhou, and 6 interviews in Tianjin²⁵ (For information on the interviewees, see Appendix 1). Regarding the growing international tensions (especially the technology war between United States and China), it has been more difficult for researchers, even as a Chinese citizen, studying or working in UK universities to do fieldwork in China. The escalating tensions of technology war made this research topic becoming even more politically sensitive to officials in the Chinese governments and other actors related to the local SEI creation. Moreover, it has been always difficult to recruit proper and relevant interviewees without establishing *guanxi* by local contacts when doing interview in China (Lawrence, 2022).

To solve these problems, the strategy for conducting interview was basically first establishing personal relationship with intermediators, the “gatekeeper”, who had relations with officials in the local government. In all three cases, the gatekeepers were contacted based on personal relationships, including but not limited to relationship with family members and supervisors. The selection of interviewees, on the one hand, was recommended by gatekeepers based on who know the process of SEI creation from both the public and private sectors. On the other hand, interviewees are selected according to the specific context of each city. For instance, as we can see in the literature and newspaper articles, Hefei’s SEI creation is strongly related to public investment, those working in related departments are considered as priority candidates for interview. The gatekeepers, in this circumstance, can help to get the access to conduct interview officials working in the departments related to SEI creation in the local government²⁶. This strategy ensures that every interviewee either directly participated in the creation of local SEIs or possesses sufficient knowledge of such a process. A snow-balling strategy was also used to get more chances for interview. On the other hand, it should be emphasised that although the existing interview data are sufficient to support this research, especially on the agency formation of key actors, future research would still benefit from the collection of additional interviews. This is not only because the creation of SEIs in China is an ongoing process, but also because the change of broader political economic context, such as the expansion of Party in China and intensifying

²⁵ In Tianjin, one interviewee participated in two interviews.

²⁶ In Hefei’s case, these departments include investment and funding-related departments (or enterprises) in Hefei High-tech Zone, Hefei Economic and Technological Development Zone, and Hefei Xinzhan High-tech Zone. In Hangzhou’s case, related departments include bureaus of economy and information from the Zhejiang provincial level to district level. In Tianjin’s case, these departments mainly include investment and funding-related departments in Tianjin Binhai New Area.

technology war between China and US, may exert new and as yet unrecognised influences on the creation of SEIs.

Every interview usually took 1–2 hours, within which the pre-prepared research profile and fieldwork question list were provided for the interviewees. Three techniques were used to maximise the time and facilitate the conversation. First, tailored questions were prepared according to the interviewee's status, position and working experience through learning the local knowledge before conducting interview. Second, in certain circumstances, the gatekeeper also attended the interview and assisted in the relationship building with interviewees. Thus, the trust with interviewees could be built up very quickly, through which more authentic and sometimes sensitive information can be accessed and obtained. The third technique is the sequence of asking questions. Specifically, easy and simple questions were asked at the beginning of the interview, which allowed the interviewees to be familiar with both the context and the interviewer. Once the trust was built, more probing questions were raised. In this way, interviewees are more likely to share their knowledge and experience.

3.5 Qualitative Content Analysis

The research adopted the qualitative content analysis method for analysing data. As shown above, this research aims at understanding the mechanism of SEI creation in China, rather than individual's perception and feeling about SEIs. Therefore, the research aims at analysing and interpreting the content of textual data and trying to find patterns and causal relationships in the content.

The data collected from documents and interviews were analysed in two steps. First, the data was read and re-read and meaningful passages was identified and selected by using the NVivo. When analysing policy documents, contents related to SEI creation, such as which specific SEI is planned to be cultivated and relevant policy tools for SEI creation, were highlighted in NVivo. Specific institutional settings which may potentially influence actors' behaviour (for instance, how the government will reward the behaviour of facilitating SEI creation) was also highlighted and notes were added. When analysing the reports and newspaper articles, three elements were highlighted in NVivo: the actors who evolved in the creation of SEIs, actions of those actors, and the condition (institutional and material) of what actions occurred. These highlighted passages were also used to construct the timeline and sequence of events of each city's SEI creation. When analysing the interview transcripts, beside the three elements mentioned above, the mindset, agency, and capacity of the actor

was prioritised and explored. Specifically, a thorough review of all transcripts was conducted to highlight direct quotes where interviewees reflected on their personal experiences, expressed their feelings, or explained their original intentions to create SEIs.

At the second step, these documents and interview transcripts were labelled by formulating codes and then grouping them into categories. According to the process tracing method and sub-question lists, three categories (with twelve sub-categories) were pre-identified to guide the data analysis (shown in Table 3-2). These categories constituted an important starting point for data coding and analysis because they provided an initial frame for systematically organising the data, linking empirical observations to the theoretical concepts of industrial path creation, and ensuring comparability across cases. The generation of categories, on the one hand, was basically following the industrial path creation theory. On the other hand, a clear distinction is drawn between the agency of local leader(s) and grassroots officials. As Ang (2016) suggests, grassroots officials are less likely to gain direct benefits from regional economic growth or industrial path creation. Therefore, it is necessary to examine the agency formation of leaders and grassroots officials separately. Moreover, as existing industrial path creation theory has limitations in fully explaining China's SEI creation and knowledge economy transition, the space for grounded knowledge was left by labelling new categories (such as agency formation).

Pre-identified categories	Pre-identified sub-categories
Precondition	Pre-existing market (opportunities)
	Innovation resource stock(s)
	Institutional environment
Actors' and their agency (innovative entrepreneurship, institutional entrepreneurship, place- based leadership)	Local government (Top leaders, Cadres and grassroots officials)
	Enterprises
	Universities
	Research institutes
	Other potential actors
Actions	Innovating
	Changing of institutions
	Identifying/constructing markets
	Anchoring/mobilising related assets

Table 3-2 Pre-Identified Categories and Sub-Categories

To ensure validity and reliability, the data was triangulated obtained from different sources. For instance, specific events and actors mentioned in the interview were cross-checked with data collected through yearbook or newspaper articles.

3.6 Conclusion

In short, the research aims to answer the question of how China makes the transition to the knowledge economy and why some cities can make but others cannot. To better answer this question, the case study research design and within-case process tracing were strategically deployed, aiming to extensively trace the causal mechanisms of how Hefei, Hangzhou and Tianjin could (or could not) facilitate the creation of SEIs in their regions. The choice of strategic emerging industry to represent China's knowledge economy transition is not only because of the innovation-intensive nature of these industries, and the significant impact of which to (future) economic growth, but also the fact that the creation of SEIs was relied on China's domestic technological progress and its industrialisation. The selection of cities takes the complexity and diversity of China's SEI creation into consideration. Hefei represents how a city can make the creation of SEIs and transition to the knowledge economy despite having very limited innovation resources pre-existing in the city. Hangzhou exemplifies how a city with abundant innovation resources can facilitate the creation of SEIs. Tianjin was chosen to explore why the city, despite having abundant innovation resources, failed to realise the knowledge economy transition.

After defining the cases, this research started to trace the processes of SEI creation in these three cities based on hypotheses and causal graph constructed from existing theories, and sub-questions list and timeline were then developed. The strategy of documentary research and in-depth interview were used to collect data to answer sub-questions. Data collected from different sources have been triangulated and cross-checked, and the qualitative content analysis method was used to analyse data.

Having outlined the use of critical realism and process tracing, and the particular methods deployed, the analysis now turns to the empirical part of this research. By systematically applying these methods, this research traces the processes of SEI creation in Hefei, Hangzhou, and Tianjin, and reveals the distinct pathways of transition to the knowledge economy in these three cities.

Chapter 4: Hefei: Rising from the Peripheral

This chapter seeks to analyse how the strategic emerging industries (SEIs) was created and developed in Hefei, based on the analytical framework outlined in Section 2.5. Hefei has garnered significant attention from news and media for the successes it has achieved over the past two decades (The Economist, 2023; Autor and Hanson, 2025). Recently, scholars just started to notice Hefei's successful experiences in technology innovation and economic transition (Lan, 2021; Jin, 2023; Liu, 2025). Since becoming the capital of Anhui Province in 1952, Hefei was traditionally considered a peripheral city in central China, once famous for its small size portrayed as “five avenues, fifty thousand population, and five square kilometers” (Liu, 2025). Until 2011, Hefei struggled to rank among the leading cities in terms of economic growth and GDP per capita, even compared to other central provincial capitals. Despite possessing well-known universities and research institutions such as the University of Science and Technology of China and the Institute of Materials Research of the Chinese Academy of Sciences since the 1970s, Hefei's primary industries at the end of the 20th century were still agriculture and low-end manufacturing, particularly clustered in the household appliance industry, which largely inherited industries transferred from coastal regions in the 1990s. After 2011, Hefei's economic growth began to accelerate significantly, and by 2021, its per capita GDP was approaching that of Wuhan, the largest city in central China (as shown in Figures 4-1). Even when China's economic growth rate declined across the board and entered the so-called “economic new normal” in 2014²⁷, Hefei's economic growth rate has generally remained above 11% (except for the impact of Covid-19 in 2020).

²⁷ The “economic new normal” was raised by President Xi Jinping in 2014. It means the growth of China's economy has shifted from the previous high speed to medium.

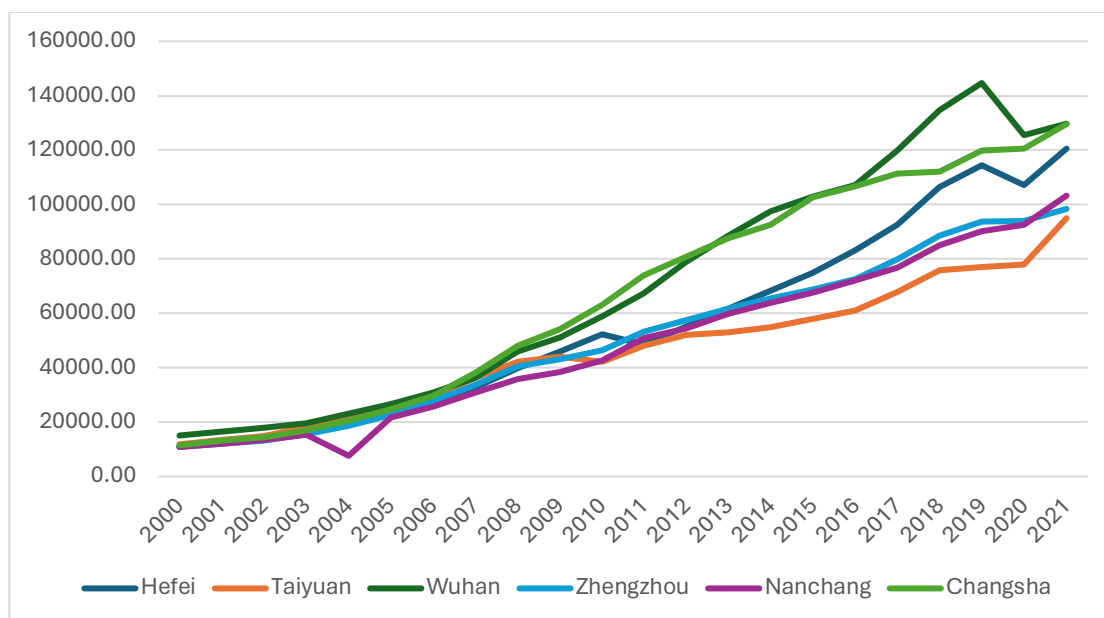


Figure 4-1 GDP Per Capita (Yuan) in Capital Cities of Six Central Provinces in China, 1998-2021 (Data Source: China City Statistical Yearbook from 2000 to 2021²⁸)

The remarkable economic growth of Hefei stems from its efforts to transition towards a knowledge-based economy. Over the past two decades, seven strategic emerging industries (SEIs) were created and developed in Hefei, including the flat-panel display (FPD), information and communication technology (ICT), and new energy vehicle industries. In recent years, the creation of SEIs started to rely on more cutting-edge technologies such as artificial intelligence, quantum computing and communication. Since 2013, the proportion of SEIs' added value in all industries increased from 27% to 42% in Hefei, and its proportion in GDP increased from 11% to 14% (see Figure 4-2). From 2012 to 2022, the proportion of technological inputs in Hefei's fiscal budget expenditure increased from 4% to 14.2%, and the proportion of R&D investment in GDP increased from 2.78% to 3.91% (Hefei Municipal Bureau of Statistics, 2022).

²⁸ China City Statistical Yearbook is published annually by the department of urban socio-economic surveys of national bureau of statistics.

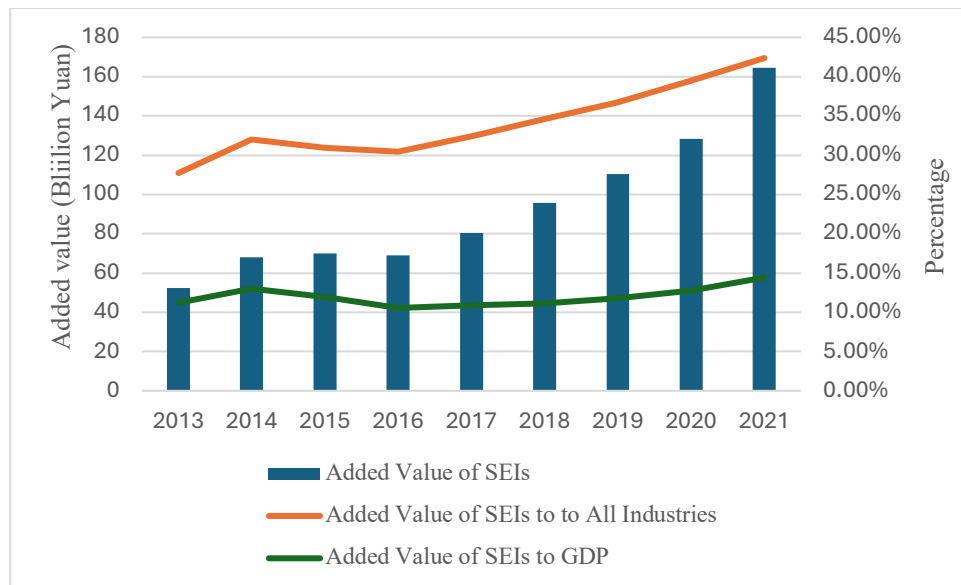


Figure 4-2 Data of Strategic Emerging Industries in Hefei, 2013-2021 (Data Source: Statistical Communiqué of the Hefei on the National Economic and Social Development from 2013 to 2021²⁹)

These SEIs, as shown below, were essentially created and developed by the local government through anchoring and mobilising resources from other regions. The creation of Hefei's SEIs can be traced back to 2008, when the city started to cooperate with BOE Technology Group and initiated the creation of FPD industry. Around 2010, the local municipal government attempted to make the breakthrough to create ICT industries, and anchoring and mobilising several enterprises from other regions such as Lenovo, Powerchip Technology and GigaDevice. After 2019, the local government turned its focus toward the new energy vehicle industry by establishing partnerships with companies including NIO, Huawei, and Volkswagen. Meanwhile, the local government started to explore regional and extra-regional cutting-edge technologies to create SEIs including artificial intelligence, quantum computing and communication.

Then, how did the local government create and develop SEIs in Hefei? To answer this question, this chapter will first review the precondition in Hefei before the development of strategic emerging industries, showing Hefei's resources, industrial base, and institutional environment prior to the creation of its first SEI. The second section demonstrates the process of agency formation, and how change agency (innovative entrepreneurship, institutional entrepreneurship, and place-based leadership) was formed in the local government in Hefei. The third section reviews the efforts made by the local government to

²⁹ For Communiqué of the Hefei on the National Economic and Social Development, see <https://tjj.hefei.gov.cn/tjyw/tjgb/index.html>

facilitate the creation of SEIs, and demonstrates why the creation of SEIs in Hefei was primarily a process of resource anchoring and mobilisation. This chapter concludes with an outline of the process of Hefei's SEI creation and discusses key elements in how Hefei can make the knowledge economy transition despite initially being a peripheral city.

4.1 Precondition: Hefei as a Peripheral City

This section aims to objectively present the initial conditions for the creation and development of SEIs in Hefei prior to 2008³⁰. This section will focus on demonstrating Hefei's industrial base (and corresponding market opportunities), innovation resource stocks, and institutional environment. Compared to Hangzhou or Tianjin, Hefei, as an inland city in China, had relatively limited industrial bases and innovation resources at the beginning of the 21st century. This is because Hefei did not inherit the legacy of the planned economy like Tianjin, nor did it benefit from the opportunities and development brought by reform and opening-up like Hangzhou. Therefore, if only considering the initial conditions, Hefei faces the greatest challenges among these three cities in creating and developing SEIs.

Industrial Base and Innovation Resource Stock

Hefei's industrial base in the early 21st century was primarily concentrated in the home appliance industry. When it became the provincial capital of Anhui in 1952, as mentioned earlier, Hefei was regarded as China's largest "county" (HF01; Liu, 2025), with few manufacturing enterprises within its region. By the 1960s, under the command of the central government, dozens of state-owned enterprises in light industries were relocated to Hefei from Shanghai, constituting the primary industrial base of Hefei during the planned economy era (Liu, 2025). After the reform and opening-up, some of these state-owned enterprises were reformed and started to produce home appliances such as televisions, washing machines, refrigerators and air conditioners (ibid.). At the very beginning of the 21st century, due to the increase in land and labour costs in the southeastern coastal areas in China, many labour-intensive industries started to migrate to the inland provinces of China. Hefei seized this opportunity with the strategy of "building an industrial city (*gongye lishi* 工业立市)" and mobilised more domestic and foreign household appliance companies to invest in Hefei. In a very short period, an agglomeration of household appliance industries was formed in

³⁰ The year 2008 was chosen as the time point because Hefei's first SEI, the FPD industry was created in 2008.

Hefei. Industries specialising in the production of televisions, refrigerators, and air conditioners became Hefei's main industrial base (Liu, 2025; HF04).

The household appliance industry created the local market for industries from upstream, such as display panel and integrated circuits (IC). However, these markets were primarily monopolised by foreign companies. This was not only the case in Hefei but also for all Chinese companies engaged in the home appliance industry at that time: in the early 21st century, the supply of core components, such as chips and displays, which accounted for the majority of profits in the home appliance industry, was heavily reliant on imports from foreign companies (Lan, 2021). For instance, the liquid crystal display (LCD) panel, which is the core component of television, was monopolised by Japan, South Korea, and Taiwan province of China at that time. The LCD panels produced by these countries and regions account for over 90% of the global market, and in 2012, mainland China still needed to import LCD panels valued at 50 billion US dollars, only less than the bill for integrated circuits, petroleum, and iron ore (Lan, 2021).

Prior to 2008, Hefei lacked innovation resources for the creation of SEIs. Initially, Hefei lacked leading enterprises with innovative capabilities³¹. As mentioned earlier, Hefei's industrial base was primarily concentrated in labour-intensive household appliance manufacturing. On the other hand, the city inherited some highly innovative universities and research institutions, such as the University of Science and Technology of China (USTC) and the Hefei Institute of Physical Science of the Chinese Academy of Sciences, from the planned economy era. However, these organisations and their innovations (such as nuclear fusion technology, quantum communication, and quantum computing) were far away from the local industrial base and thus difficult to industrialise in the early 21st century in Hefei³² (HF03). Thus, despite their innovative capabilities, these organisations were difficult to be recognised as resources for SEI creation at the very beginning.

The Insitutional Environment

The formal institutional environment before 2008 was conducive to the creation of SEIs in Hefei. In 2003, following the recommendation of local researchers, the top leaders of Anhui Province and Hefei government proposed the political vision of establishing Hefei as “a pilot city for science and technology innovation city (keji chuangxin xing chengshi shidian shi,

³¹ Such us companies like Alibaba in Hangzhou's case.

³² Some industries, such as quantum communication, only began to show trends toward commercialisation and industrialisation in the very recent years.

科技创新型城市试点市)” (hereafter the Pilot City), as part of a plan to drive Hefei’s economic growth through scientific and technological innovation (Anhui Technology, 2004; Lu, Dai and Zhou, 2005). This plan was quickly noticed by the the Ministry of Science and Technology (MOST) of the central government which proposed the “Rise of the Central Region strategy (zhongbu jueqi zhanlue, 中部崛起战略)” in 2004 (Anhui Technology, 2004; Ding and Yi, 2004; Ministry of Science and Technology, 2005). At the same year, the “science and technology innovation city” plan was officially added to the “861 Action Plan” issued by the Anhui Government³³ (Anhui Provincial Government, 2005; Wang, 2006).

Driven by targets set by the upper-level government, the Hefei municipal government formed a special leader group, and attempted to use the monetary incentive to promote the implementation of the Pilot City project (Office of the Hefei Municipal Government, 2006). To do so, Hefei established a special fund mainly based on local fiscal revenue, and institutionalised the management, operation, and use of this special fund through a series of policies. For instance, the special fund could be used as start-up funds, loan interest compensation, or rewards for projects related to the construction of the Pilot City if systematically reviewed and approved (Office of the Hefei Municipal Government, 2006). Based on the special funds, the local government began to set up some research centers with enterprises and research institutions, or multinational corporations, including the Institute of Circular Economy of the Chinese Academy of Sciences, Hefei Microsoft Technology Center, and the Automotive Engineering Research Institute of Hefei University of Technology (Hefei Development and Reform Commission, 2007).

However, the Pilot City project just played a limited role in SEI creation. From 2005 to 2007, the Hefei municipal government initiated the “121 Project” to promote industrialisation in Hefei³⁴. It can be observed that over 75% projects in the “121 Project” were related to Hefei’s traditional industries (household appliances, agriculture, automobiles) among the 40 key projects, but the majority of projects related to the Pilot City were not included in the “121 project” system (Hefei Municipal Economic Commission, 2008, 2009). Therefore, although the Pilot City project did attract some innovation-related companies into Hefei, it did not directly facilitate the SEI creation and knowledge economy transtion.

³³ The main goal of “861” Action Plan is to systematically promote industrialisation and accelerate economic growth in Anhui Province through the construction of a series of “major projects”.

³⁴ The “121 Project” was the project initiated by the local government, and it included forty projects which were considered to be able to dramatically facilitate the progress of industrialisation and economic growth of the city in each year.

In terms of the informal institutional environment, some norms or habits, such as official corruption, rent-seeking, and idling, hindered the creation and development of SEIs (HF01). In the early 21st century, the most challenging issue in Hefei was not economic development but illegal construction within the city, which was found to pollute Hefei's natural as well as investment environment (Hua, Wang and Fan, 2006). This issue was caused by two main reasons: on the one hand, some officials engaged in the illegal construction as a form of corruption³⁵; on the other hand, and more importantly, most cadres and grassroot officials in the local government were reluctant to take action and neglected their duty (Hua, Wang and Fan, 2006).

Consequently, we can see that although some formal institutions conducive to the creation of SEIs began to be established before 2008, Hefei, as a peripheral city, faced numerous difficulties in creating SEIs at the very beginning. These included a lack of innovation resource stocks, the monopolisation of technology and markets by foreign or multinational companies, and the existence of "bad conduct" and habits within the local government.

4.2 The Turning Point: The Local Government Being "Active"

The success of Hefei's SEI creation is attributed by scholars to the presence of a "proactive" local government (HF03; HE06; Liu, 2025). Just as scholars have argued, the formation of change agency in the local government was the "turning point" of Hefei's industrial development and economic growth. However, there is currently little understanding of why Hefei's local government differed from those in other peripheral regions and could gain change agency to proactively facilitate or even lead the creation of SEIs. Therefore, this section will demystify how change agency was formed in the local government.

The initial idea to create SEIs came from the top leader in the local government. In 2005, Sun Jinlong, former Standing Secretary of the Central Committee of the Communist Youth League, became the Secretary of the Hefei Municipal Party Committee. Upon taking the position, Sun Jinlong personally showed a keen interest in innovation, technology, and facilitating local economic growth through emerging industries. For instance, in 2005, shortly after Sun Jinlong became the Municipal Party Secretary, he noted at a government work meeting that: "I have a dream of electronic information, I have a dream of integrated

³⁵ This also led to a significant number of citizens imitating the behaviour of officials and engaging in illegal construction.

circuits” (HF07). The top leader’s personal mindset became the “spark” that ignited the formation of change agency in the local government³⁶.

The elimination of officials’ bad habits and “bad conduct”, such as corruption, rent-seeking and dereliction of duty, became the prerequisite for the downward diffusion of the top leader’s innovative entrepreneurship. As mentioned above, in the early 21st century, the illegal construction, caused by officials’ corruption, rent-seeking and dereliction of duty, was the most challenging issue in Hefei (HF01; Qian, 2005; Wang, Chen and Dai, 2005; Yang, 2005; Hua, Wang and Fan, 2006). In 2005, only two months after taking the position of Party Secretary, Secretary Sun Jinlong initiated the “large-scale demolition of illegal constructions” (da chai wei, 大拆违) campaign, which was viewed as an important opportunity to punish corruption and mobilise officials (Hua, Wang and Fan, 2006). In practice, a number of senior officials involved in corruption and rent-seeking were punished, which served as a deterrent to others (Qian, 2005). Meanwhile, Secretary Sun, as the direct leader of the campaign, participated in the front-line work of demolishing illegal structures, mobilising a large number of cadres and grassroot officials and encouraging them to “began to have the willingness to develop” (HF01). Ultimately, Hefei completed the demolition of approximately 13.8 million square metres of illegal structures within a year³⁷ (Hua, Wang and Fan, 2006, p. 43). This campaign was then described as “a ‘crucible’ that forged a norm of good conduct by local officials” (Hua, Wang and Fan, 2006, p. 33).

The top leader’s innovative entrepreneurship was primarily diffused downward through locally embedded formal and informal institutions after eliminating the “bad conduct”. In terms of the formal institutions, the local government established a performance evaluation system for cadres, formally implementing the diffusion of the top leader’s personal innovative entrepreneurship. Specifically, quantified indicators related to technology, innovation, and SEIs, were added to evaluate the performance of cadres in relevant departments (HF04; HF05). For instance, officials from the Party Secretary of Hefei Municipal Government to leaders of various districts and counties, as well as cadres responsible for investment promotion, economic development, and industrial development,

³⁶ However, individual’s innovative entrepreneurship alone is not sufficient to facilitate the creation of SEIs within a region, even when it originates from the top leader. This is fundamentally determined by the characteristics of Hefei as the peripheral city: individual’s innovative entrepreneurship cannot change the fact that Hefei was still lacking innovation resources, and relying solely on individual efforts is insufficient to mobilise the necessary quantity and quality of innovative resources for SEI creation. Therefore, the creation of SEIs is only possible when more actors have the “mindset” and innovative entrepreneurship.

³⁷ In 2006, the total new construction area in Hefei was only 26.09 million square metres, the demolition area accounting for 53% of the new construction area.

were required to complete investigation and evaluation of a certain number of technologies within a specific timeframe (weekly or quarterly). This requires cadres not only to have knowledge of technologies but also to be aware of the prospects for the industrialisation of these technologies and whether they could be used to locally create SEIs (HF04; HF05). Additionally, the number of times cadres participate in technology mobilisation and the reservation of sub-regional potential technological companies were also included in the formal evaluation system (HF05). On the other hand, cadres in the local government were required to submit formal written reports after their investigation of technologies and industries. These reports were regularly recorded, shared, and appraised (HF04; HF05). As the interviewee noted:

“Under such an insitutional arrangement, from the municipal party secretary to cadres in various relevant departments, they all needed to participate in the creation of SEIs to meet the assessment requirements (HF05).”

However, what was transmitted by the formal evaluation system was the “pressure”, which is fundamentally distinct from “agency”: in the formal evaluation system, actors demonstrated more that they “have to act” rather than that they have the “will to act”. Therefore, relying solely on the formal evaluation system to discipline cadres’ behaviour, could have lead to “pointless formalities”³⁸ and “prioritizing superiors’ opinions over realities (wei shang bu wei shi, 唯上不唯实)”³⁹, thereby distorting the transmission and diffusion of the innovative entrepreneurship (He, 2021).

The informal praise and promotion system complemented deficiencies of the formal evaluation system, and helped to transfer officials’ behaviour from “having to act” to “being willing to act”. Over the past decade, higher-level officials gradually established such a norm: they tended to evaluate their subordinates based on how well the lower-level officials understood or to what extent they knew the technology and SEIs in Hefei (HF01; HF04; HF05). Such evaluations were particularly prevalent in the contexts where higher-level officials, through informal observation and conversation, tried to judge whether the lower-level officials deserved to be promoted (HF01). Consequently, cadres and grassroot officials

³⁸ Pointless formality refers specifically to officials replacing real action with grandiose formalities. For instance, they may use false data, reports, and materials to cheat, which allows them to easily achieve excellent results in formal evaluations. But it will prevent the real policy implementation or creation of SEIs.

³⁹ This describes a working style where officials blindly follow directives from higher authorities while ignoring actual facts, practical needs, or ground-level truths. It implies a rigid adherence to hierarchical authority at the expense of objectivity and practicality, often leading to inefficient or unrealistic outcomes in the policy implementation.

who were more familiar with technology, markets, and local SEIs were more likely to receive praise and get promotion (HF01). This then encouraged more cadres and grassroots officials to actively engage in SEI creation (HF01).

The continuous development of SEIs in Hefei further solidified this informal reward and promotion system, thus forming a virtuous cycle. When other cities in Anhui Province found Hefei's cadres and grassroots officials had the ability to facilitate SEI creation, these cities' government were more willing to use Hefei's cadres or grassroots officials as their leaders to drive SEIs creation; this provided Hefei's cadres and grassroots officials with more opportunities of promotion (HF01). Thus, the increase in promotion opportunities further motivated officials in the Hefei government to more proactively participate in the creation of SEIs. Therefore:

“Under the influence of these informal norms and rules, officials in the local government demonstrated a strong desire for ‘development’. Cadres and grassroots officials began to proactively learn technology and industry, even doing research on it (HF01).”

The establishment of a “tolerance of failure” system also enabled and facilitated the downward diffusion of innovative entrepreneurship⁴⁰. After the 18th National Congress of the Communist Party of China, the Party Central Committee and the central government placed greater emphasis on “accountability”, which manifested itself in local governments as “everything must have someone responsible for it, and when problems arise, someone must take responsibility” (He, 2021). In general, overemphasizing accountability and supervision means the centralisation of power and thus reducing the agency of officials at the local level (Zhao, 2019; He, 2021). However, in Hefei government, the element of “tolerance to failure” was added into the design and operation of the accountability system, particularly by leaving room for unintended mistakes, avoided the potential damage to innovative entrepreneurship diffusion. As shown below, in the creation of SEIs in Hefei, due to the lack of sufficient innovation resources within the region, officials needed to mobilise extra-regional resources and enterprises by strategically using state-owned assets. But if these mobilised enterprises failed or bankrupted⁴¹ in the process of SEI creation, officials could have faced the accusation of “causing the loss of state-owned assets” (HF05)⁴². In the

⁴⁰ The “tolerance of failure” system has both the formal and informal elements.

⁴¹ After all, investments in emerging technologies always carry high risks.

⁴² Depending on the severity of the situation, this will not only affect the career of the official, but may also result in penalties under party regulations or even criminal law. Therefore, when the central government overemphasised accountability, some local officials chose to remain inactive rather than take the risk of making mistakes.

operation of Hefei's accountability system, even if the above situation occurred, the local government would first investigate the investment decisions and processes. If the officials' decisions complied with procedures and there was no corruption or rent-seeking behaviour, the officials who used the state-owned assets to mobilise resources would not be penalised for failure (HF01; HF05). In other words, the accountability system was not intended to find a "scapegoat" for failures that may occur during industrial path creation. On the contrary, these failed attempts were viewed as a means of diversifying risks (HF04). For instance, when creating the FPD industry, officials in the local government simultaneously invested in both TFT-LCD and plasma display technologies⁴³. This approach described by local officials as "putting eggs in different baskets". Officials who made the "wrong" decision were thus protected rather than punished by higher-level leaders (HF01; HF04). Therefore, when such a "tolerance of failure" system was established alongside the accountability system, officials were encouraged to take greater risks in the creation of SEIs, without overly worrying that unintended mistakes might impact their careers.

It can be observed that capability was also diffused downward alongside innovative entrepreneurship. These capabilities included learning (innovation and technologies), sensing (local and national market opportunities), coordinating (with innovative enterprises and other actors), seizing (anchoring and mobilising resources in proper time), and reconfiguring (regional assets to ensure their compatibility with SEIs). Once again, these capabilities were diffused from the top leader through the formal evaluation system and the informal reward and promotion system⁴⁴ (HF01; HF04; HF05). Therefore, officials in this scenario were thus not traditional "technocrats". Instead, they should better be labelled as "techno-internalised bureaucrats": officials in Hefei government acquired knowledge and skills related to technology and SEIs creation after they entered the bureaucratic system⁴⁵, rather than becoming technical experts prior to participating in the governance of industrial path creation.

Another notable phenomenon was that the diffusion of innovative entrepreneurship (and capabilities) within the Hefei government was not interrupted by the turnover of the local

⁴³ Only the TFT-LCD survived and facilitated the creation of FPD industry in Hefei.

⁴⁴ In Hefei's SEI creation, only few local leaders initially possessed these capabilities. However, with the establishment of these institutions, more local cadres and grassroot officials began to actively acquire the capabilities in order to meet assessment requirements or seek promotion opportunities, leading to the downward diffusion of capabilities.

⁴⁵ Although this benefits from the local government having preference for officials with education background in Science, Technology, Engineering, and Mathematics (HF01).

leadership⁴⁶. This is because in the local government, there existed channels for bottom-up transmission of innovative entrepreneurship (and capabilities). In general, the creation of SEIs can be easily interrupted by the turnover of leadership⁴⁷. This is because the creation of SEIs typically involves significant investment, high risks, and is unlikely to gain returns for regional economic growth in the short term; however, top leaders in the local government need to facilitate rapid economic growth to achieve their personal promotion. From this perspective, the creation of SEIs conflicts with the personal interests of top leaders. Therefore, new local leaders may choose to develop industries that can rapidly facilitate economic growth in the short term (such as real estate and traditional manufacturing) to pursue personal promotion, and the creation of SEIs may thus be eliminated from the regional development plan⁴⁸. However, this scenario was rare in Hefei's local government. This does not imply that Hefei's top leaders did not pursue economic growth or personal promotion (HF05). However, when new top leaders overly pursued economic growth while neglecting the creation of SEIs, lower-level officials, especially those appointed as "second-in-command", influenced the mindset and behaviour of the new top leader (HF04; HF05). As one interviewee noted:

"At the very beginning, new leaders were unfamiliar with SEIs. Officials responsible for the economy, industrial development, and state-owned asset management would assist them in learning (relevant knowledge), and even 'brainwashed' them, conveying the importance of SEIs creation to prevent new leaders from stopping creation of SEIs. Therefore, despite the fact that the Hefei Municipal Government has seen four or five changes in its Party Secretary over the past decade, the strategic focus on creating and developing SEIs has remained unchanged. (HF04)"

⁴⁶ "Carry forward the work from one administration to the next, and work with the same blueprint until the goal is reached (yiren jiezhe yiren gan, yizhang lantu hui daodi, 一任接着一任干, 一张蓝图绘到底)", namely "the successor top leader was able to maintain the development strategy of the previous leader and persist in the creation of SEIs" is considered an important reason for the success of SEI creation in Hefei.

⁴⁷ The case of how the turnover of the leadership interrupts the diffusion of innovative entrepreneurship can be found in Chapter 6.

⁴⁸ This conflict is particularly likely to occur between the first leader who viewed SEI creation as the development strategy and his/her successor. This is because the creation of SEIs initially brings high risks (high investment, full of uncertainty) but cannot contribute to economic growth in a short term. When SEIs continue to develop and become profitable and generate economic growth, top leaders will become less likely to oppose the creation of SEIs.

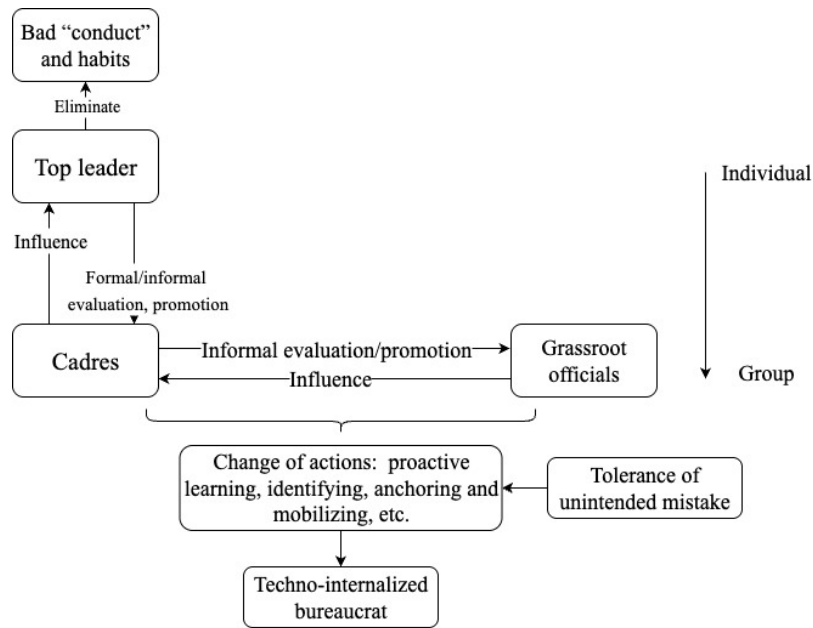


Figure 4-3 The Diffusion of Innovative Entrepreneurship (and Capabilities) in Hefei's Local Government (Source: the Author)

In short, as shown in Figure 4-3, the formation of change agency within the local government of Hefei was an endogenous process. At the very beginning, the vision and ideas for developing SEIs originated from a specific local leader. The diffusion of innovative entrepreneurship required the elimination of the bad conduct and habits, such as corruption, rent-seeking, and dereliction of duty; additionally, it required the top leader(s) to act as the institutional entrepreneur, establishing corresponding formal and informal systems related to the evaluation, praise, and promotion of cadres and grassroot officials. To meet evaluation requirements or seek promotion opportunities, cadres and grassroot officials thus had to change their behaviour patterns, for instance, shifting from dereliction of duty to actively learning technological and industrial creation-related knowledge, participating in market investigation and identifying opportunities, and facilitating the anchoring and mobilisation of innovation resources from other regions. In this process, cadres and grassroot officials also gained the capability to facilitate the creation and development of SEIs. Furthermore, leaving room for unintended mistakes ensured that the strict accountability system did not hinder the sustained diffusion of innovative entrepreneurship. Once the mindset of creating SEIs was widely diffused and became the collective vision of most officials within the local government, a bottom-up diffusion channel for innovative entrepreneurship became possible: this ensured that the development strategy of facilitating economic growth through SEIs creation would not be interrupted by the turnover of leadership.

4.3 SEI creation: A Government-led Process

The creation of SEIs in Hefei was a government-led process: once innovative entrepreneurship had been widely formed in the local government, the local government played the role of place-based leader and institutional entrepreneur to facilitate the creation of SEIs. As discussed above, before 2008, Hefei suffered from the lack of industry-specific innovation resources that could be used to create SEIs. Therefore, to facilitate the creation of SEIs, local government officials began to actively search (local) market opportunities, anchor and mobilise innovation resources from other regions, and engage in institutional reforms.

Local Government as the Place-based Leader

The local government in Hefei's case simultaneously acted as the place-based leader in the creation of SEIs. This was determined by Hefei's initial condition as a peripheral city: due to the lack of innovation resource stocks at the very beginning, the local government needed to anchor and mobilise the resources that could be used to create SEIs. In Hefei's case, the creation of SEIs thus followed this process: the local government first anchored and mobilised key innovative enterprises in the SEI it wanted to create⁴⁹, then attracted more upstream and downstream enterprises related to the key enterprise, and ultimately formed a complete industrial chain for the relevant SEI within the region.

FPD Industry

The creation of the FPD industry in Hefei originated from the local government's proactive exploration of the regional market opportunities: officials in the local government wanted to make some breakthroughs in the SEI creation, so they first conduct some surveys of the preexisting market opportunities. As noted above, at the beginning of the 21st century, Hefei's main industrial base was the home appliance industry (Liu, 2008). Televisions were one of Hefei's main industrial products at that time. During the survey, officials found that one out of every four televisions produced in China came from Hefei (HF04). However, local television manufacturers heavily relied on imported display screens from other regions and countries: "The display screen self-sufficiency rate for colour televisions in Hefei is

⁴⁹ In some cases, the local government will firstly search and identify the market opportunity within the region. If the market opportunity has been identified, the local government can use this to persuade anchored enterprises and thus increase the possibility to mobilise resources from other regions.

extremely low (HF04)”. This identification of demand and potential market opportunities prompted the local government to seek breakthroughs in the FPD industry.

After identifying the market, officials in the local government began actively seeking and anchoring the innovative resources. In 2003, some local leaders used their personal network to try to establish contact with BOE Technology Group (BOE), one of the few companies in mainland China that mastered the technology for producing TFT-LCD panels (Yi, 2023). The story between Hefei and BOE, regarded as the creation of the FPD industry in Hefei, has been thoroughly narrated by the media, as well as in Lan’s book (2021). In brief, although local officials had established contacts with BOE through personal social networks in 2004, Hefei was not BOE’s first choice to cooperate with. BOE had attempted to establish a sixth-generation TFT-LCD production line in cooperation with the Shenzhen and Shanghai twice between 2005 and 2007, but both attempts ended in failure due to the intervention of Sharp from Japan⁵⁰ (Lan, 2021). In the middle of 2008, the sudden global financial crisis caused a substantial drop in demand for LCD panels, which caused BOE to transition from a profitable state to massive losses in just two months (Q. Li, 2008; Lan, 2021). In this situation, most local governments were also concerned about the excessive investment risk and then were unwilling to cooperate with BOE (S. Li, 2008). In this scenario, despite facing greater financial risks due to the lack of funds compared to Shenzhen and Shanghai, Hefei government still chose to collaborate with BOE to build the sixth-generation TFT-LCD production line project (6th generation line project).

How the local government decided to choose and mobilised BOE is worth discussing⁵¹. In terms of the decision-making, as a peripheral city, in 2008, Hefei’s total fiscal revenue was 30 billion yuan, with local fiscal revenue being only 16 billion yuan, while the 6th generation line project required at least 17.5 billion yuan (Pan, 2008; Lan, 2021; HF04). In this circumstance, investing in the 6th generation line project is an extremely risky endeavour. To ensure the rationality of the investment decision, local leaders proactively learned the relevant technology and industry knowledge and were willing to bear the risks associated with project failure (for instance, the impact on their personal careers) (HF01; HF02; HF04). On the other hand, there was a collective decision making process on such a high-risk project:

⁵⁰ When BOE proposed to cooperate with the local government, Sharp also followed by showing willingness to invest in the local new generation of LCD panel production line. Because Sharp’s technology is more advanced, Shenzhen and Shanghai have chosen to cooperate with Sharp rather than BOE. However, after kicking BOE out, Sharp soon stopped co-operating with Shenzhen and Shanghai to maintain its monopoly (Lan, 2021).

⁵¹ Because the mobilisation of BOE had a profound impact on subsequent institutional reforms, as shown in Section 4.3.2.

before making final decisions, the local government the local government held an enlarged meeting of the standing committee of the municipal party committee, which included leading officials from the Hefei Municipal Party Committee, the Standing Committee of the Municipal People's Congress, the Municipal Government, as well as leading officials from the districts, counties, development zones and municipal departments under the jurisdiction of Hefei⁵² (Hefei Development and Reform Commission, 2009d).

BOE, the key innovative enterprise for creating FPD industry, was mobilised to Hefei through equity investment with state-owned assets⁵³, which making the Hefei government's collaboration with BOE resembled more of a partnership between businesses (State-owned Assets Supervision and Administration Commission of Hefei Municipal Government, 2009; HF04). In 2008, Hefei provided BOE with 6 billion yuan through its state-owned asset management company by means of equity purchase, and together they established a company to support the 6th generation TFT-LCD project; this funding also served as the initial capital for the new project (State-owned Assets Supervision and Administration Commission of Hefei Municipal Government, 2009; HF04). Subsequently, the Hefei government collaborated with BOE to raise the remaining funds necessary for the industrialisation of new technologies through the financial markets (State-owned Assets Supervision and Administration Commission of Hefei Municipal Government, 2009). Unlike typical corporate partnerships, the local government did not seek to claim technology property rights or the management rights of the company, despite its holding an 81% equity stake at the first time. As the new project achieved mass production within two years, the Hefei government quickly sold its shares of BOE through the financial market, thereby realising an increase of state assets (HF04; HF07).

After completing the 6th generation line project, the local government reached more cooperations with BOE through the same way of state-owned asset equity investment. In 2009, the Hefei government and BOE jointly established Hefei Xinsheng Optoelectronic Technology Campony (Hefei Xinsheng, 合肥鑫晟), which served as the main entity for the new 8.5th generation TFT-LCD production line project (8.5th generation line project). Before obtaining approval from the central government in 2012, the Hefei government had

⁵² Due to the success of BOE's 6th generation line project, proactive learning has become a habit among local leaders, and the collective decision-making on high-risk and important project has also been retained in the proceeding creation of SEIs in Hefei.

⁵³ This does not imply the local government did not provide other services to mobilise BOE. For instance, the local government provided quick approval service for BOE and upstream and downstream enterprises, as well as applied tax exemption for Importing equipment of the 6th generation line project (Hefei Development and Reform Commission, 2009c, 2009a, 2009b).

already used administrative resources within the region to assist Hefei Xinsheng in gaining local government approvals and related infrastructure construction (Wang and Yang, 2009). After obtaining approval, Hefei also adopted equity investment to provide initial funding for the project. In addition to the fiscal expenditure of 4 billion yuan, the Hefei government participated in BOE's directional private placement in 2014 through an investment company under the State-Owned Assets Supervision and Administration Commission (SASAC), injecting 6 billion yuan into the 8.5th generation line project (Ming, 2012; Hefei Municipal Public Resources Trading Supervision and Administration Bureau, 2014; HF07). After obtaining sufficient start-up funds, BOE quickly injected the funds, personnel, and corresponding technology required for the project construction into Hefei Xinsheng. As a result, the 8.5th generation line project was put into mass production within 16 months after obtaining approval. In 2015, Hefei initiated cooperation with BOE in the same manner to launch the 10.5th generation line project, the world's first tenth-generation TFT-LCD production line (Reuters, 2015; Yan, 2015; Wang and Liu, 2022). Driven by these projects, a large number of upstream and downstream enterprises related to display panel production gathered in Hefei, ultimately promoting the development of Hefei's FPD industry (Hefei Industry and Informatization Bureau, 2016). Furthermore, because Hefei focused on local industrial development rather than holding shares in individual enterprises, it quickly sold its holdings in BOE after the lock-up period, which is estimated to have brought Hefei at least over 14 billion yuan in profits (HF07). In short, in the three cooperations, the local government has invested more than 100 billion Yuan in BOE through state-owned assets, and these investments:

“have brought Hefei with over 200 upstream and downstream enterprises engaged in the FPD industry, increase of state-owned assets, and a comprehensive industrial chain that can complete the ‘from sand to final products’ production. Furthermore, the creation of FPD industry also provides the market for chip industry (HF04).”

ICT Industry

The creation of the ICT industry in Hefei was also a process in which the local government explored the market and actively sought, anchored, and mobilised resources. The ICT industry in Hefei originated from the low-end electronic information manufacturing sector, which can be traced back to 2006. In 2006, several ICT-related companies began to build their factories in Hefei and produced circuit boards and power managers for air conditioners or refrigerators. In the same year, motivated by municipal leaders, officials in Hefei

Economic and Technological Development Zone (HETDZ) formulated a plan for the ICT industry in 2006 and began actively seeking suitable enterprises (HF01). Accidentally, officials found Huntkey (Hangjia Dianzi, 航嘉电子) among these ICT-related companies. This company, came from Shenzhen, had the technology for producing power manager chips for home appliances and personal computers (PC), but intended to leave Hefei as it was facing operational difficulties and not optimistic for the future of Hefei's ICT industry. Officials in HETDZ, with the mindset of creating ICT industries, persuaded Huntkey to stay:

“It was by chance that we were acknowledged that the Huntkey wanted to withdraw. We made relations with their leaders, and told them we had a big plan and ambition to create ICT industry in the region. They were eventually persuaded and even increased their investment in HETDZ. (HF01)”

The stay of the Huntkey became the window of opportunity. With their good *guanxi* with Huntkey, local officials got the chance to make contact with its client, Baolongda (Shenzhen), which was responsible for contract manufacturing of laptops for Lenovo. Thereafter, the connection with Baolongda helped the local government have the chance to anchor and mobilise Lenovo into the city. The mobilisation of Lenovo was to some extent similar to the process of mobilising BOE. During the period from 2008 to 2009, Lenovo experienced dramatic losses due to personnel changes and the global financial crisis; the Hefei municipal government seized this opportunity to propose the cooperation with Lenovo. After a year of negotiations, in 2011, the Hefei municipal government persuaded Lenovo to establish a company, Lianbao Technology, for the research and manufacturing of laptops in Hefei (Jiemian Anhui, 2023; HF01). While this remained at the lower end of the ICT industry value chain, the cooperation with Lenovo laid the foundation for Hefei's transition towards higher-end ICT industry. On the one hand, the export of laptops provided financial support as well as market for Hefei's further industrial upgrades⁵⁴. More importantly, this greatly enhanced local officials' confidence in further developing the ICT industry. As a local official who had participated in the cooperation with Lenovo noted:

“Although, from today's perspective, the assembly and production of laptops is at the lower-end of ICT industry, at the time, the fact that Hefei could produce laptops was considered as

⁵⁴ Lianbao Technology's output value exceeded 100 billion yuan in 2020. In recent years, this company began to use robots and more intelligent way to improve their productivity, which provided the market for the local intelligent robot industry (HF01).

a major achievement. This also caused a significant stir across the entire Anhui province. Consequently, we were more confident in creating the ICT industry in Hefei (HF01).”

After successfully mobilising BOE and Lenovo, local officials became even more eager to seek breakthroughs in higher-end in the ICT industry chain. Based on the need of BOE and Lenovo, they had their mindset to create the chip industry in the region (HF01; HF04)⁵⁵. After the cooperation with BOE, officials in the Hefei XinZhan High-Tech Zone (the area where BOE was mobilised) found that, unlike its main competitors at the time, BOE’s display driver IC, a key component of the Hefei display panel industry chain, still primarily relied on massive imports (HF04). To address this issue and seek new breakthrough in the ICT industry, local officials sought out and cooperated with Powerchip Technology, an innovative chip manufacturing company from Taiwan, China. In 2015, to mobilise the Powership into Hefei, the local government promised to provide funds (through state-owned assets) and construct the factory, while the Powerchip only needed to provide technology and a small amount of capital at the initial stage (Xinhua Net, 2015). Powerchip thus quickly agreed to cooperate with the local government, and jointly established Nexchip in Hefei (Zhang, 2025). The establishment of Nexchip then attracted upstream and downstream enterprises and formed the agglomeration in the chip industry in Hefei (HF04). As one of the interviewees noted:

“Subsequently, we (Xinzhan High-Tech Zone) began to develop the chip industry based on Powerchip and further mobilised more than 80 upstream and downstream chip companies into Hefei. In 2017, Powerchip also invested in the wafer factory in Hefei, which helped us to upgrade the chip industry (HF04).”

The same story happened in HETDZ: officials were proactively seeking out the technologies and companies for SEIs they wanted to create, and then mobilising them through equity investment. After successfully mobilising Lenovo, local officials in HETDZ also wanted to make some breakthrough in the ICT industry: based on the need of laptop, they ultimately turned their attention to the Dynamic Random Access Memory (DRAM) chip (HF01). Although almost none of them initially knew DRAM chip, local officials still proactively learned related knowledge and searched both domestically and internationally for the which companies with technologies had the potential to cooperate with (HF01). With their efforts,

⁵⁵ An interesting fact is that the chip industry emerged in two different functional zones in Hefei respectively (Xinzhan High-Tech Zone and HETDZ), which also demonstrates that the innovative entrepreneurship were widely diffused in the local government.

they found GigaDevice, a Beijing company with DRAM chip production technology. To mobilise GigaDevice, the HETDZ government provided funding through state-owned assets and swiftly completed the construction of factory and infrastructure (Yang, 2024; HF01). In 2017, GigaDevice partnered with the local government to establish Changxin Memory Technology (CXMT), and within just two years and three months, CXMT started to produce LPDDR4 and DDR4 memory chips. Subsequently, local officials began mobilising more related upstream and downstream enterprises based on CXMT and the market opportunity it created, including chip design, production equipment manufacturing, materials, and packaging and testing (HF01). A completed memory chip industrial chain was thus established in Hefei.

New Energy Vehicle, Quantum Industry and More

Following the FPD and ICT industries, with more sufficient fundings⁵⁶, the local government had more options when selecting SEIs. On the one hand, local officials started to search for the niche market at the national level rather than only within the region. In 2019, the local government found that the demand for new energy vehicles in China was growing rapidly (Gong *et al.*, 2024; HF01). Thereafter in 2020, the local government launched a plan to develop the new energy vehicle industry and, in the same year, NIO, a new energy vehicle company that had incurred a loss of approximately 11.3 billion in 2019, through equity investment was anchored and mobilised to Hefei by equity investment (Hu and Lian, 2020; China Economic Weekly, 2023). Subsequently, the local government also mobilised more companies such as BYD, Huawei and Volkswagen to create the new energy vehicle industry (HF07).

Moreover, with more fundings, the local government started to shift their focus to more cutting-edge and new-to-the-world technologies and SEIs, for instance, artificial intelligence, intelligent robots, and quantum industries (HF03; HF05). Specifically, the local government was no longer satisfied with mobilising innovative companies with mature technologies; it began to seek out universities with more original and cutting-edge technologies for cooperation (HF01; HF04). Additionally, the local government started to actively use the regional innovative resources to create new SEIs (HF03; HF05). For instance, the government in Hefei High-Tech Zone made the rule that any technologies and innovation

⁵⁶ As shown above, through several cooperation with BOE, Hefei achieved an increase in the value of local state-owned assets. The development of the FPD and ICT industries also continued to contribute to tax revenue for the local government. These increased state-owned assets and tax revenues can be used to support the creation of new SEIs.

with potential to be industrialised from USTC should be fully funded by the local government, and it established a dedicated platform to support the industrialisation of USTC's innovations. Officials in the High-Tech Zone also established (professional or personal) networks with USTC and were actively using state-owned assets to help USTC commercialise cutting-edge technologies such as quantum communication and quantum computing (HF04; HF05). As one of the interviewees noted:

“The USTC did not play a significant role in SEI creation in Hefei before, mainly because its key research and innovations were too far from industry. However, as technology and innovation become more cutting-edge and the development of industry need frontier innovations based on original research, the advantages of abundant local innovation resources such as USTC (for the creation and development of SEIs in Hefei) becomes more apparent (HF03).”

Local Government as the Institutional Entrepreneur

Once the innovative entrepreneurship was widely formed, the local government could also act as the institutional entrepreneur. It can be observed that in Hefei's SEI creation, the local government, on the one hand, modified institutional arrangements made by higher-level governments and transformed them into institutions facilitating its own SEI creation; additionally, the local government institutionalised its experience on anchoring and mobilisation of innovation resources, thereby establishing formal or informal institutions to facilitate the creation and development of SEIs.

Institutional Adaptation

Once the innovative entrepreneurship was formed in the local government, it became more adaptable to macro-level institutional changes. This was evident in the fact that although the local government still had to comply with policy arrangements from higher-level governments (including provincial and central government), it would still actively seek policy space for the creation of SEIs and transform institutional arrangements from higher-level governments into institutions suitable for the development of local SEIs. For instance, in 2008, President Hu Jintao also visit Anhui and defined the role and division of Anhui Province in China's economic growth. In his speech, President Hu expected Anhui to undertake industries mobilised from the southeast coastal region, by saying that Anhui needs to “take its fully advantages in location, natural resources and labour resources, actively participate in the Yangtze River Delta division of labour, and take the initiative in

undertaking the transfer of industries from the coastal region” (Sun, 2008). Therefore, soon after Hu’s visit, the Anhui provincial government made the Plan for the Demonstration Zone for Undertaking Industrial Transfer in the Wanjiang Urban Belt according to central government’s order (Anhui Provincial Committee of CPC and Anhui Provincial Government, 2010; National Development and Reform Commission, 2010). In this plan, Hefei was identified as one of the major cities where industries would be mobilised into, and needed to undertake traditional industries such as automobile production or home appliance industry (Anhui Provincial Committee of CPC and Anhui Provincial Government, 2010; National Development and Reform Commission, 2010).

It is evident that Hefei had its own plans. The policy to establish a demonstration zone to undertake industrial transfers was top-down. However, at this time, the Hefei municipal government did not issue a specific policy document for the demonstration zone. Instead, the Hefei government retained the policy on promoting independent innovation issued in 2008 and 2009. In 2010, Hefei published the Issuance of a Number of Policies and Measures to Undertake Industrial Transfer and Further Promote Independent Innovation (Hefei Municipal Government, 2010). At this time, Hefei did not give the certain industries it desired to undertake as it usually did in past documents. On the contrary, the industrial transfer was considered as an opportunity for independent innovation in Hefei. In the following two years, although the Hefei Municipal Government modified the policy measures for undertaking industrial transfer and promoting independent innovation, such as formulating some of the criteria for subsidies and incentives, the main idea of “promoting independent innovation” were basically retained (Hefei Municipal Government, 2010, 2011, 2012a). Thereafter, in Hefei’s 12th Five-Year Plan, discourses such as “cultivating and strengthening strategic emerging industries” and “using strategic emerging industries as a breakthrough for industrial upgrading” emerged for the first time, FPD industries were also viewed as key priorities to be developed in Hefei in the next five years (Hefei Municipal Government, 2012b). In 2013, Hefei announced its own ICT industry plan, which was one year ahead of the relevant plans from the central government (Office of the Hefei Municipal Government, 2013).

Institutionalise the Successful Experience

Following the first successful anchoring and mobilisation of BOE, top leaders in the local government began to realise the importance of officials’ knowledge of technology for the creation of SEIs. Thus, in recent years, the local government established the “Chain Chief

System (lianzhang zhi, 链长制)”, requiring leaders in the municipal government leaders (including the party secretary and mayor) to choose and take charge of developing at least one SEI in Hefei (HF04). The leaders then need to actively learning technology and industries, anchoring and mobilising “chain master” enterprises⁵⁷ and constructing the related industrial chain of the specific SEI (HF04). In terms of cadres and grassroots officials, as discussed in Section 4.2, the formal evaluation system and informal promotion system was established to ensure their participation in SEI creation (HF01, HF04, HF05). These institutions also reduced the risks of SEI creation, as the anchoring and mobilisation of resources was based on officials’s knowledge on technology and industry. Moreover, a collective decision-making institution was established for projects with high risks (HF02). As one of the interviewees noted:

“(In Hefei) all major projects are not merely government decisions, nor are they merely decisions made by the Municipal Party Committee, nor are they merely decisions made by the Standing Committee of the Municipal People’s Congress. When the local government want to decide a project with high risks, it will be first submitted to the Finance and Economics Committee of the Municipal People’s Congress. After the Finance and Economics Committee reviews it, it will be reported to the Director’s Office Meeting, and then to the Standing Committee. (This is because) there are a large number of people from different working background in the Finance and Economics Committee, the Standing Committee has a large number of former government leaders, and the Standing Committee of the People’s Congress consists of three types of people: government officials, university professors, and financial/industrial representatives (HF02).”

The informal rules for which resources should be mobilised in Hefei also exhibit distinct local characteristics. In general, when deciding whether resources need to be mobilised, local officials pay particular attention to the economic value they can bring or whether they can contribute to local economic growth in the short term, as this has a direct impact on their personal promotion (Ang, 2016; HF05). However, in Hefei’s local government, while officials did need to consider economic value of the resources⁵⁸, they placed greater emphasis on how well the technology aligns with the SEIs that Hefei aims to create (or has already developed). In other words, whether technology or innovative enterprises can drive the creation of emerging industries and integrate into the existing SEIs industrial chains is

⁵⁷ “Chain master” enterprises is a metaphor for the key innovative enterprises, such as BOE in FPD industry.

⁵⁸ For instance, how much fiscal revenue it can brings. This is one of the mandatory criteria for evaluating officials, which is common among local governments and not unique to Hefei (HF05).

the primary rule for officials to decide whether to mobilise resources (HF04; HF05). Again, this is based on officials already having sufficient knowledge of technologies and local SEIs development.

The government-led industrial investment fund system, as shown above, played a fundamental role in successfully mobilising enterprises in Hefei. In the creation of Hefei's SEIs, the city did not, as seen in other regions, solely use monetary incentives such as providing subsidies or tax incentives to mobilise technologies and enterprises. Instead, the local government acted more like an "venture capital" company (as shown in Figure 4-4): after anchoring enterprises and technologies, the local government provided funding from state-owned assets for those enterprises by equity investment, and thus facilitating the industrialisation of these technologies in Hefei (HF04; HF05). Unlike fund raising from the financial market, the local government's state-owned assets were not seeking for short-term profits (Liu, 2025). After technologies are industrialised and the SEIs are created, the local government will sell its equity holdings (to other companies or via financial market) while simultaneously achieving the increase of state-owned assets; these funds will then be reinvested to other technologies and companies (HF04; HF05).

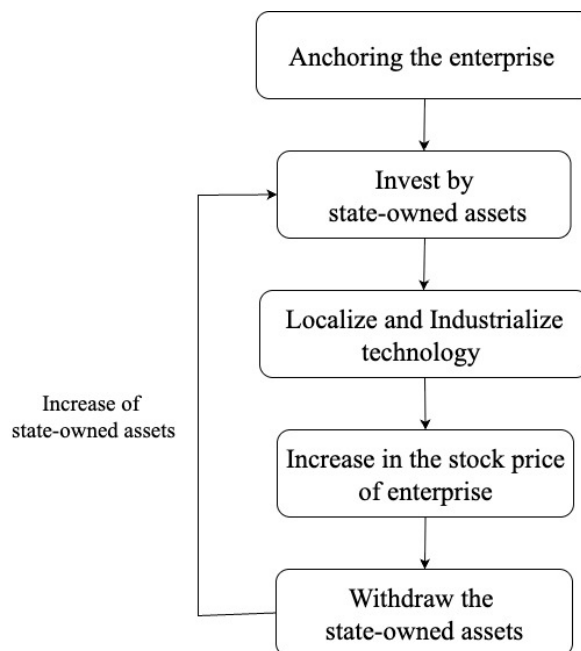


Figure 4-4 The Government-led Industrial Investment Fund System in Hefei (Source: the Author)

4.4 Discussion and Conclusion

This section have explored how Hefei created emerging industries as a peripheral region and transitioned to the knowledge economy through SEI creation over the past decade. It is evident that the local government activated the SEI creation and knowledge economy transition in Hefei. In this process, the local government became the main (and in some scenarios the sole) agent for anchoring and mobilising resources: to facilitate SEI creation in the absence of abundant innovation resources, the local government actively explored and identified (local) markets. Based on these (local) markets, it connected with, selected, and anchored enterprises that had related technologies and innovative capabilities, and mobilised them into Hefei as resources for SEI creation (the place-based leader). Finally, the local government established a series of formal and informal institutions to provide systemic support for anchoring and mobilising enterprises, particularly through strategically using state-owned assets for equity investment to mobilise innovative enterprises (the institutional entrepreneur).

Hefei's case illustrates that, the local government's change agency can, and should be, built up in the process of regional knowledge economy transition. As the peripheral region, Hefei initially lacked giant innovative enterprises, nor did the local government exhibit significant interest in SEIs. Consequently, the region was initially lacking key actors possessing innovative entrepreneurship to trigger regional industrial path creation. However, the turnover of the top leader opened up the window of opportunity for building up change agency in the local government, and the downward diffusion of change agency within this window of opportunity empowered the local government to become the pivotal actor in regional knowledge economy transition. It was only then that the local government started to deliberately and systematically identify and mobilise external innovation resources to reconstruct the local industrial foundation. Therefore, although Hefei's successful transition to the knowledge economy is frequently ascribed to a so-called "well-functioning government" (youwei zhengfu, 有为政府) (Liu, 2025; HF03; HF06), it is precisely the process of acquiring the change agency that transformed the local government from a structurally embedded, passive object into a proactive actor capable of engaging in and propelling the creation of regional emerging industries.

As the key actor driving the regional knowledge economy transition, the local government's change agency can be endogenously constructed. In the specific case of Hefei, the formation of change agency was a top-down process initiated by specific top leaders, subsequently

diffused down to broader cadres and grassroot officials. Once the change agency was formed, a bottom-up tunnel of transferring change agency to new top leaders also appeared. Specifically, the “endogenous” formation here is referred to the local government rather than the whole regions. It means that the formation of change agency was endogenously formed in the local government, rather than vertically responding to pressures from higher-level authorities or horizontally transferring from other regional actors, as will be discussed in Hangzhou’s case.

While acknowledging the pivotal role of top local leaders (cf. Jin, 2023), the change agency should by no means remain restricted to government’s top leaders. In peripheral regions, while the initial anchoring and mobilisation of external resources may be spearheaded by specific leaders, a profound reconfiguration of existing regional resource endowments is imperative to ensure these resources become deeply embedded and sustained over the long term (Gong *et al.*, 2024). Consequently, to continuously identify, anchor, and mobilise extra-regional resources from upstream and downstream industrial chains, a wider diffusion of change agency is essential. This necessitates empowering a broader spectrum of mid-level cadres and grassroots officials to acquire this change agency to execute regional development strategies.

The effective diffusion of change agency in this case requires the specific top leader possessing innovative entrepreneurship to first act as the institutional entrepreneurs. In Hefei’s case, the top-down diffusion of innovative entrepreneurship laid in the alteration of the patterns of cadres and grassroots officials through other domains of government activity. Through the demolition campaign (*da chai wei*, 大拆违), the local leaders penalised bureaucratic inaction and vigorously activated grassroot officials, thereby laying down the institutional foundation for transferring innovative entrepreneurship. Notably, this change of institutions even predated the local leaders’ articulation of the vision for a knowledge economy transition. Accordingly, this also implies that specific leaders need to accomplish this institutional change within their limited tenure⁵⁹.

The change of formal and informal systems for evaluating and promoting officials served as the core institutional framework driving the diffusion of innovative entrepreneurship within the government. The design of these systems was inevitably shaped by the reality of resource scarcity in Hefei. To compensate for this resource disadvantage, officials were required to

⁵⁹ The Tianjin’s case discussed below provides the example of specific leaders do not finish institutional change and transfer their innovative entrepreneurship before leaving the position.

learn industry-related knowledge and technology, as well as possess the capacity to anchor and mobilise the potential resource externally. On the one hand, the formal assessment system was designed as the instrument to exert pressure on cadres, incorporating metrics such as the frequency of technological research visits or the number of successful mobilisation of resources. On the other hand, the informal promotion norm served to stimulate internal motivation. When grassroots officials perceived that a deeper understanding of SEIs constituted a key informal criterion for gaining the favour of superiors and increasing the potential of promotion, they became more proactive in engaging in relevant activities related to SEIs creation. Consequently, through this institutional design constituting both pressure and motivation, the innovative entrepreneurship can be diffused to and acquired by more cadres and grassroot officials within the local government.

The SEIs-directed evaluation and promotion systems distinguish Hefei from other regional local governments. In Hefei's case, while officials' behaviour was highly impacted by evaluation and promotion institutions, as promotion tournament or franchising the bureaucracy discussed in Chapter 2 hypothesis, it is evident such institutions are not necessarily imposed by higher-level government; rather, the local government may build up localised embedded modes of assessment and promotion institutions. This is crucial for understanding regional divergence in the transition towards the knowledge economy.

Once change agency was widely formed in the local government, its continuity no longer hinges on the tenure of individual leaders. As the creation of SEIs transitioned from the mindset to a norm, a channel for bottom-up diffusion of innovative entrepreneurship gradually opened: lower-level officials could assist new top leaders to swiftly learn the knowledge of SEIs and realise the significance of creating SEIs to regional development. This ensures that the creation of SEIs was Hefei's primary strategy in economic growth over a relative long period.

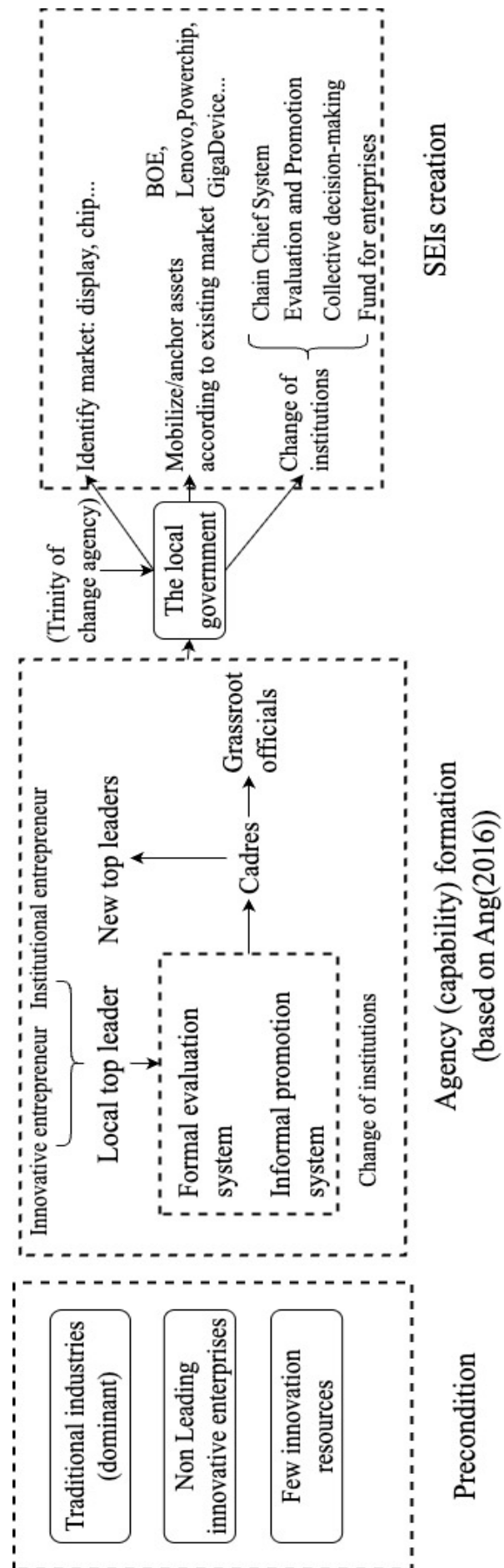


Figure 4-5 The Transition to the Knowledge Economy in Hefei (Source: the Author)

This endogenous agency formation largely determines the trajectory of Hefei's SEI creation and knowledge economy transition. Once the innovative entrepreneurship and capabilities widely spread, officials in the local government clearly know which SEIs they want to create, and what they should do to drive this process, the local government thus can easily take the role of place-based leadership. This, to some extent, means the Hefei local government is not entirely reliant on its local innovation resources to drive industrial path creation. As a result, SEIs in Hefei demonstrate less technological relatedness. On the other hand, officials in the local government understand that they need to anchor and mobilise resources from other regions to drive the creation of SEIs. Therefore, formal institutions facilitating the winning of resource competition with other regions are more likely to emerge. As a result, we can observe that the local government exhibits a preference for institutions that can provide funding for the enterprises, particularly those have technologies and innovative capabilities. Formal institutions related to enterprise service are given much lower priority.

In short, Hefei's case exemplifies how the region in the peripheral can make the transition to the knowledge economy. In the peripheral regions, the creation of SEIs is by no means a simple process of resource anchoring and mobilisation. The key to the success lies in whether change agency can be formed in the local government. On the other hand, while officials' change agency is being formed, they also need to acquire the corresponding capabilities to ensure that their goals can be realised.

Chapter 5: Hangzhou: Transition to the “Digital Economy”

This chapter seeks to analyse the creation and development of strategic emerging industries (SEIs) in Hangzhou, following up on the analytical framework outlined in Section 2.5. In Hangzhou, SEIs are primarily created and developed around industries related to information and communication technologies (ICTs), including e-commerce, cloud computing, big data, etc. Since 2014, the added value of SEIs in Hangzhou—locally defined and labelled as the “digital economy”—has steadily increased from 20% to approximately 27% as a proportion of GDP, with an annual growth rate of 1% to 2% (Hangzhou Municipal Bureau of Statistics, 2015, 2022).

The development of strategic emerging industries in Hangzhou can be divided into two main stages. The earliest SEI in Hangzhou was the e-commerce industry, predominantly driven by the B2B, C2C, and B2C model⁶⁰, led by Alibaba in the early 2000s. After 2014, Hangzhou’s SEIs gradually expanded into cloud computing, big data, the Internet of Things (IoT), digital content, and other ICT-related and service-based industries. Notably, the creation and development of SEIs in Hangzhou, both in the early 21st century and after 2014, is deeply impacted and shaped by Alibaba, one of the most famous and successful technology companies around the world.

Thus, this chapter is structured as follows: The first section reviews the preconditions in Hangzhou before the development of strategic emerging industries, showing Hangzhou’s resources, industrial base, and institutional environment prior to the first stage of SEI, and providing contextual information essential for understanding why Alibaba finally chose Hangzhou rather than Beijing and Shanghai. The second section examines the development of strategic emerging industries in Hangzhou in the early 21st century, focusing on the e-commerce sector led predominantly by Alibaba. The third section explores the creation and development of strategic emerging industries in Hangzhou after 2014. This chapter concludes with an outline of the process of Hangzhou’s SEI creation and tries to discuss key elements in Hangzhou’s successful knowledge economy transition.

⁶⁰ Only B2C e-commerce is recognised as strategic emerging industry according to Category of Strategic Emerging Industries (2018).

5.1 Why Choose Hangzhou? Economic Reforms in Hangzhou during the 1990s

Hangzhou, the capital of Zhejiang Province, is located in the Yangtze River Delta on the southeast coast of China. It is renowned as “the Paradise on Earth” due to its picturesque landscapes and rich cultural heritage. In terms of topography, the urban area of Hangzhou is predominantly characterised by mountains and hills, which make up 65.6% of the total urban area, while plains account for only 26.4% (Ren, 2000; Qian, 2015). Additionally, Hangzhou is endowed with a complex and abundant water body system, including the famous West Lake and the Qiantang River, which together constitute 8% of the urban area (Ren, 2000; Qian, 2015).

The complex topography, natural environment, and rich cultural heritage partly shaped Hangzhou’s initial industrial development. When under the period of planned economy, Hangzhou, like many other cities, was commanded to develop the manufacturing industry, and relied on heavy industries to drive economic growth. At that time, Hangzhou was designated as a “comprehensive industrial city based on heavy industry” under central government command (Hangzhou Bureau of Planning and Natural Resources, 1959). Consequently, in the 1960s, a large number of state-owned enterprises (SOEs) specialising in heavy manufacturing were established in Hangzhou, forming the city’s initial industrial base alongside its traditional textile industry.

These heavy manufacturing industries were concentrated in the eastern plains of Hangzhou, inevitably leading to severe environmental pollution and damage to cultural landscapes, particularly the West Lake. Thus, following the Reform and Opening Up in 1978, Hangzhou adjusted its Master Plan, and refined the city’s nature from the heavy industrial city to “the historical and cultural city and a key national scenic tourism city” (Hangzhou Bureau of Planning and Natural Resources, 1983). Consequently, the tertiary industry, especially tourism industry, was prioritised as a key driver for future growth. However, the repositioning of Hangzhou also resulted in the exclusion of many new industrial projects due to their potential damage to the city’s tourism and natural environment, leading to a slowdown in economic growth to some extent (Hangzhou Bureau of Planning and Natural Resources, 1983).

By the mid-1990s, how to balance the economic growth with the political demand at environmental protection and fulfilling the goal of building the “national scenic tourism city” became a pressing issue for Hangzhou’s local government. In response, the local government

proposed a dual transformation strategy to resolve the issue: one is the proactive marketisation, and the other is integrating innovation into economic growth. At the end of 1995, Li Jinming, the Party Secretary of Hangzhou, emphasised at the Conference of “Study session on the spirit of the Fifth Plenary Session of the Central Committee of the Communist Party of China for leading cadres in Hangzhou” that economic growth in Hangzhou required two “fundamental shifts”:

“... the reform should shift from merely decentralising power and offering preferential policies or pursuing isolated breakthroughs to a systematic and comprehensive reform aimed at establishing a socialist market economy, thereby integrating public ownership with the market and market economy. Second, development should shift from relying mainly on increased investment, expanding production, and pursuing quantity of products to a focus on enhancing economic efficiency. Growth should be driven primarily by technological progress and improvements in the quality of the workforce, thereby achieving overall economic expansion through qualitative advancement (Ren, 1996, p. 2).”

Marketisation

The first solution proposed by Hangzhou’s local government in the 1990s was proactive marketisation, which brought about two major changes. The first was the transformation of SOEs, the traditional drivers of economic growth since 1960s. The institutional reform of SOEs in Hangzhou, like many other cities in the southeast coastal region, started at the early 1990s. Inspired by Deng Xiaoping’s Southern Tour in 1992, Hangzhou initiated pilot reforms to promise SOEs greater operational autonomy (Ren, 1993, p. 39). And the local government delivered the “three systems reform” (labour, distribution, and social security) across 357 enterprises in the city (Ren, 1993, p. 202), of which primary objective was to “expand the autonomy of state-owned enterprises and promote their integration into the market” (Ren, 1993, p. 39). Moreover, the market-oriented transformation of SOEs was also implemented by attracting foreign investment, adopting joint-stock reforms, and establishing enterprise groups, all of which were guided and activated by the local government.

In 1997, the Hangzhou Municipal Party Committee and Municipal Government issued the Three-Year Plan for Enterprise Reform in Hangzhou (1998–2000), which called for a further optimisation and institutional reform of SOEs. Large and medium-sized SOEs were required to establish modern corporate governance institutions, while smaller SOEs underwent more liberalised and market-oriented transformations. The local government attempted to

transform the small SOEs into “independent legal entities and market competitors, operating autonomously, bearing their own profits and losses, pursuing self-development, and exercising self-discipline”(Ren, 1998, p. 3). At the beginning of the 21st century, 85.6% of state-owned enterprises, 95.6% of collective enterprises, and 88.7% of large and medium-sized SOEs in Hangzhou completed the Three-Year Plan (Hangzhou Municipal Bureau of Statistics, 2001).

More importantly, the reform of SOEs also brought up a significant ideational change for local officials in Hangzhou. During the three-year SOE reform, the local officials rapidly dismantled the traditional perceptions of “only public ownership matters” or “sole reliance on SOEs” rooted in the planned economy. In 1995, “improving state-owned enterprises” was still taken as one of the urgent priorities for the city’s future development (Ren, 1996, p. 2). However, by 2000, local leaders had shifted their understanding of public ownership and the state-owned economy from focusing on “state-owned enterprises” to emphasising “state-owned capital”. They argued that the form of public ownership had evolved from SOEs to state-owned capital. The government’s responsibility was thus to concentrate the state-owned capital in a few asset management companies, prioritising its guiding role in economic growth rather than its absolute dominance (Ren, 2001, p. 3). Consequently, in subsequent SOE reforms, the local government supported—even encouraged—the “acceleration of the diversification of investment entities” in large and medium-sized SOEs, including appealing investments from private and foreign investors (Ren, 2001, p. 7).

The second change brought by marketisation was the government’s encouragement and cultivation of non-public economic entities, primarily including private enterprises, township and village enterprises (TVEs), and foreign direct investments (FDIs). Private enterprises first emerged in Hangzhou in 1988. Following the issuance of the Provisional Regulations on Private Enterprises of the People’s Republic of China, Hangzhou began to relax restrictions on private business operations. In the early 1990s, as the debate over whether the economy should be “capitalist or socialist” subsided, the local government shifted its attitude on private enterprises from merely “relaxing restrictions” to “actively encouraging”. Moreover, as previously mentioned, the support for the tertiary sector created fertile ground for the growth of private enterprises. By 1998, 46.9% enterprises operating in the tertiary sector was owned by private enterprises (Ren, 1999, p. 81). Once again, the more significant impact was the shift in mindset. By the end of the 20th century, the private economy was no longer seen as merely a supplement to economic development but was

instead recognised as occupying an “important position” in local economic growth (Ren, 2000, p. 82).

On the other hand, TVEs in Hangzhou also experienced a rapid growth in the 1990s, eventually becoming a crucial component of the city’s private economy. TVEs in Hangzhou, as well as in Zhejiang Province, first emerged in the 1980s. During this period, the southeast coastal regions of China witnessed a significant transformation of “commune and brigade enterprises (shedui qiye, 社队企业)”⁶¹ into TVEs. In Zhejiang, TVEs initially concentrated in the Wenzhou area, forming the so-called “Wenzhou Model”⁶² and later rapidly expanding to Taizhou, Ningbo, Shaoxing, and parts of Hangzhou (Yue, Liu and Fan, 2010). By the mid-1990s, the Hangzhou Municipal Government began to actively promote the development of TVEs, recognising them as a new driver of economic growth. By the end of the 20th century, the total number of TVEs in Hangzhou had reached 102,400, contributing 63.5% of the total industrial output value (Ren, 2000, p. 10). Simultaneously, a significant number of export-oriented enterprises emerged among these TVEs. By 2000, 1,878 export-oriented TVEs emerged in Hangzhou (Ren, 2000, p. 54). At the beginning of the 21st century, nearly all these TVEs were converted into private or joint-stock enterprises (He and He, 2013).

The progress of FDI in Hangzhou was not smooth as the development of private and township enterprises. In the mid 1990s, like other local governments of that period, the Hangzhou government promoted the slogan of “expanding openness to the world” and sought to stimulate the local economy through FDI, as well as the importation of relevant technologies and innovations by encouraging the establishment of multinational enterprise (MNEs) (Ren, 1996, p. 9). Despite the implementation of various policies and support measures, the performance of FDI in Hangzhou during the 1990s was not good as the government expected. In 1995, the actual utilisation of FDI in Hangzhou amounted to 427 million US dollars, but by 1999, this figure had declined to 420 million US dollars. This indicates that FDI or MNEs did not significantly contribute to the city’s economic growth like it did in Suzhou or Shanghai.

⁶¹ “Commune and brigade enterprises” primarily refer to rural enterprises established by rural people’s communes during the Great Leap Forward and the rural industrialisation movement. These enterprises were set up to undertake certain collective industrial production tasks assigned to them. They primarily engaged in manufacturing industries such as steel production, mining, small machinery manufacturing, and food processing.

⁶² The “Wenzhou Model” refers to a production and operational model of township and village enterprises that started as small family-run workshops. These enterprises, through a wide network of rural salespeople, rapidly promoted locally produced goods to national and even global markets. This model is characterised by its market-driven approach, allowing products from rural areas to be distributed quickly across different regions.

In short, following a series of economic reforms and institutional adjustments, Hangzhou gradually moved away from a state-owned (or publicly owned) enterprise-led growth model in the early 21st century. The main driver of the city's economic growth shifted from state-owned enterprises to private or privately owned enterprises. More importantly, throughout these economic reforms, local officials gradually abandoned the perception that economic growth must be exclusively driven by state-owned enterprises. Instead, they began to accept, encourage, and respect private enterprises—and even started to rely on them (HZ03). This favourable environment for private enterprises played a crucial role in Jack Ma's decision to relocate Alibaba back to Hangzhou, as will be discussed more in the next section.

Innovation

The other solution proposed by the local government was integrating innovation into economic growth, with the expectation that advanced technology and innovation would drive future development. Although this idea was first proposed in the early 1990s, it was not given sufficient attention within the Hangzhou government until the mid-1990s. As early as 1990, Hangzhou was among the first cities in China to establish a national-level high-tech development zone. However, the development of the High-Tech Zone was nearly stagnant in the early 1990s as less attention was paid to innovation or technologies (Office of Party History of the Hangzhou Municipal Committee and Lang, 2019). In 1992, the Hangzhou High-tech Zone was warned by the State Council and even faced the risk of being shut down (Office of Party History of the Hangzhou Municipal Committee and Lang, 2019). This political pressure from the central government forced local officials in Hangzhou to reassess the role of innovation and technology, especially in the field of economic development. In response, the city published the “Revitalising the City through Science and Education (kejiao xingshi, 科教兴市)” strategy in 1992 (Office of Party History of the Hangzhou Municipal Committee and Lang, 2019).

By the mid-1990s, as previously mentioned, influenced by the Master Plan of City and reposition of Hangzhou, the local government began to pay more emphasis on innovation, and the innovation-driven economic growth was prioritized among the city's development strategies. Phrases related to innovation increasingly appeared in government policy documents, and discourses such as “actively fostering emerging industries” and “concentrating superior resources to cultivate and develop high-tech industries” were being incorporated into Hangzhou's Ninth Five-Year Plan. These emerging industries included

sectors such as information and communication technology industries (e.g., computer manufacturing and software industry) and biopharmaceuticals (Qian, 2015).

Subsequently, the Hangzhou government launched initiatives such as the “Qiantang River Science and Technology Wave (qiantang keji chao, 钱江科技潮)” and the “National Advanced Science and Technology County (City/District) Competition”, and treated the innovation-driven economic growth from a previously “fragmented departmental effort” to “a coordinated collective action within the whole government” (Ren, 1997). At the end of 20th century, the municipal government introduced policies to support overseas returnees who possessed technological expertise to start businesses in Hangzhou. Additionally, preferential policies were extended to private enterprises which were actively engaged in innovation. The government encouraged and expected the private sector could be the emerging key force in innovation-driven economic growth (Ren, 2000, p. 82).

Overall, by the early 21st century, Hangzhou had established a foundation for emerging industries, including ICT-related industries, biopharmaceuticals, and new materials. Among these industries, software-related sectors experienced particularly rapid growth under government policy support (Ren, 2000, p. 121; Office of Party History of the Hangzhou Municipal Committee and Lang, 2019). By supporting overseas returnees to start their businesses, Hangzhou attracted the initial capital, technology, and talent necessary for innovation (Office of Party History of the Hangzhou Municipal Committee and Lang, 2019). At the same time, policy support for private enterprises which were proactively engaged in innovation led to a significant agglomeration of innovative private enterprises in Hangzhou’s High-Tech Zone by the late 1990s, even accounting for more than half of all enterprises in the High-tech Zone (Ren, 2000, p. 82). Alibaba was one of these companies.

5.2 The Creation of E-commerce Industry

This section will focus on reviewing how the e-commerce industry was created and developed in Hangzhou. The majority of e-commerce-related enterprises in Hangzhou emerged in the late 1990s. At the beginning of the 21st century, the predominant e-commerce model in Hangzhou was business-to-business (B2B). Within two to three years, the industry gradually diversified into customer-to-customer (C2C) area, marked by the establishment of Taobao by Alibaba. Following the success of Taobao, Alibaba redirected its focus towards business-to-customer (B2C) e-commerce in 2008, launching Taobao Mall (later rebranded as Tmall), which signified the creation of the B2C e-commerce industry in Hangzhou.

This section will then analyse the preconditions, agency formation, and the process of path creation of each stage. While an overview of the development of Hangzhou's e-commerce industry will be provided, as a whole, the primary focus of this section will be paid to Alibaba, as it plays a pivotal role in this process.

B2B E-commerce

The precondition for the development of e-commerce in Hangzhou stems from the institutional, material, and human resource foundations established in the 1990s. In terms of industry-specific knowledge and innovation capacity, as demonstrated in the previous section, the emphasis on and cultivation of innovation throughout the 1990s led to the rapid growth of Hangzhou's software industry. This, in turn, provided the necessary knowledge resources and technical infrastructure for the initial development of the e-commerce sector in Hangzhou.

Regarding infrastructure, the early 21st century saw rapid internet development across China, lowering the barriers to internet access for both businesses and individuals⁶³. In terms of market constructions, the southeastern coastal regions of China, including Hangzhou and Zhejiang, witnessed the transformation of numerous township and village enterprises into private businesses. Their early efforts to digitise services and marketing provided a rapid growth market for China's e-commerce industry (Ren, 2001, p. 147).

The agency driving e-commerce development in Hangzhou emerged from both government and the private sector. On the government side, the recognition that innovation and technology should drive economic growth shaped in the late 1990s, played a crucial role in the agency formation. By the early 21st century, this recognition became even more concrete. In 2000, the Hangzhou municipal government published a political slogan "Paradise Silicon Valley (tiantang guigu, 天堂硅谷)" and launched the "Project No. 1 (yihao gongcheng, 一号工程)", which prioritised the development of information technology and pharmaceutical industry by constructing Two Ports and Three Zones⁶⁴. E-commerce was identified as one of key industries within this initiative (Office of the CPC Hangzhou Municipal Committee

⁶³ In 2000, only 1.78% of China's population (approximately 22.48 million people) had access to the internet. By 2006, just five years later, over 10% of the population in China (approximately 132.41 million people) started to use the internet, and this figure doubled just in two years (approximately 299.45 million people). (Data source: ITU DataHub, <https://datahub.itu.int/data/?e=CHN&c=701&i=11624&v=chart>)

⁶⁴ The Two Ports and Three Zones refers to the Information Port (information industry cluster), Pharmaceutical Port (pharmaceutical industry cluster), Hangzhou National High-Tech Industrial Development Zone, Hangzhou National Economic and Technological Development Zone, and Hangzhou Higher Education Park.

and Office of the Hangzhou Municipal Government, 2000). To further support this endeavour, in 2000, the Hangzhou government applied to the central government as the “pilot city for e-commerce”, seeking additional policy support (Ren, 2001).

In addition to acting as institutional entrepreneurs, Hangzhou’s local government also actively sought innovative entrepreneurship, which was primarily achieved by collaborating with “pilot enterprises” to facilitate technological implementation. For example, the Hangzhou government partnered with Huali to experiment with e-commerce in the manufacturing sector, focusing on supply chain management systems (Xu, 2002). Similarly, the local government collaborated with Keximeng Network Technology Company to explore how the e-commerce could be applied in the tourism industry (Xu, 2002).

On the other side, the agency for creating e-commerce industry also formed in the private sector. This is evident by that, at the end of 2001, more than 1,500 enterprises in Hangzhou had established websites, and thousands of businesses had begun creating web pages, including the famous Alibaba (Xu, 2002, p. 216). Given its scale and subsequent impact on Hangzhou SEI’s development, this section will focus on how Alibaba established its B2B e-commerce business, despite this being a well-researched and widely known topic. It is important to note that while Jack Ma and Alibaba may not be considered typical enterprises, from an agency perspective, they were not fundamentally different from the majority of Chinese entrepreneurs at the time, many of whom recognised the opportunities existing in the internet.

In the early 1990s, while travelling in the United States as a translator, Jack Ma encountered the power of the internet, which quickly piqued his interest in the potential for online transactions in China (Wulf, 2010). From Ma’s perspective, China had a large number of small and medium-sized enterprises, but they were highly fragmented and lacked access to communication channels and information sources necessary for marketing and product promotion (Wulf, 2010, p. 3). Consequently, establishing a trusted platform for these enterprises to facilitate information exchange seemed a significant entrepreneurial opportunity. Drawn by the business environment in Hangzhou (shown in the last section), Ma and his eighteen co-founders left their government positions in 1999 and returned to Hangzhou to establish Alibaba. The company’s initial B2B e-commerce, including Gold Supplier and China TrustPass, were designed to assist small and medium-sized enterprises in connecting with retailers, trading companies, and downstream manufacturers (Wulf, 2010;

Havinga, Hoving and Swagemakers, 2016). Through its B2B service, Alibaba rapidly accumulated initial capital and achieved profitability by the end of 2002 (Sun, 2019).

The differences in agency formation led to two distinct developmental trajectories within Hangzhou's e-commerce industry in its early stage. On the one hand, government-driven e-commerce were experimental and primarily focused on local industries which had comparative advantages, such as tourism. Although the public enterprises that collaborated with the government successfully fulfilled their objectives (Xu, 2003, 2004), this government-led approach restricted the further diversification of Hangzhou's e-commerce industry. In contrast, the private sector was not constrained but benefited from the institutional environment constructed by the local government, as innovative entrepreneurship emerged from the grassroots level and was primarily formed within the group of entrepreneurs. As a result, after achieving success in B2B business, certain companies, such as Alibaba, began expanding the e-commerce industry into C2C and B2C.

From B2B to C2C and B2C

After 2003, the diversification of Hangzhou's e-commerce industry was almost entirely led by Alibaba. By 2008, the total revenue of Hangzhou's e-commerce industry had reached 4 billion RMB, while Alibaba alone generated 2.8 billion RMB, accounting for nearly 70% of the city's total e-commerce revenue, and this was before Alibaba established its B2C business (Xu, 2009, p. 83). By 2013, Alibaba had taken the largest share of China's e-tailing market and became one of the biggest e-commerce companies in China (The Economist, 2013; Havinga, Hoving and Swagemakers, 2016).

The decision to establish C2C e-commerce, marked by the launch of Taobao, originated internally within Alibaba, and was driven by the need to steer the company out of difficulties or to counter external competition (Wulf, 2010; Sun, 2019). Jack Ma once highlighted the key motivation for establishing Taobao:

“At that time, there were only two companies in China that understood online marketplaces, eBay and Alibaba. I was particularly concerned that eBay's power sellers would grow their business to compete in the B2B space. In China, the line between individuals and small businesses is blurry. There are (so) many people with entrepreneurial ambitions. I needed to stop eBay to protect Alibaba. (Wulf, 2010, p. 4)”

At the very early stage, knowledge creation in Taobao relied heavily on importing mature technologies from more technologically advanced countries and regions (Zhao, 2013). For instance, Taobao's initial website was purchased from a seller in the United States and decorated by workers in Alibaba (Zhao, 2013). Then, it continued to import and rely on relevant technologies from foreign enterprises. For example, when trying to improve the quality of the database for Taobao's users, Alibaba started to cooperate with Sun Microsystems, an American technology company that invented Java (Zhao, 2013). Another channel for knowledge and technology creation stemmed from Alibaba's B2B e-commerce. During Taobao's development, engineers who had worked in Alibaba's B2B division provided essential technical support for the platform (Zhao, 2013). Alibaba played the role of innovative entrepreneur in the process of C2C e-commerce's creation.

In terms of financial investment, in 2005, Alibaba sold 40% of its equity to Yahoo in exchange for Yahoo China's search engine technology and, more importantly, 1 billion dollars in cash support. This funding was quickly allocated to advertising campaigns and marketing efforts (*Crocodile in the yangtze*, 2012).

Several factors contributed to Taobao's success. One significant factor was the SARS outbreak in China in 2003. Much like the global pandemic starting in 2020, the outbreak of SARS led to widespread stay-at-home orders, and Alibaba seized this opportunity to "cultivate online shopping habits for customers, just like rapid growth of the online education industry during the COVID-19 pandemic" (HZ03).

In the C2C e-commerce battlefield against eBay, Aliwangwang and Alipay, two tools developed by Alibaba, were regarded as key factors that helped Alibaba defeat its competitor (Havinga, Hoving and Swagemakers, 2016; Sun, 2019). On the one hand, Aliwangwang, an instant messaging software, was designed to facilitate communication between buyers and sellers, even allowing for price negotiations. Compared to eBay, which prohibited direct communication, the launch of Aliwangwang were considered better fitting with the habits of Chinese consumers (Zhao, 2013). On the other hand, since online shopping was a relatively new concept in China, transactions were often hindered by a lack of trust between buyers and sellers. To solve this problem, Alibaba launched Alipay, a third-party payment service that only released funds once both buyers and sellers confirmed the completion of orders, thereby minimising fraud. In 2007, Taobao dominated 82% of China's C2C e-commerce market, while eBay and its local partner's market share shrank to just 7% (Wulf, 2010).

In April 2008, Alibaba launched Taobao Mall, marking the expansion of Alibaba's e-commerce into the B2C sector. Once again, the decision to establish Taobao Mall originated internally within Alibaba. In the Alibaba's internal meeting in September 2007, Jack Ma emphasised that Alibaba's future vision was to build "an open, collaborative, and prosperous e-commerce ecosystem" (Sun, 2019). The creation of Taobao Mall and the expansion into B2C e-commerce were integral components of this strategy. On the other hand, before Taobao Mall's launch, Taobao faced criticism for inconsistent product quality and the presence of counterfeit goods (Taobao Baiken, 2025). To improve the quality of goods, Alibaba decided to introduce famous brands into Taobao, rather than solely providing service for the individual or sellers from small and medium enterprises. After several years of development, by 2013, Alibaba had captured 50.7% of China's B2C e-commerce market, while its closest competitor, JD.com, held only 17.1% (Havinga, Hoving and Swagemakers, 2016).

In short, in the early stages of the e-commerce industry in Hangzhou, both the local government and enterprises independently formed the agency for the industrial path creation growth, and engaged in innovative entrepreneurial activities respectively. In this stage, the local government also acted as the institutional entrepreneur, establishing a friendly environment conducive to the development of e-commerce. Under this institutional environment, B2B e-commerce flourished rapidly, driven by the combined efforts of enterprises and the local government, and ultimately led to the rise of the giant companies such as Alibaba. Subsequently, within a relatively supportive policy environment, Alibaba expanded Hangzhou's e-commerce industry from B2B to C2C and eventually to B2C (Chen and Zhao, 2017; HZ03). This industrial diversification also laid the foundation for the next stage of SEI's development in Hangzhou.

Alibaba's rapid expansion and growth had a profound impact on Hangzhou. Beyond its influence on knowledge creation, technological advancement, financial investment, and market shaping⁶⁵, a more significant consequence was Alibaba's growing political influence at the local level. This was evident in the frequent visits of national leaders to Alibaba between 2008 and 2009 (Xu, 2009, 2010). Moreover, even when Yahoo's investment in Alibaba sparked controversy — as it effectively changed the nature of Alibaba into a foreign-funded enterprise — the Hangzhou government continued to express its strong support for

⁶⁵ This will be analysed in the next section.

this company (*Crocodile in the yangtze*, 2012). The political influence of Alibaba laid the foundation for its subsequent influence on political decisions in Hangzhou's government.

5.3 From E-commerce to “Digital Economy”

The further development of Hangzhou's SEIs was primarily concentrated in the period after 2010. In this stage, SEIs in Hangzhou progressed from e-commerce to a “digital economy”, characterised by ICT-led industries such as cloud computing, big data, intelligent logistics, and IoT. Notably, a range of ICT-related enterprises, including Alibaba, Ant Financial, Hikvision, and Dahua, experienced rapid expansion in Hangzhou after 2010, and finally six hundred-billion-yuan “digital economy” industrial clusters were formed in Hangzhou (HZ03)⁶⁶.

Preconditions

As outlined in Section 2.5, the outcomes of the industrial path development at the first stage will be the preconditions, such providing the market opportunity for the next. In terms of technological innovation capabilities and human resources, the continued development of Hangzhou's SEIs benefited significantly from the expansion of Alibaba, which acted as a talent magnet for the region (HZ02). By 2010, Alibaba employed over 18,000 people, and its employment became even larger with the expansion of the company⁶⁷. A government official familiar with the situation described it as follows:

“At that stage, due to the rapid and substantial increase in business volume each year, Alibaba began to demonstrate a strong talent aggregation effect. Every year, Alibaba recruited a large number of employees, primarily top-tier graduates, at least with a bachelor's degree or even higher. Additionally, Alibaba consistently attracted talent from worldwide (HZ02).”

Besides talent recruitment, Alibaba actively contributed to the formation of human resources in Hangzhou. Internally, the company established “Taobao Technology University” in 2009, aimed at training newly recruited employees in software development, database management, and other ICT skills, based on the technological expertise and their knowledge accumulated through the development of e-commerce business (Zhao, 2013). Externally,

⁶⁶ These six hundred-billion-yuan “digital economy” industrial clusters include digital security and network communications, integrated circuits, high-end software, intelligent computing, smart photovoltaics, digital content (Hangzhou Daily, 2022).

⁶⁷ By March 2025, Alibaba has 124,320 employees.

Alibaba sought to strengthen its partnerships with higher education institutions. For instance, in 2008, the company collaborated with Hangzhou Normal University to establish the “Alibaba Business School”, where senior executives from Alibaba took on leadership roles to “cultivate management talent closely aligned with industry needs” (Alibaba Business School, 2023). Moreover, Alibaba founded the Taobao Club⁶⁸ at Zhejiang University, Dalian University of Technology, and other universities to attract a wider pool of skilled professionals (Zhao, 2013).

The institutional environment for Hangzhou SEI’s further development was even more complex. This is because:

“How to drive economic growth was uncertain and still under exploration between 2000 to the early 2010s (HZ03).”

In 2000, alongside the proposed Project No. 1 (yihao gongcheng, 一号工程), the municipal government also implemented the “Industrial Development Strategy for Urban Revitalisation (gongye xingshi, 工业兴市)”, identifying manufacturing as the cornerstone of economic growth of Hangzhou at the first decade in 21st century (Wang, 2023). The reason for developing information technology was interpreted as “injecting new vitality and momentum into the manufacturing industry” (Wang, 2002). Therefore, while policies supporting information industries like e-commerce were launched by the local government, the city’s economic growth was fundamentally organised around traditional manufacturing, such as textile, food processing, or equipment manufacturing.

In 2008, the Global Financial Crisis dramatically impacted the growth of Hangzhou’s manufacturing industry. First-quarter data from 2008 showed manufacturing enterprises maintaining 14.6% value-added growth with 25.3% profit growth. However, by year-end, these figures had plummeted to 9.3% and 0.3% respectively (Xu, 2009, p. 56).

The decreased growth of manufacturing industries in Hangzhou, to some extent, prompted institutional recalibration. In the Fourth Plenary Session of the 14th Hangzhou Municipal Committee, the Hangzhou Municipal Committee proposed to establish the “3+1 modern

⁶⁸ The Taobao Club, founded within the university, aims to provide students with curricula pertaining to the Taobao platform and opportunities for experimental project engagement. Its establishment facilitates early student exposure to Alibaba’s corporate ecosystem while simultaneously functioning as a strategic talent pipeline for the enterprise (Zhao, 2013).

industrial system” and “ten priority industries”⁶⁹, and tried to position service sectors as the new growth engine for Hangzhou’s economy (Wang and Liao, 2008; HZ03). However, paradoxically, the “Industrial Development Strategy for Urban Revitalisation (gongye xingshi, 工业兴市)” was not abandoned. In 2009, the local government began a political campaign that suggested the city should “prioritise, consolidate, and stabilise the manufacturing industry”⁷⁰ for economic growth in the future, and sought to revitalise the manufacturing sector through stimulating domestic demand and promoting digital transformation (Hangzhou Municipal Committee of CPC and Hangzhou Municipal Government, 2009; Xu, 2010). By 2011, despite growing awareness of “persistent structural and qualitative contradictions” in the local manufacturing industries, the government nevertheless reiterated its determination with the slogan “Unwavering Adherence to Industrial Development Strategy for Urban Revitalisation (jianchi gongye xingshi zhanlue budongyao, 坚持工业兴市战略不动摇)” (Hangzhou Municipal Government, 2011).

The economic stagnation also led the local government to become wide-reaching when establishing the institutional environment for SEIs’ creation. In 2011, the local government published the Strategic Emerging Industry Development Plan (2011–2015). In this plan, all seven SEIs, following instructions from the central government, were emphasised as “key sectors” that needed to be cultivated (Office of the Hangzhou Municipal Government, 2011). However, this strategy for the city’s industrial planning was highly unusual, as there normally would not have been sufficient financial and technological resources for developing all seven SEIs at the city level.

Agency Formation

The impetus for the further development of SEIs in Hangzhou initially formed within the private sector. Once again, the mindset required to depart from existing paths and create new ones originated from Alibaba. Between 2008 and 2009, Alibaba’s e-commerce operations experienced exponential growth. Notably, in 2009, the company launched the “Singles’ Day

⁶⁹ The “3+1” industrial clusters and “ten priority industries” include modern agriculture, modern manufacturing, modern service industry (3), and the cultural and creative industries (1). The modern agriculture industry encompasses ecological agriculture, agritourism, and facility agriculture. The modern manufacturing includes the development of traditional advantageous industries such as textiles, apparel, silk, foodstuffs, beverages, printing, and papermaking through advanced technologies; the upgrade of heavy and chemical industries, and the cultivation of high-tech sectors including information technology, pharmaceuticals, new materials, and environmental protection. The modern services encompass the tourism, cultural and creative industries, finance, commerce and logistics, software, intermediary services, real estate, and community services. The cultural and creative industries include information services, animation and gaming, design services, modern media, art, education and training, cultural leisure tourism, and cultural exhibitions.

⁷⁰ See Hangzhou Yearbook 2010, page 57.

Shopping Festival” to accelerate its B2C expansion⁷¹. When the Shopping Festival become more popular, however, Alibaba found they faced critical infrastructural constraints, particularly to its computing capacity (Shi, 2018).

Prior to 2009, Alibaba heavily relied on foreign technologies, especially building their computing capacity relying on technologies from IBM, Oracle and EMC (IOE) (Shi, 2018). When demand began to rapidly rise, Alibaba found that beyond pursuing independent innovation, their only viable solution was to make larger-scale technology purchases (including servers and software). However, this would bring two severe problems. First, increased procurement of foreign technologies would dramatically increase the company’s operational costs: “if we continued purchasing software and hardware from foreign companies, the cost alone would have bankrupted Alibaba” (Shi, 2018). Second, the technologies from IOE were not cutting-edge enough to meet Alibaba’s needs for simultaneously serving hundreds of millions of users. Confronted by these pragmatic imperatives, Alibaba redirected capital and human resources towards indigenous innovation in industries such as cloud computing.

Unlike the development of e-commerce, the impetus for the further development of SEIs was not formed simultaneously within the local government. The initial decision for cultivating ICT-related SEIs, such as cloud computing, was a political order from the central government. In 2011, the central government chose Hangzhou and four other cities as pilots for exploring the development of the cloud computing industry. Following up on the instructions from higher-level government, the Hangzhou government quickly published related industrial plans and established “the Cloud Computing Industrial Park” (Xu, 2012, p. 190). However, these actions appeared more like the fulfillment of political mandates assigned by higher-level government. By 2011, only four enterprises were moved into the Cloud Computing Industrial Park, excluding Ali Cloud (Xu, 2012, p. 190).

The innovative entrepreneurship of the local government in further SEIs was not fully formed until 2014. The window of opportunity emerged due to the city’s economic slowdown. As previously mentioned, between 2008 and 2011, Hangzhou’s manufacturing industries experienced a dramatic decline due to the Global Financial Crisis, this led to the

⁷¹ The Single’s Day Shopping Festival’s transaction volume was only 50 million yuan in 2009. Subsequently, as the Shopping Festival gained popularity, an increasing number of consumers opted to make purchases on this day. For instance, by 2017, the day’s transaction volume reached 168.2 billion Yuan, and in 2019 it reached 410.1 billion Yuan. The peak order creation rate in 2019 was 544,000 orders per second, 1,360 times higher than in 2009 (Qian, 2019).

stagnation in the growth of Hangzhou's economy and ultimately resulted in a sharp decline in the city's GDP growth rate (Gao and Yi, 2021). In 2012, Hangzhou ended its more than 20-year period of double-digit economic growth, with GDP growth falling to 9%, and further declining to 8% in 2013 (Xu, 2013; Wang, 2014). Consequently, how to find a new engine for economic growth became an urgent political mission for the local government officials. In an expert consultation meeting on Hangzhou's economic growth in 2014, Dr. Wang Jian, then Chief Technology Officer of Alibaba, offered a recommendation to the local leaders:

“Hangzhou can no longer aspire to become the political centre of China, nor can it become the country's economic centre. However, it has the potential to become China's data centre (Yu and Tang, 2017)”.

Dr. Wang's proposal was quickly accepted by leaders in the local government, partly due to the remarkable success of Ali Cloud in 2014 (Gao and Yi, 2021). After receiving these suggestions, the view of local government leaders on economic growth started to change: “The new generation of information technology, represented by big data, cloud computing, the Internet of Things, mobile internet, and intelligent manufacturing, is the direction Hangzhou must pursue (Yu and Tang, 2017)”.

Following this shift in vision, leaders in the local government decisively abandoned the Industrial Development Strategy for Urban Revitalisation, and reconceptualised the “Project No.1”⁷² by prioritising the development of the “information economy”⁷³. The construction of ICT-related industrial clusters in e-commerce, big data, cloud computing, and the Internet of Things, etc., thus became the primary objective of the local government (Hangzhou Municipal Committee of CPC and Hangzhou Municipal Government, 2014). The cultivation of the ICT-related SEIs was further recognised as the “correct and only” choice for the future economic and industrial development of Hangzhou (X. Wang, 2015).

The diffusion of innovative entrepreneurship from the top leader to cadres and grassroots officials was primarily through three ways. First, when top leaders in the local government initially reconceptualised the “Project No.1” and saw the information economy (digital

⁷² This “Project No.1” was significantly different from the one proposed in 2000. The “Project No.1” proposed in 2000 primarily focused on software, information technology, and the pharmaceutical industry, whereas the 2014 version specifically targeted ICT-related industries such as cloud computing, big data, intelligent logistics, and the Internet of Things.

⁷³ After the 2016 G20 Summit in Hangzhou, the term “information economy” was replaced by “digital economy”, defined as “a series of economic activities driven by information and knowledge as key factors and supported by information networks as essential carriers” (HZ03). Despite this shift in the terminology, both “information economy” and “digital economy” refers to the same category of industries.

economy) as the main engine for Hangzhou's future economic growth, lower-level cadres and grassroots officials were unclear about its implications (Yu and Tang, 2017). The top leaders thus established a special leading group and convened a series of meetings related to "Project No.1" leading group meetings. Leaders from all districts and related departments were included and required to attend these meetings. Within these meetings, by explaining the industries and technologies encompassed in the digital economy and its significance for Hangzhou's economic growth, the top leaders helped cadres to have the mindset to create digital economy-related SEIs, thus diffusing the innovative entrepreneurship from the top leader to cadres (H. Wang, 2015; Yu and Tang, 2017).

Thereafter, the local government reorganised its internal divisions, and established special departments, such as the Bureau of Cloud Computing and Big Data and the Digital Economy Division in the Bureau of Economy and Information Technology, which were the first of their kind in China (Gao and Yi, 2021). It even set up specialised research institutions within the government, such as the Hangzhou Digital Economy Research Institute (HZ03). These departments thus functioned as the channel for innovative entrepreneurship diffusion (HZ03; HZ04).

Last but not least, the local government established the evaluation, and more importantly, the reward system to facilitate the wider diffusion of the innovative entrepreneurship. In 2014, the Hangzhou government developed a comprehensive set of statistical indicators and the evaluation system specifically for the ICT industries, also the first in the country. Such an evaluation system was designed to assess cadres and officials by using indicators such as the output value of related industries, R&D expenditure, and the output value of new products. This system thus disciplined cadres and officials' behaviour and let them "have to" engage in SEI creation (HZ03). Meanwhile, the local government established a special reward fund: officials who performed well in the evaluation would be considered as making a contribution to local SEI creation, and thus could receive the performance bonus addition to their salaries ⁷⁴ (Office of the Hangzhou Municipal Government, 2014; HZ03). Consequently, officials in the local government became more motivated to facilitate the creation of SEIs.

⁷⁴ This is quite similar to the "franchising the bureaucracy" discussed by Ang (2016).

The Creation of Strategic Emerging Industries

Policy

Between 2014 and 2015, a series of policies were formulated and promulgated to foster the creation and development of ICT-related industries in Hangzhou, shortly after the idea of innovative entrepreneurship had been diffused from the private sector to the leaders in the local government. In 2014, the local government issued *Several Opinions on Accelerating the Development of the Information Economy* (Hangzhou Municipal Committee of CPC and Hangzhou Municipal Government, 2014). This policy document emphasised that cultivating industries related to the “information economy” and “smart economy” is the “critical pathway” and an “inevitable requirement” for the city’s future socioeconomic transformation. Consequently, an ambitious industrial development plan was proposed, mandating comprehensive coverage of the ICT industry chain—spanning from upstream infrastructure to downstream technological applications. Furthermore, the plan stipulated that by 2020, Hangzhou must establish six ICT-related industrial clusters: cloud computing and big data, the IoT, internet finance, smart logistics, digital content, and international e-commerce. Additionally, ICT industries were required to contribute to the upgrade of the city’s manufacturing sector and enhance the intelligence of public services including healthcare, governance, and transportation (Hangzhou Municipal Committee of CPC and Hangzhou Municipal Government, 2014).

Subsequent to these overarching strategies, the local government introduced numerous targeted policy initiatives to operationalise the development of ICT-related industries, in alignment with the highly ambitious industrial blueprint. In 2015, the Master Plan for Information Economy and Smart Applications (2015–2020) was published, mandating that local ICT industries sustain an annual growth rate of 10% to 20% and achieve widespread application across sectors such as modernising traditional manufacturing, streamlining governmental operations, and enhancing citizen services (Hangzhou Municipal Bureau of Economy and Informatization, 2015). In the same year, the local government made a suite of specific action plans, including *Several Opinions on Promoting the Construction Work of Smart E-government in Hangzhou*, the *Three-Year Action Plan for Promoting Smart Applications*, and the *Three-Year Action Plan for Establishing Six Major Centres* .

Market Constuction

The local government's industrial policies and associated action plans constructed a large domestic market for local enterprises, extending beyond market creation driven by pre-existing industries such as e-commerce. An important channel for market construction was through government procurement. Again, taking the cloud computing industry as an example. In 2014, the Hangzhou Municipal Government initiated the Smart E-Government Project (zhahui dianzi zhengwu xiangmu, 智慧电子政务项目), also known as the E-Government Cloud, which provided opportunities for local firms. In that year alone, over 70 local enterprises and research institutions submitted over 300 proposals to bid for this project, and 34 projects were selected and funded by the local government in the next year (H. Wang, 2015, p. 98). In 2015, the Hangzhou Smart Economy Promotion Regulations was published (Hangzhou Municipal People's Congress Standing Committee, 2015). The procurement of cloud computing resources and services was treated as the necessity, and the priority was given to "domestically pioneered products and services with independent intellectual property rights" in the government procurement (Hangzhou Municipal People's Congress Standing Committee, 2015). In the same year, the Smart E-Government Project Management Measures were issued, institutionalising the use of government procurement to stimulate the development of local cloud computing industry (Office of the Hangzhou Municipal Government, 2015b). A similar case is the smart application initiatives linked to public service, such as smart transportation, healthcare, elderly care, etc., launched after 2014 under the Three-Year Action Plan for Promoting Smart Applications (H. Wang, 2015). Similar to the Smart E-Government Project, these projects were typically bought or subsidised by the local government, providing market opportunities for local ICT firms. In 2016, the municipal government further invested in the City Data Brain Project (chengshi shuju danao, 城市数据大脑), a system that uses artificial intelligence (AI) and scientific algorithms to optimise urban management, notably traffic congestion. This initiative created additional demand for local enterprises specialising in cloud computing (infrastructure), big data (analytics), IoT (data acquisition) and AI (algorithm) (Ding, 2017, p. 97).

The other channel of market construction was through government-led initiatives to upgrade traditional agriculture and manufacturing industries in Hangzhou. In 2014, the Hangzhou Municipal Government launched the Smart Agriculture Project, aimed at exploring the application of ICTs in the agricultural industry (H. Wang, 2015). In the same year, the local government proposed the agenda for the upgrading of traditional manufacturing through digital transformation. Discourses such as "Four Upgrades and Three Innovations (sihuan

sanming, 四换三名)” and “Robots Replacing Human Labour (jiqui huanren, 机器换人)” firstly appeared in that year’s Government Work Report (Hangzhou Municipal Government, 2014). To operationalise this agenda, the government released the Three-Year Action Plan for “Robots Replacing Human Labour” in 2014, requiring that traditional manufacturing enterprises complete over 450 automation projects annually with a total investment target of 45 billion RMB (H. Wang, 2015). In 2015, the local government initiated the Special Action on “Factory IoT (gongchang wulianwang, 工厂物联网)”, designed to drive intelligent upgrades of manufacturing industries through the adoption of IoTs (Wang, 2016). Under this initiative, the government adopted a dual strategy: tax incentives were provided to enterprises actively engaged in the Special Action, while punitive measures, including differentiated electricity pricing and land-use policies, were imposed to compel reluctant firms to invest in industrial IoT and automation technologies (Wang, 2016). This approach effectively stimulated demand for locally developed solutions, creating a robust market for enterprises in IoT and robot industries. In 2017, Hangzhou introduced the Enterprise Cloud Migration Plan (qiye shangyun jihua, 企业上云计划), with an initial target of connecting 27,000 enterprises to cloud computing services (Ding, 2018). A remarkable market for cloud computing was then created by the policy, as over 45,000 enterprises from agriculture, manufacturing, and service sectors purchased locally provided cloud computing services in that year (Ding, 2018).

Technological Innovation

Once the market was constructed, an increasing number of local enterprises actively engaged in technological innovation in ICT-related industries. Besides Alibaba’s earlier establishment of Ali Cloud and its multi-billion-yuan investments in cloud computing and big data industries, Hangzhou-based firms such as Hikvision, Dahua Technology, and H3C (later renamed as New H3C,) strategically aligned their R&D efforts with emerging opportunities created by government-initiated projects like Smart City between 2014 and 2015 (H. Wang, 2015; Wang, 2016). In 2014, Hikvision and H3C unveiled cloud computing-based Smart City solutions, and Hikvision started the digital and intelligent transformation in that year. Concurrently, Dahua Technology invested 2.5 billion RMB to establish an IoT Industrial Park with the local government. By 2017, responding to market opportunities generated by policies such as “Machines Replacing Human Labour” and the “Factory IoT”, firms including Alibaba Cloud and Supcon Technology systematically integrated cloud computing,

IoT, big data, and AI technologies into manufacturing processes. These enterprises⁷⁵, through their proactive innovation strategies:

“formed the backbone of Hangzhou’s ICT-related industrial creation and development (HZ03)”.

It can be observed that as more enterprises engaged in innovation, Hangzhou’s ICT-related industries began to exhibit intra- and inter-industrial collaborative development. In terms of intra-industrial collaboration, taking the cloud computing sector as an example, at the very beginning, Hangzhou’s cloud computing industry clustered predominantly on Infrastructure as a Service (IaaS)⁷⁶, dominated by Ali Cloud. When technologies in Ali Cloud became more mature, local firms such as Hikvision began collaborating with the leading firm, and taking advantage of the technological infrastructure provided by Ali Cloud to expand the cloud computing into Platform as a Service (PaaS) and Software as a Service (SaaS) (H. Wang, 2015). In terms of the inter-industrial collaboration, the maturation of the local cloud computing industry facilitated the growth of big data industries, as the big data technologies rely heavily on scalable computational power, and cloud computing provided flexible, abundant, and cost-effective computational resources. By 2015, clusters of big data enterprises specialising in video analytics, information security, data storage, and healthcare emerged in Hangzhou (Wang, 2016; Ding, 2017, p. 99). In turn, these firms generated new demand and markets for cloud computing industries. Concurrently, the innovation of IoT sensor technologies and smart devices was accelerated⁷⁷, driven by the need for high-volume, precise data acquisition from the big data industry. The broader application of IoT technologies subsequently spurred demand for novel algorithms and analytical models in cloud computing and big data, creating a cyclical innovation dynamic. These interconnected developments — industrial maturation, cross-sector collaboration, and technological iteration — constituted the foundation for subsequent advancements in Hangzhou’s internet finance, robotics, and artificial intelligence industries⁷⁸.

⁷⁵ In the interview, Alibaba, Hikvision, NetEase, H3C, Dahua and Ant Financial are described as the ‘six pillars’ of Hangzhou’s digital economy.

⁷⁶ Alibaba Cloud, as an IaaS provider, enables users to access and utilise core computing resources such as computing power, storage, and networking based on their own demand, without the need to purchase and maintain costly physical hardware.

⁷⁷ For instance, Hikvision and Dahua was engaging in the innovation and production of IoT sensor technologies and smart devices.

⁷⁸ Such as Ant Finance, Unitree Robotics, and Deepseek.

Resource and Assets

More resources and assets were anchored and mobilised jointly by private-sector actors and the local government for SEI creation and development. These resources were deployed through the establishment of locally based industrial parks, the formation of sectoral strategic alliances, the provision of finance via multiple channels, and the implementation of government-led talent programmes. The first channel for anchoring and mobilising assets was the creation of locally based industrial parks. Such parks, instituted by the local government, were initially designed to foster spatial clustering of enterprises by offering an attractive package of policy incentives, including tax concessions, bandwidth subsidies for internet firms, and financing subsidies. The first ICT industrial park emerged in Hangzhou was the Cloud Computing Industrial Park, which was established in 2012. At the beginning, the park failed to attract tenants via policy levers, since the trajectory and future prospects of cloud computing in China remained very ambiguous. Between 2012 and 2013, only eight firms entered into the industrial park (Fu, 2017). The turning point was in 2013. In that year, Ali Cloud—the leading local cloud computing enterprise—was mobilised into the park through private relationships between the company leader and the responsible government official (Fu, 2017). In the same year, Ali Cloud’s developer conference, later renamed as the “Yunqi Conference” (yunqi dahui, 云栖大会), was relocated to the cloud computing park. Taking advantage of the influence of both Ali Cloud and the Yunqi Conference, a substantial influx of cloud computing firms was soon attracted into the park, rapidly generating an industrial agglomeration. In 2014, 115 cloud computing firms had moved into the Cloud Computing Industrial Park; by 2017, the number of resident companies had risen to 475, constituting a “relatively comprehensive cloud computing ecosystem” in the industrial park (H. Wang, 2015; Ding, 2018). In 2014, Li Qiang—then Governor of Zhejiang Province and current Premier of the State Council—highly praised the development model of Hangzhou’s cloud computing industrial park after his tour in the park: “we need to (learn from the cloud computing industrial park to) cultivate more characteristic towns, and let Hangzhou have more ‘colourful clouds’ of innovation” (Fu, 2017). Thereafter, the model of government-built industrial parks (subsequently named as “characteristic towns (tese xiaozhen, 特色小镇)”), engagement with local dragonhead enterprises, and then attraction of more enterprises in the related industries gained more political legitimacy. Between 2014 and 2019, more than fifty ICT-related industrial parks were established, covering sectors such as Internet finance, the IoT, information security, and AI (Ding, 2019).

The second channel for asset mobilisation was forming industrial strategic alliances among various types of organisations, which aims at mobilising the local knowledge and innovation resources. In Hangzhou, the presence of leading institutions—such as Zhejiang University and other research institutes—constitute a large pool of knowledge and innovation assets for industrial development. With the support from the local government, local “dragonhead enterprises”⁷⁹ established industrial strategic alliances with the local universities and research institutes to facilitate the commercialisation of pertinent knowledge, technologies, and innovations. After 2014, it can be observed that a series of enterprise-university (or research institution) alliances emerged across Hangzhou’s cloud computing, big data, and IoT industries (H. Wang, 2015; Wang, 2016).

In terms of financial assets, the sources of funding for Hangzhou’s ICT-related industries were diversified. On the one hand, the early successes of leading local firms such as Alibaba and Hikvision, and their access to domestic and international capital markets, provided the initial financial investment for regional industrial development. On the other hand, with the launch of the “Project No. 1”, the municipal government also initiated a series of funding schemes for ICT-related industries. In 2015, the local government, in collaboration with provincial state-owned investment enterprises, established a 2-billion-Yuan “Information Economy Investment Fund” (xinxi jingji touzi jijin, 信息经济投资基金), designed to attract additional private capital for industrial path creation through government cornerstone investments (Wang, 2016). In 2016, the National Emerging Industries Venture Capital Guidance Fund was mobilised into Hangzhou, primarily adopted to support innovative SMEs at the seed and start-up stages within emerging industries. In that year, more than 40 billion Yuan was channelled, under the guidance of the National Emerging Industries Venture Capital, into over 900 small and medium-sized enterprises (Ding, 2017). Furthermore, dedicated fiscal budgets were earmarked to complement local Special Action initiatives (such as “Robots Replacing Human Labour” and “Factory IoT”), including providing firms participating in these initiatives with low-interest loans, subsidies, and performance-based rewards (H. Wang, 2015; Wang, 2016).

Last but not least, a greater pool of human assets was mobilised and agglomerated in Hangzhou through the concerted efforts of the private sector and the local government, in order to meet the region’s demand for knowledge, particularly cutting-edge knowledge, in path creation. On the private sector side, just similar to patterns observed elsewhere⁸⁰, local

⁷⁹ A metaphor for these giant and innovative leading companies in Hangzhou, such as Alibaba.

⁸⁰ For instance, see Gong and Binz (2023)’s analysis on Shanghai’s gaming industry.

dragonhead firms not only recruited talent from China's and the world's leading universities, and deepened collaborations with domestic research institutes, but also established R&D centres and branch offices abroad to utilise global knowledge to the local industrial path creation. Meanwhile, the municipal government actively used monetary incentives to encourage more talent to agglomerate in Hangzhou⁸¹ (HZ02). To foster the generation of cutting-edge knowledge, new types of universities and research institutes, such as Westlake University and Zhijiang Laboratory, were established or funded by the local government. Moreover, the local government also concentrated their efforts on re-industrialisation of the existing talent pool to prevent the outflow and migration of human assets⁸². For instance, the government established entrepreneurship platforms to facilitate local talent's re-entry into the ICT industry, thereby ensuring that inflows consistently exceed outflows of human resources (Zhejiang Economic and Information Center, 2024). As one interviewee observed:

“Many employees of leading local firms, such as Alibaba, face institutional constraints that compel them to leave their position after the age of 35. The workers may seek other entrepreneurial opportunities in Hangzhou or other cities. In response, the municipal government established nearby industry platforms, such as the ‘Dream Town’, to support their second ventures. Through these government-provided platforms and associated policy support, coupled with the employees’ existing corporate networks with the local firm, an increasing number of talented people and professionals choose to stay in Hangzhou to start their businesses. (HZ02)”

Change of Institutions

The establishment of various formal and informal institutions has played a pivotal role, alongside resource mobilisation, in fostering local innovation and industrial path creation. In 2014, with the launch of “Project No. 1”, departments in the local government⁸³, regulations, and evaluation systems pertaining to the ICT-related industries were initiated at the same time. In the same year, the municipal government applied to the central government and tried to be selected as the “National Demonstration Zone for Independent Innovation”⁸⁴ (guojia zizhu chuangxin shifanqu, 国家自主创新示范区). This was approved in the next

⁸¹ These monetary incentives include direct monetary rewards and housing subsidies for the talents.

⁸² In recent years, more and more cities in China made their own talent policies and started the competition for talents (Wen, 2018).

⁸³ Such as the Bureau of Cloud Computing and Big Data, the Digital Economy Division in the Bureau of Economy and Information Technology, and Hangzhou Digital Economy Research Institute.

⁸⁴ The “National Demonstration Zone for Independent Innovation” was an institution designed and selected by the central government to allow certain regions to experiment in institutions, policy and finance system that may have positive impact on independent innovations.

year. By selecting as the “National Demonstration Zone for Independent Innovation”, local ICT-related industries received more assets and support from the central government, and the local government had greater autonomy in industrial path creation. In 2018, the municipal leadership proposed a political campaign called “Building the First National Digital Economy City” (dazao quanguo shuzi jingji diyicheng, 打造全国数字经济第一城). Under this campaign, more institutions, such as a specialised leading group for digital economy development chaired by the party secretary and mayor, were established (Office of the CPC Hangzhou Municipal Committee and Office of the Hangzhou Municipal Government, 2018; HZ03). Also, to scientifically ensure that the development of ICT-related industries was on the right track, an expert system to provide suggestions on which technologies or SEIs was also established (HZ01). Experts, typically sponsored by the local government, engaged in in-depth studies of local emerging technologies and industries, produced reports, and identified firms and innovations that could contribute to local industrial development. Based on the experts’ recommendations, the local government provided support, such as land or funds, to promising enterprises and technologies⁸⁵ (HZ01).

As industrial path creation heavily relies on innovation and entrepreneurship activities from the private sector (especially in the dragonhead companies), institutions related to providing service for local firms were established. In 2016, the local government initiated a series of institutional reforms aimed at enhancing the administrative efficiency, including the “reform of government functions” (fang-guan-fu gaige, 放管服改革) “Streamline Administration, Delegate Power, Strengthen Regulation and Improve Services” (fang-guan-fu) initiative, building the “Four Lists, One Net” system (sizhang qingdan yi zhang wang, 四张清单一张网), and the “One Visit at most” (zui duo pao yi ci, 最多跑一次). These institutional reforms sought to integrate different government departments through information technology, thereby enabling firms to obtain necessary government resources, such approvals for land use and investment, in significantly reduced timeframes. Such a highly efficient administration was recognised as constitutive of Hangzhou’s favourable business environment, which was deemed essential for “attracting more innovative firms, safeguarding and stimulating entrepreneurship and innovations in industrial path development” (Ding, 2017; HZ03). Furthermore, dedicated departments and institutional arrangements were established to provide ongoing support to dragonhead local enterprises.

⁸⁵ Once the technologies are industrialised, the experts in the expert system will also evaluate the extent to which the technologies facilitate the creation and development of SEIs. But this also leaves space for rent-seeking and corruption (discussed in Section 5.4)

For instance, in 2018, the Yuhang District government⁸⁶ established a division, “Qincheng Ban (亲橙办)”, aiming to provide the round-the-clock services for Alibaba. As one of interviewees working in the government department described:

“For enterprises, applying for policies or approvals often requires engaging with various government departments at different levels, which can be extremely time consuming. Therefore, we established the Qincheng Ban for Alibaba. Any government-related issues that Alibaba needs to coordinate or seek approvals for can go directly through this office. Similarly, if we have any specific requirements for Alibaba, we just communicate with them through this office. This significantly reduces administrative costs for Alibaba (HZ02).”

In terms of the informal institution, Local officials have demonstrated an inclusive and supportive attitude towards the industrialisation of cutting-edge technologies. This inclusivity manifests primarily in two aspects. First, local officials encouraged such cutting-edge technologies to be “tried out first”. Even if relevant regulatory policies remain to be completed or the risk assessment system was under development, officials were willing to provide funding and opportunities for experimental exploration in the industrialisation of emerging technologies (TJ05). As one interviewee noted:

“The local government permitted the commercialisation of new technologies even when regulatory frameworks remained underdeveloped. In many other cities, without the policy basis and regulatory systems, it is impossible for the local government to allow these technologies to be industrialised. (TJ05)”

Second, the local government tolerated failure in innovation activities. For example, during the development of local ICT-related industries, the government repeatedly signed cooperative agreements with local dragonhead firms to support the commercialisation of technology through implementation of various projects. While such collaborations typically involve governmental intervention, such as imposing deadlines for project completion through administrative powers (TJ05), the Hangzhou government exhibited a higher degree tolerance for experimental setbacks in the collaboration. As one local official noted:

“Enterprises may suspend or even terminate projects due to market considerations or technical constraints. The local government permits firms to unilaterally make such

⁸⁶ In 2013, Alibaba relocated its headquarters to Yuhang District. Consequently, the service provision for Alibaba was primarily the responsibility of the Yuhang District Government (HZ02).

decisions, even if these projects are formally listed in government-enterprise cooperation agreements (HZ03).”

5.4 Discussion and Conclusion

Hangzhou may exemplify the transition towards the knowledge economy among certain developed regions in China. It is evident that, despite possessing leading innovative enterprises such as Alibaba, Hangzhou’s knowledge economy transition was not straightforward. Hangzhou’s transition towards the knowledge economy followed two stages. The first stage, characterised by the rise of Alibaba and the development of the e-commerce industry, signalled the initial emergence of SEIs within the city. Yet, this phase primarily functioned as a preparatory stage: despite the symbolic significance of e-commerce, the city’s overall growth remained largely dependent on labour-intensive industries such as food processing and textiles. The second stage, by contrast, marked a substantive transformation of the growth model. With the creation of cloud computing, big data, the Internet of Things, digital content, and other ICT-related SEIs, Hangzhou experienced a structural shift in which the “digital economy” replaced labour-intensive industries as the main engine of economic growth.

The change agency driving Hangzhou’s SEIs creation and knowledge economy transition did not initially originate within the government; however, the formation of change agency within the local government proved crucial to triggering this transformation. Quite like other developed nations and regions, the first actor having the mindset and ability to create SEIs in Hangzhou were innovative enterprises (notably Alibaba), and these firms to some extent facilitated the creation of several local SEIs. However, enterprise-led path creation did not fundamentally reconfigure the regional industrial structure; Hangzhou’s economic development strategy as well as growth was still driven by traditional manufacturing before 2014. The turning point of transferring Hangzhou’s economic growth model was the formation of change agency in the local government. As we can see, when creating SEIs to drive economic growth became the collective vision in the local government, it rapidly abandoned the “Industrial Development Strategy for Urban Revitalisation” and repositioned the development of the digital economy as the foremost strategy for economic development, ultimately leading to Hangzhou’s transition to the knowledge economy.

The Hangzhou case demonstrates that in developed regions, the local government’s change agency can be transferred from enterprises and thus be exogenously formed. The nature of

this exogenous formation is enterprises with innovative entrepreneurship transmitting their mindset and visions for creating SEIs to drive economic growth to the local government, which persuades the local government to reach a collective vision in SEIs-driven economic growth⁸⁷. Consequently, this ensures that the local government collaborates with the innovative enterprises to allocate resources in SEIs creation, provide policy or institutional support, and even use government procurement to create niche markets for SEIs.

The transmission of innovative entrepreneurship from enterprises to the local government depends on specific conditions. First, there are innovative enterprises pre-existing in the region who have the innovative entrepreneurship in SEIs creation. These enterprises need to prove themselves to the local government that they have capabilities to create SEIs and thus can contribute to local economic growth. This is the source of legitimacy for the enterprises to pass their innovative entrepreneurship in creating SEIs to the local government. Second, the transmission of innovative entrepreneurship from the enterprises to the government necessitates a window of opportunity. In the Hangzhou case, this window of opportunity emerged during a period of local economic stagnation. Under such a circumstance, local government officials, compelled by the pressures of assessment or promotion, were driven to seek solutions to stimulate economic growth. Consequently, local leading enterprises having proven their abilities had the chance to transfer their innovative entrepreneurship in creating SEIs and lobby the government.

In the context of economic stagnation, the diffusion of change agency in the local government is relatively direct. This is because officials at all levels need to drive economic growth to meet evaluation requirements or get promotion. Consequently, when traditional industries fail to sustain growth, creating SEIs for local officials is a pragmatic choice. However, this does not imply that corresponding institutional adjustments are unnecessary. Like Hefei, the Hangzhou government implemented institutional adaptations to facilitate the downward diffusion of innovative entrepreneurship. These institutional adjustments are also regional and embedded in Hangzhou's specific context. For instance, most officials initially were unfamiliar and lacking knowledge of "digital economy" when the local government changed their development strategy. The local government established "the leading group" based on this situation, and used this institutional arrangement to help cadres and grassroots

⁸⁷ The motivation for enterprises to transmit innovative entrepreneurship to the local government lies in that harmonising government development strategies with their specific industrial sectors facilitating corporate expansion and profitability (Huang, 2023).

officials familiarised themselves with the core concepts and development modalities of the digital economy.

Exogenous formation of change agency requires the relationship of the enterprise and local government in SEIs creation. Since innovative entrepreneurship initially originates from enterprises, the government may merely need to partner with these firms to facilitate SEIs creation. This implies that the local government may not need to engage in resource anchoring or intervene directly in the reconfiguration of regional endowment. Consequently, in the creation of SEIs, enterprises predominantly take the role of innovative entrepreneurs and place-based leaders, whilst the local government leans more towards the role of an institutional entrepreneur. This role distinction shapes the nature of institutional design. Under such a circumstance, institutional arrangements established by the local government, such as fast-track approvals and tolerance for innovation failure, are essentially utilised to provide public services and support for enterprises. This presents a fundamental contrast to the situation in Hefei discussed in Chapter 4. For instance, because the Hefei government needed to mobilise resources by itself, the fault-tolerance institution in Hefei was initially directed at local government officials. Conversely, in the Hangzhou case, the risk-tolerance institution designed by the government was explicitly intended to facilitate enterprises' decision-making and actions in creating SEIs.

Government's exogenous formation of agency also determines the trajectory of Hangzhou's SEI creation and knowledge economy transition. In contrast to Hefei's multiple development paths, Hangzhou's SEIs creation is characterised by a relatively concentrated focus on the "digital economy", exhibiting stronger technological relatedness among its industrial paths. As discussed above, this is manifested by the exogenous transmission of change agency and the consequential division between the government and enterprises. It is worth noting that, exogenous formation of change agency to a certain extent resulted in the local government lacking the capacity for independent intervention in industrial creation. For instance, in the Hangzhou's case, the local government faced top-down political pressures and needed to cultivate manufacturing-related SEIs that diverge from the dominant domains of local leading enterprises (HZ03). Under such a circumstance, the Hangzhou government was unable to rely solely on state capacity to spearhead the development of these target industries, unlike its counterpart in Hefei. Consequently, the creation of manufacturing-related SEIs in Hangzhou was significantly less rapid than in Hefei (HZ02; HZ03).

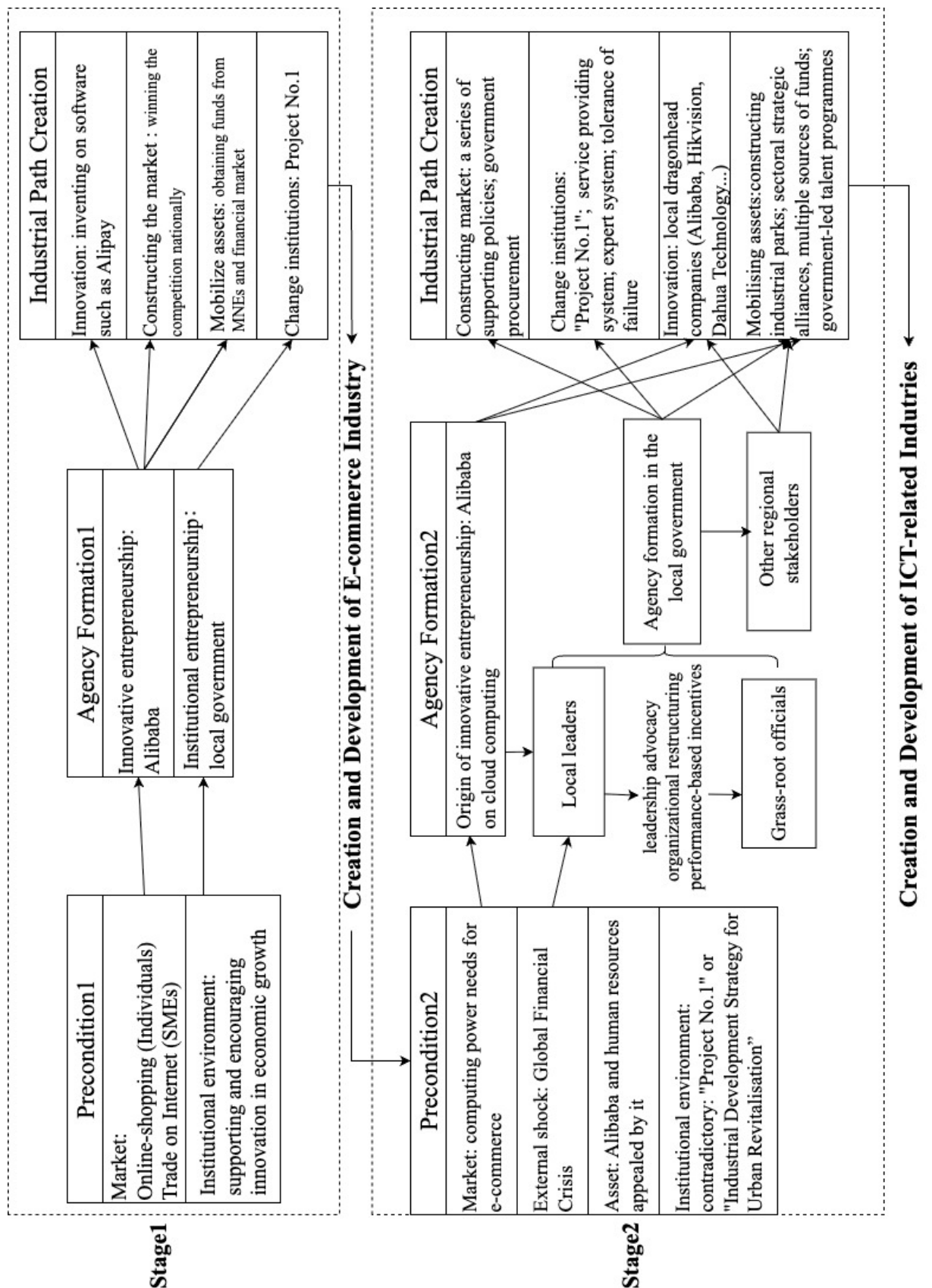


Figure 5-1 The Transition to the Knowledge Economy in Hangzhou (Source: the Author)

The Hangzhou's case exemplifies how the region with dragonhead companies can make the transition to the knowledge economy. It reveals the key of triggering the knowledge economy in these regions lies in whether enterprises with innovative entrepreneurship can transmit their agency to the government within the window of opportunity, and whether the entire government can reach a consensus, and have the mindset and will to create SEIs. This is also illustrated in Tianjin's case.

Chapter 6: Tianjin: Why Left Behind?

This chapter aims to analyse why Tianjin failed to create and develop strategic emerging industries (SEIs) and transition to the knowledge economy. In 2005, the Tianjin Binhai New Area (TBNA) was chosen by the central government as China's second national-level new area and the only one in the northern part. This brought up a significant amount of innovative resources to TBNA, and as show below, some of SEIs began to emerge within the city. However, since statistics became available in 2014, the proportion of SEIs to GDP in Tianjin has consistently remained below 8%, and its economic growth continues to heavily rely on traditional industries such as oil and chemical industries⁸⁸. This raises the question: why did Tianjin, a city with abundant innovative resources and favoured by the central government (TJ02), fail to successfully create and develop strategic emerging industries in the city?

This chapter is organised as follows. The first section reviews the preconditions in Tianjin, particularly in the TBNA, prior to the creation and development of SEIs, demonstrating that Tianjin's failure in the knowledge economy transition cannot be attributed to weak initial endowments. The second section examines the administrative system reforms undertaken by the TBNA local government, with a particular focus on why change agency of creating SEIs failed to be formed within the local government. The third section analyses how the TBNA government impedes, rather than leads or facilitates, the creation and development of SEIs. The chapter concludes by discussing why Tianjin, a city with abundant innovative resources and favoured by the central government enjoying ultimately failed to successfully make the transition to the knowledge economy.

6.1 Precondition of Tianjin: Before 2010s

This section aims to objectively present the preconditions for the creation and development of SEIs in Tianjin prior to 2010⁸⁹. The analysis focuses particularly on the resource endowments pre-existing within the region that were relevant to SEI creation and development, and thus demonstrates that Tianjin's failure in transitioning towards a knowledge economy cannot be attributed to weak endowments at the initial stage. On the contrary, compared to cities such as Hefei or Hangzhou, Tianjin had, by 2010, already accumulated a significant base of the knowledge resources essential for SEIs development

⁸⁸ See Statistical Communiqué of Tianjin on the National Economic and Social Development from 2014 to 2021.

⁸⁹ Selecting the year 2010 is because the Decision on Accelerating the Cultivation and Development of Strategic Emerging Industries was published by the State Council in 2010.

and began to establish both market structures and a supportive institutional environment spanning from the central to the local government. Some SEIs had even begun to emerge within Tianjin at this stage. It could thus be argued that, from the perspective of resource endowment, Tianjin possessed greater potential than Hefei or Hangzhou to take a leading position in the transition to the knowledge economy.

Industrial Base

In terms of the industrial base, a cluster of industries directly or indirectly related to SEIs were formed locally in Tianjin before 2010. The creation and development of these industries benefited from both the concentration of local research institutions predating the Reform and Opening-up era, and the subsequent inflow of foreign direct investments (FDIs) and multinational enterprises (MNEs). More importantly, parts of these industries were already exhibiting evolutionary trajectories towards SEIs. Take the Information and Communication Technology (ICT)-related industries as an example. During the planned economy period, Tianjin possessed significant research capabilities in information technologies: China's first television set, photocopier, Chinese-language fax machine, and first colour television production line was all invented and manufactured in Tianjin. In 1998, the Tianjin Municipal Government established its High-Tech Zone, which was selected as the National High-Tech Industrial Development Zone in 1991, and enabled increasing numbers of local research institutions to engage in ICT-related industries by clustering in the High-Tech Zone. Around 2000, several enterprises specialising in Internet of Things (IoT) technologies (e.g., Tianjin University's Tiancai, later rebranded Tiandy Technologies) and software development (e.g., Nankai University's Nanda General) were founded by local research institutes. These enterprises rapidly evolved into regional dragonhead enterprises through participation in major national projects. Consequently, attracted by these dragonhead enterprises, even more IoT and software enterprises agglomerated in Tianjin. In 2006, through the collaboration with the Chinese Academy of Sciences (CAS), Tianjin government mobilised the design and production of supercomputers into Tianjin (Chinese Academy of Science, 2007; Xinhua News Agency, 2019). This initiative further incentivised the municipal government to attract upstream and downstream ICT enterprises (e.g., software development for supercomputer). By 2010, over 270 software firms had clustered in Tianjin, generating exceeding 27 billion Yuan revenues in the software industry in that year (Tianjin Development and Reform Commission and Tianjin Economic and Informatization Commission, 2012b).

Moreover, after the era of the Reform and Opening-up, the municipal government established the Tianjin Economic-Technological Development Area (TEDA) in 1984, which served as the platform for attracting FDI and MNEs to facilitate the local ICT industries. In 1992, Motorola, the world's leading mobile communications equipment manufacturer at that time, established their branches and research center within TEDA, causing the rapid growth in domestic telecommunications manufacturing (including pagers and mobile handsets) in Tianjin (Mao, 2018). In 1995, Motorola invested and established a semiconductor packaging and testing production line at TEDA, and further established an 8-inch wafer fabrication plant in Tianjin. Afterwards, more MNEs specialising in telecommunications equipment and semiconductors — such as Samsung — were attracted and started their business at TEDA. With the influence of these giant foreign firms, domestic companies (e.g., Tianjin Zhonghuan Electronic) began to engage in ICT-related R&D activities and contributed to the creation of local ICT industries through participation in upstream and downstream supply chains (G. Liu, 2010; Tianjin Development and Reform Commission and Tianjin Economic and Informatization Commission, 2012a). By 2010, the output value of Tianjin's telecommunications equipment manufacturing sector alone exceeded 70 billion Yuan, while integrated circuits (IC) and semiconductor industries similarly demonstrated rapid expansion (Tianjin Development and Reform Commission and Tianjin Economic and Informatization Commission, 2012a).

Besides the ICT industry, industries directly related to SEIs such as pharmaceuticals, new energy, and new materials also emerged and developed in Tianjin prior to 2010. This progression was likewise facilitated by the scientific research legacy retained from the planned economy era, coupled with large-scale technology transfers following the Reform and Opening-up. In the pharmaceutical industry, for instance, locally-based research institutions (such as the China Academy of Medical Sciences' Blood Diseases Centre, established during the planned economy period) invented technologies related to stem cell banking, transplantation, therapeutics, and pharmaceutical development. These innovations gradually became commercialised and were applied into industries, contributing to the transformation of the local pharmaceutical industry (G. Liu, 2010; Liu, 2011). Whereas Tianjin's pharmaceutical industry historically relied predominantly on drug replication before 2010, the recognition of Tianjin's leading position in stem cell technologies — both domestically and internationally — subsequently attracted and incentivised numerous enterprises specialising in cellular and genetic engineering to establish their business in the city (Tianjin Development and Reform Commission and Tianjin Economic and Informatization Commission, 2012c).

The same pattern can also be observed in new (or green) energy industry. By 2010, Tianjin's new energy industry primarily encompassed three domains: lithium-ion batteries, wind power, and photovoltaics. The technological foundations of Tianjin's lithium battery industry can be traced back to the planned economy era. In 1958, the China Electronic Technology Group Corporation's 18th Research Institute (CETC-18), a state-owned research institution specialising in battery technology, was established in Tianjin. By 1997, CETC-18 and the Tianjin Municipal Government had jointly founded Tianjin Lishen Battery. Based on CETC-18's accumulated expertise in lithium battery technologies, Lishen rapidly secured a collaboration with Motorola, establishing itself as one of China's leading lithium battery enterprises during this period⁹⁰. Driven by this dragonhead enterprise, numerous upstream and downstream lithium battery manufacturers as well as companies specialised in the material industry agglomerated in Tianjin. In terms of the wind power industry, technologies transferred from advanced countries, such as Denmark's Vestas in 2005, were adopted to create new industries in Tianjin. Regarding photovoltaics and new materials, Tianjin also possessed technologically advanced leaders such as Tianjin Zhonghuan Electronics (a state-owned enterprise). Collectively, under the leadership of these dragonhead enterprise, Tianjin attracted over 1,000 enterprises specialising in new energy and new materials by 2010, total output value of which consequently expanded rapidly from 11 billion Yuan in 2005 to 60 billion Yuan (Tianjin Development and Reform Commission and Tianjin Economic and Informatization Commission, 2011a).

It is worth noting that before 2010, industries associated with SEIs still constituted a relatively minor proportion of Tianjin's economic growth. Even the most profitable industry, telecommunications equipment manufacturing, ranked merely fifth among Tianjin's all industries (with output value of 6.1 billion in 2010), contributing substantially less to local economic growth than traditional sectors such as petroleum (54.32 billion) and equipment manufacturing (17.736 billion) (Huang, Wang and Zheng, 2010).

Nevertheless, Tianjin's stagnation in its transition to the knowledge economy is not due to its path dependence on traditional industries. On the contrary, it can be observed that the prosperity of traditional industries provided enabling conditions for emerging industries. For instance, by 2010, Tianjin's annual output of conventional vehicles reached 3.73 million per year, the car industry had become a primary contributor to municipal taxation and economic

⁹⁰ In the early 2000s, Lishen, BYD and ATL were recognised as the "troika" in the lithium battery industry in China. While firstly started innovation in dynamic batteries for new energy vehicles, Lishen was sold to China Chengtong because it was seen as "lacking competitiveness" in the industry. But BYD and ATL still maintain their dominance in the lithium dynamic batteries industry until now.

growth (Huang, Wang and Zheng, 2010). But this did not impede local car enterprises and research institutes (such as Tianjin Qingyuan, CETC-18, Lishen and laboratories in Tianjin University) continued to expand their R&D in new energy vehicle technologies (G. Liu, 2010). Furthermore, anticipating policy-driven new energy vehicles market expansion—notably stimulated by the China’s Ministry of Science and Technology (MOST) and the Ministry of Finance’s *Ten Cities, Thousand Vehicles 2009–2012* project—several enterprises in the traditional industry began strategically to invest in technologies in the new energy vehicle industry. innovation. For instance, in 2009, the China National Offshore Oil Corporation (CNOOC), invested 5 billion Yuan in Lishen to increase the density of their R&D activities in the dynamic battery industry in 2009 (The Economic Observer, 2014).

Institutional Environment

Viewed solely from the institutional perspective, the creation and development of SEIs in Tianjin was even more promising than Hefei or Hangzhou in 2010. This comparative advantage stemmed primarily from the establishment of Tianjin Binhai New Area (TBNA) in 2005, which was the only national special economic area in the northern China. In the Fifth Plenary Session of the 16th CPC Central Committee in 2005, “promoting the development and opening of Tianjin Binhai New Area and other qualified regions to stimulate regional economic growth” was proposed by the Central Committee. The work on advancing TBNA’s development was formally incorporated into the subsequent Government Work Report and the Eleventh Five-Year Plan (2006–2010) in the next year (Zhu and Sun, 2009). Consequently, TBNA was formally given the equivalent status to Shenzhen or Pudong New Area in Shanghai.

The designation of TBNA as the national special economic area secured central policy support for Tianjin’s SEIs development. On the one hand, the planning and construction of TBNA was initiated by the Tianjin municipal government in 1994. Between 1994 and 2006, the municipal government systematically relocated SEIs to TBNA⁹¹ (as shown in Table 6-1). On the other hand, in the *Opinion on the Issues of Promoting the Development and Opening of Tianjin Binhai New Area* (guanyu tuijin Tianjin Binhai xinqu kaifa kaifang youguan wenti de yijian, 关于推进天津滨海新区开发开放有关问题的意见), TBNA was positioned by the State Council as “A gateway to northern China leveraging the Beijing-Tianjin-Hebei region, serving the Circum-Bohai Region, radiating across the ‘Three

⁹¹ Some enterprises related to SEIs within the TEDA and High-tech zone were belonged to TBNA after 2006, as both TEDA and Tianjin High-tech Zone were incorporated into TBNA after since.

Norths'⁹² (North, Northeast, and Northwest China), and engaging Northeast Asia – striving to become China's northern hub for international commerce, an advanced manufacturing and R&D conversion base, and a global shipping and logistics centre" (State Council, 2006). The primary approach for achieving this vision was through "prioritising indigenous innovation capacity, refining R&D conversion systems, and enhancing comprehensive technological competitiveness" (State Council, 2006). Therefore, to support indigenous innovation in TBNA, the central government, in addition to providing tax exemptions and special subsidies, also approved the TBNA to become the "Comprehensive Reform Pilot Area", which decentralises the power of economic and administrative system design to TBNA. In particular, the power of institutional reform in finance was decentralized, and the development of industrial investment funds, venture capital funds, diversified ownership financial institutions were also encouraged in TBNA. This gave the comparative advantage of enterprises engaging in SEIs in TBNA, as they would not face the difficulty in accessing investment due to institutional constraints — particularly given China's highly-controlled financial system back in 2006.

TBNA's administrative system, once was considered as "the most significant stumbling block" for the local economic and industrial development⁹³, underwent substantial reform before 2010 (Zhu and Sun, 2009; Di, 2012; Liu, 2013; Zhang, 2014; Song, 2016). When the municipal government established Binhai New Area in 1994, there were three districts (Tanggu, Hangu, Dagang) and three functional zones (Tianjin Port, TEDA, Free Trade Zone, and later incorporating the Hi-Tech Zone) within the region. This caused the fragmentation of government in the TBNA. Before 2009, there were seven public security bureaus, five industry and commerce administrations, six state tax bureaus, five local tax bureaus, six courts, and five procuratorates in the jurisdiction of the TBNA (Zhang, 2014, p. 2). The overlapping functions and ambiguous jurisdictional boundaries between departments, and problematic multi-actor management of enterprises impeded investment activities and local industrial development (Zhu and Sun, 2009; Liu, 2013; Zhang, 2014).

This fragmented administrative system underwent substantial reform in 2009 — one year prior to the central government's decision on accelerating the development of SEIs. In 2009, Tianjin municipal government abolished Tanggu, Hangu, and Dagang districts, and TBNA

⁹² This refers to regions including in China's north, northeast, and northwest.

⁹³ See Zhu and Sun, 2009, p2.

was designated as a unified administrative district at deputy-provincial level⁹⁴. The power of governance was transferred to the newly established TBNA government, and departments with similar functions were largely reduced: by 2009, TBNA's administrative system comprised a mere 26 departments compared with 57 in peer Tianjin districts (Zhang, 2014), which was China's most streamlined sub-provincial administrative system at the time (Liu, 2013; Zhang, 2014). It was thought that this reform could substantially strengthen local government capacity for integrated resource allocation (particularly industrial assets), strategic planning, and cross-sectoral coordination (Di, 2012). Inter-departmental collaboration could thus be improved, enabling unified service delivery for enterprises through a single administrative hierarchy (Di, 2012).

Aligned with administrative system reform was the further decentralisation of power from the municipal government to the TBNA. In 2009, the Tianjin municipal government proposed that "TBNA's issues should be dealt within TBNA (xinqu de shi xinqu ban, 新区的事新区办)", and mandated that "TBNA can make decisions on issues which normally ought to be determined by Tianjin municipal government" (Zhang, 2014). Thus, administrative powers for investigation and approval were transferred to TBNA, which was regarded as "substantially optimising the local business environment, enhancing TBNA's attractiveness to enterprises and foreign investment" (Liu, 2013).

Resources and Assets

TBNA's designation as a national special economic area catalysed the inflow of resources critical to SEI development, predominantly comprising financial capital and knowledge assets. Financially, following the *Opinion on the Issues of Promoting the Development and Opening of Tianjin Binhai New Area* — which decentralised the power for financial system reform — TBNA established China's first industrial investment fund, the Bohai Industrial Investment Fund (20 billion Yuan)⁹⁵ (Wu, 2012). In 2009, the *Specific Plan for Financial Innovation in the Tianjin Binhai New Area Comprehensive Reform Pilot Zone* (Tianjin binhai xinqu zonghe peitao gaige shiyan jinrong chuangxin zhuanxiang fang'an, 天津滨海新区综合配套改革试验金融创新专项方案) was approved by the State Council (Zhang and Sun,

⁹⁴ Same with Pudong New area in Shanghai. Binhai New Area and Pudong New Area were the only two national new areas in China before 2010 that had the status of administrative districts, while the other new areas were functional zones rather than administrative districts.

⁹⁵ This stands in marked contrast to Hefei, a benchmark city for SEI development through industrial funds (as we have shown in chapter 4), which remained dependent on municipal fiscal resources when financing the BOE Technology investment in 2009.

2009). This meant TBNA was formally granted the legitimacy to use equity investment-based industrial funds as instruments for regional industrial development (Zhang and Sun, 2009; Zou, 2009). Consequently, within 24 months, over 1,800 private equity funds (including management entities) with around 300 billion Yuan agglomerated within TBNA (Wu, 2012). The TBNA government even had the ambition to established one of its functional zones (Yujiapu Financial Center) into “China’s Manhattan”.

Aligned with industrial investment funds was the inflow of knowledge assets and innovation resources, driven primarily by high developmental expectations for TBNA as China’s next Shenzhen or Pudong (Wu, 2012; Liu, 2013). In 2011, MOST chose TBNA as its first National 863 Programme Industrialisation Partner City⁹⁶, and planned to industrialise and commercialise more than 500 niche technologies in TBNA before 2015 (Tianjin Daily, 2013). Through the partnership with MOST, over twenty national-level research institutes established their branch in TBNA in 2011. Meanwhile, more domestic enterprises and MNEs also wanted to seize the opportunities in TBNA. More than 150 enterprises in the Fortune Global 500 opened branches in TBNA, while over 100 MNEs established their R&D centres in the region (Wu, 2012). These newly anchored extra-regional resources, combined with pre-existing local innovation assets, collectively constituted the knowledge assets for SEI creation and development within the TBNA (see Table 6-1).

Strategic Emerging Industry		Innovation assets
New energy and new material		25 national-level and 39 municipal-level public innovation institutions, 7 national-level and 54 municipal-level enterprise technology centres
High-end equipment manufacturing	Ship craft, aerospace craft	5 national-level key laboratories, 5 national-level engineering technology centres
	New energy vehicle	9 national-level enterprise technology centres, 112municipal-level enterprise technology centres
Biopharmaceutical industry		International Biomedical Joint Research Institute
ICT-related industry	Semiconductor	Leading companies including Freescale Semiconductor, SMIC, Samsung, Tianjin Zhonghuan Electronic
	Internet of things	Leading companies including Datang Telecom, Tiandi Technologies
	Software	Gbase and other software companies serving Tianjin National Supercomputing Centre

⁹⁶ The 863 Programme — formally titled the National High-Tech Research and Development Plan — originated in March 1986, was initiated by the central government to advance emerging industries through indigenous innovation on niche technologies. The industrialisation of these niche technologies would certainly accelerate the creation and development of SEIs in TBNA.

Table 6-1 Innovation Resources Pre-existing within TBNA⁹⁷ (Source: the Author)

In short, in terms of preconditions prior to 2010, Tianjin seemed more promising than Hefei or Hangzhou for creating and developing SEIs. Regarding its industrial base, Tianjin already had enterprises specialising in or having relations with the next-generation information technology, biopharmaceuticals, new energy, new materials, high-end equipment manufacturing (aerospace and marine), and new energy vehicles industries. Clusters of SEI emerged within TBNA even before 2010. Sets of institutions conducive to the SEI's development, such as a streamlined administrative system and autonomised and liberalised financial institutions, were established before 2010. When TBNA was designated as China's second national special economic area, even more financial and knowledge resources and assets agglomerated in TBNA. Theoretically, these institutions and resources should have underpinned TBNA, as well as Tianjin's SEI's development and transition towards the knowledge economy (Liu, 2011; Di, 2012).

6.2 “Streamlined yet Underperforming”: How the Local Government was Formed?

It can be observed that before 2010 some enterprises within TBNA — including traditional industries — had developed the strategic mindset to transition towards emerging industries (Liu, 2013; The Economic Observer, 2014). Emerging industries such as new energy and new materials had already emerged and agglomerated in the region. Theoretically, the policy autonomy granted by the central government should have catalysed rapid SEI development through enterprise-local government cooperation, just as we have observed in Hefei and Hangzhou. However, by 2023, only a few emerging industries (such as Information technology application innovation industry) survived in the TBNA, and none of these industries became the main contributors to local economic growth (J. Li, 2024; Tianjin Municipal Bureau of Statistics, 2024). In 2023, the output value of SEIs accounted for merely 3% of Tianjin's GDP (J. Li, 2024; Tianjin Municipal Bureau of Statistics, 2024). Most of the SEIs we mentioned in the last section such as new energy vehicles, high-end equipment manufacturing, or IoT appeared but quickly vanished.

This section consequently focuses the analytical lens on explaining the failure of SEIs to achieve sustainable development within the TBNA, and demonstrating how the local

⁹⁷ These data are collected from Tianjin's Twelfth Five-Year Plan of these industries (Tianjin Development and Reform Commission and Tianjin Economic and Informatization Commission, 2011a, 2011b, 2012a, 2012b, 2012c, 2012d).

government impeded the creation and development of SEIs in the region. Prior to beginning detailed analysis, it is essential to clarify why the analysis centres on TBNA rather than the whole Tianjin municipality. First, as showed in Section 6.1, virtually all SEI-related enterprises were concentrated within the TBNA prior to 2010. Secondly, following its 2006 designation as a national economic new area, TBNA was expressly assigned the task of cultivating and developing SEIs. For instance, in Tianjin’s Twelfth Five-Year Plan (2011-2015), the strategic imperative to “actively anchor and mobilise leading projects in strategic emerging industries” was put explicitly into the chapter “Advancing Binhai New Area’s Opening and Development through All-out Efforts” (Tianjin Municipal Government, 2011).

A Streamlined Administrative System, but How Effective?

Prior to undertaking a detailed analysis of how the local government impeded the creation and development of SEIs in TBNA, it is necessary to systematically outline the evolutionary process of TBNA’s administrative system, which we have briefly mentioned in the last section. As illustrated in the Figure 6-1, the administrative system within TBNA before 2009 was relatively complex, even chaotic, as manifested primarily in two aspects: the overlapping jurisdictions between functional zones and administrative districts, and the resulting fragmented management and ambiguous power of leadership over these areas.

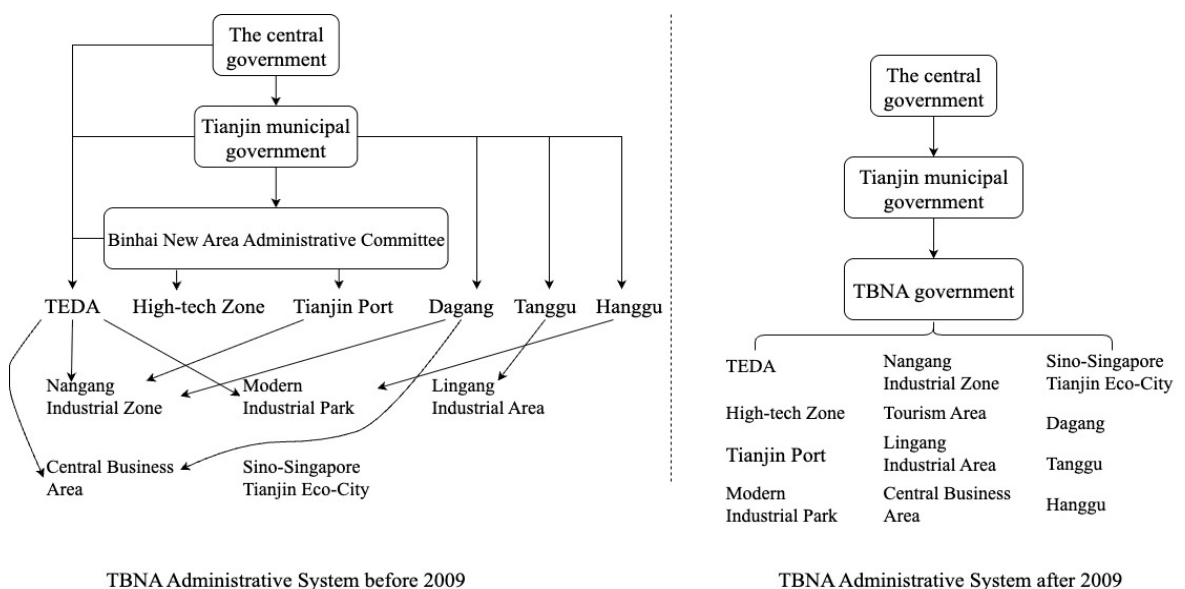


Figure 6-1 Comparison of the TBNA Administrative System Before and After 2009 (Source: the Author)

First, before 2009, TBNA existed predominantly as a conceptual region, but not a real administrative district. At that time, TBNA encompassed three administrative districts⁹⁸ (Tanggu, Hangu, Dagang) and several functional zones (shown in Figure 6-1)⁹⁹. Critically, there existed no *de facto* administrative division corresponding to “Binhai New Area” itself. Consequently, it can be observed that during this period, each of the three administrative districts within TBNA maintained its comprehensive hierarchical governance structures separately — including the district Party Committee, government, People’s Congress, and its own Political Consultative Conference (Bo, 2010). Simultaneously, the various functional zones had their own administrative systems and operated autonomously (Bo, 2010; Liu, 2013; Zhang, 2014). This inevitably led to overlapping responsibilities whenever new functional zones were established to pursue the new industrial development. For instance, the Nangang Industrial Zone¹⁰⁰ was jointly constructed and governed by the TEDA Administrative Committee, the Tianjin Port Free Trade Zone Administrative Committee, and the Dagang District Government. The Central Business District¹⁰¹ was co-managed by the TEDA Administrative Committee and the Dagang District Government (Bo, 2010; Liu, 2013; Zhang, 2014). The co-government inherently generated conflicts arising from divergent regional interests. For instance, when constructing the Central Business District, leaders in the TEDA Administrative Committee desired to build it as an agglomeration zone for modern service industries (e.g., finance), whilst leaders in Dagang District favoured its development as a high-density urban central business district focused on consumption and commercial activities. This fundamental divergence¹⁰² in strategic vision resulted in significant resource misallocation and operational inefficiencies during the Central Business District’s development (Bo, 2010; Zhang, 2014).

⁹⁸ Administrative District (xingzheng qu, 行政区) here refers to territorial units with comprehensive governance structures, including party committee, government, People's Congress, and political consultative conferences within the region. The administrative district normally relies on a hierarchical administration system, and used to intervene and control economic activities and social life.

⁹⁹ Functional Zone (gongnengqu, 功能区) here refers to areas established for specific economic or developmental purposes (e.g., high-tech industries), typically managed by specialised administrative committees with authority delegated from higher-level government. Functional zones normally have streamlined organisations, high-quality personnel and a strong sense of “serving the private sectors”.

¹⁰⁰ A functional zone designated for developing heavy industries.

¹⁰¹ A functional zone designated for developing financial and service-related SEIs.

¹⁰² The conceptual divergence stemmed from the heterogeneous economic growth models of functional zones versus administrative districts. Functional zones (e.g., TEDA) typically pursued economic growth through developing emerging industries, thus they wished to develop service sectors to provide capital, funds and expertise for emerging industries. Administrative districts (e.g., Dagang), on the other hand, rely on land sales, consumption, and real estate for local fiscal revenue and economic growth. Therefore, leaders in Dagang government consequently prioritised establishing commercial and consumer centers rather than pursuing service industries.

The overlapping jurisdictions and administrative disarray observed among different districts and zones in TBNA before 2009 were attributable to the absence of unified governance. Before 2009, as TBNA was not a “real” district and lacked formal administrative status, it was unable to establish dedicated governmental departments. Consequently, the Tianjin municipal government relied primarily upon the Binhai New Area Administrative Committee to coordinate and manage the various districts and zones within the region. Although its director was typically a member of the Tianjin Municipal Party Standing Committee, the Administrative Committee was, by nature, merely a “extensional organ (paichu jigou, 派出机构)” of the Tianjin Municipal Government rather than a formal administrative organisation. It consequently lacked authority and power over personnel appointments, land-use approvals, and fiscal allocations within TBNA (Zhu and Sun, 2009; Bo, 2010; Zhang, 2014). Tanggu, Hangu, and Dagang retained their capacity to circumvent the Administrative Committee and made connections directly with the Tianjin municipal government (Zhu and Sun, 2009). Moreover, sometimes leaders in the Tianjin municipal government bypassed the administrative Committee, issuing directives directly to subordinate districts or zones (Zhu and Sun, 2009). This lack of integrated governance directly resulted in resources earmarked for industrial development being fragmented across multiple sub-regions in TBNA. Furthermore, detrimental competition between districts and zones emerged as they competed and even fought for resources such as technology or investment (Zhu and Sun, 2009; Bo, 2010; Zhang, 2014).

Based on these circumstances, in 2009 the Tianjin municipal government submitted to the Central Government the *Proposal on Adjusting Certain Administrative Divisions in Tianjin*, which received prompt approval. Consequently, the administrative system of TBNA was reformed that same year. This reform primarily encompassed the following two aspects. Firstly, TBNA was formally established as an administrative district (as opposed to the conceptual region before 2009), and finally a unified government for the TBNA was established. The TBNA government then replaced the former Binhai New Area Administrative Committee as the only regional governing authority. Meanwhile, the administrative district status of Tanggu, Hangu, and Dagang was rescinded. These three areas were instead designated as functional zones under the unified governance of the TBNA government. Then, the power of land use approvals, fiscal allocation, and personnel appointments within the region was centralised into the newly established government. This centralization effectively eliminated the previous detrimental competition or resource misallocation rooted in the region, as well as the circumstance whereby the Tianjin municipal government bypassed the Administrative Committee to manage the area directly. In 2013,

the functional zone status of Tanggu, Hangu, and Dagang were further dissolved in TBNA (shown in Figure 6-1), thereby reducing the number of functional zones within the TBNA jurisdiction from ten to seven. Secondly, a significant number of government departments (such as those subordinate to the former Tanggu, Hangu, and Dagang administrative districts) were abolished (as discussed in Section 6.1). From an institutional design perspective, the reformed TBNA administrative system was demonstrably more streamlined and efficient (Liu, 2013).

However, a significant problem arose from administrative system reforms: how would officials from abolished departments, particularly leaders and cadres be placed? According to Bo (2010), the administrative system in 2009 affected over 100 department-level (tingju ji, 厅局级) leaders and more than 1,000 division-level (chuji, 处级) cadres within TBNA. The overwhelming majority of these officials originated from the former administrative districts of Tanggu, Hangu, and Dagang¹⁰³. Consequently, to ensure the reforms proceeded smoothly, the vast majority of affected officials from previous governments, including leaders and cadres, were reassigned to the newly established Administrative Committee in Tanggu, Hangu and Dagang (Zhang, 2014). Furthermore, a proportion of these officials were subsequently selected and took positions in some departments (such as the State-owned Assets Supervision and Administration Commission) in the newly established TBNA government, especially after the administrative system reform in 2013 (TJ01; TJ04; TJ05, TJ06).

While this arrangement secured the smooth implementation of administrative system reforms, officials who were affected by the reform soon received compensation, or even “rewards”. This engendered a fundamental contradiction within TBNA: cadres experienced in administering traditional districts possessed neither familiarity with functional zone operational paradigms, nor the requisite understanding of which industries merited cultivation and policy support (TJ01; TJ04; TJ05). This stemmed from the inherent heterogeneity between the administrative district and the functional zone. Specifically, governance in the functional zone was primarily conducted through Administrative Committees, focusing on efficient, comprehensive service provision to enterprises to propel industrial, particularly emerging industries, development. However, governance of administrative districts relied on the bureaucratic hierarchy, emphasising social stability and the interventionist regulation of social and economic activity (Zhang, 2014). Consequently,

¹⁰³ As we can see the Tanggu, Hangu, and Dagang were regions most significantly impacted by administrative system reform in both 2009 and 2013.

this personnel arrangement partially subverted TBNA's founding rationale. As one of the interviewees working in the local government put it:

“Our initial objective in establishing TBNA was trying to replicate the industrial development model pioneered in the Tianjin Economic-Technological Development Area (TEDA) across Tanggu, Hangu, Dagang, and other regions in Tianjin. TEDA had been ranked the most advanced economic-technological development area in the past ten years. In this way, we could have thereby stimulated the creation of emerging and high-tech industries across a broader geographical scope. However, when establishing the TBNA government, the overwhelming majority of appointed officials and cadres originated from Tanggu, Hangu, and Dagang — rather than being promoted from TEDA. Crucially, these officials and cadres possessed limited understanding of TEDA's industrial development paradigm, as well as emerging industries (TJ04).”

Consequently, an increasing number of leaders and cadres originating from administrative districts progressively took dominant positions within the TBNA government¹⁰⁴. A paradoxical phenomenon thus became observable within the TBNA government: despite a substantial reduction in the number of governmental departments and a more streamlined institutional design, the efficiency of decision and policy-making for emerging industrial development experienced a remarkable decline. This inefficiency arose from the cognitive inertia of officials from administrative districts when managing functional zones. These officials exhibited a pronounced tendency to rely on Tianjin's traditional pillar industries, such as petrochemicals, to drive local economic growth. This preference stemmed from the dominance of SOEs like China National Petroleum Corporation (CNPC), China Petroleum & Chemical Corporation (Sinopec), and CNOOC within these industries, representing perceived stability and lower risks. Conversely, their perception of new technologies and emerging industries was characterised by caution, deliberation, and conservatism, frequently coupled with a lack of proactive initiative to understand these industries (TJ02; TJ04; TJ05).

¹⁰⁴ The precise rationale for this arrangement remains unclear based on available evidence. This arrangement may be partially attributable to the imperative during the reform's initial phase to secure cooperation or mitigate resistance from these officials. Therefore, there was a necessity to assign them positions within the newly established government apparatus of equivalent or even elevated level.

These appointments may also have stemmed from the change of leadership within TBNA. The formation of the TBNA government was initially spearheaded by Pi Qiansheng (former Director of the TEDA Administrative Committee and Director of the TBNA Administrative Committee). However, Pi departed from his leadership role prior to the government's formal establishment following a corruption investigation. As one interviewee noted: “Personnel arrangements for TBNA were originally intended to appoint TEDA officials to leadership positions. Significant changes occurred after Pi left his position (TJ05).”

Consequently, shortly after the establishment of TBNA government, the official in the local government found that:

“Before the establishment of the TBNA government, investment projects related to emerging industries typically received decisions and approvals within three days. We could even bypass the Tianjin Municipal Government to secure necessary support directly from departments in the central government. After the establishment of the TBNA government, however, the decision-making and approval processes became protracted. Projects now require initial submission to the TBNA government and Tianjin municipal government before eventual referral to the central government. But I do not attribute this inefficiency primarily to the district government’s creation itself, but rather to the officials’ deficient awareness, understanding, and decision-making capacity regarding emerging industries. This caused that an extreme extension of approval timelines, even up to approximately three months, after the establishment of the TBNA government (TJ04).”

Furthermore, leaders with the excessive emphasis perception on “stability” in the newly established government had a preference for SOEs and MNEs over private domestic enterprises (TJ04). This preference stemmed from the perception that SOEs and MNEs typically possess substantial capital reserves, enabling them to operate “stably and continuously” within the region. In contrast, private enterprises were viewed as more susceptible to operational difficulties arising from entrepreneurial missteps or capital shortages — representing a perceived risk for government decision-making and investment. Consequently, although the TBNA government initially succeeded in attracting SOEs and MNEs possessing relevant technologies and innovative capabilities, the absence of a critical mass of supporting upstream and downstream private enterprises ultimately prompted many to relocate from TBNA. For instance:

“TBNA’s electronics manufacturing industry once hosted dragonhead multinational corporations, including Motorola and Samsung. However, these firms ultimately relocated to southern China, leading to the virtual disappearance of TBNA’s electronics manufacturing industry. This exodus occurred because the majority of components within electronics manufacturing are produced by private small and medium-sized enterprises. Leaders in the TBNA government, prioritising caution and stability, refused to mobilise these supporting private enterprises into the region. Consequently, production often necessitated transporting components to southern China for processing before returning them to TBNA for final assembly, which generated exorbitant but unnecessary costs (TJ04).”

Although the initially streamlined yet underperforming local government significantly impeded the creation and development of emerging industries within the region, this does not necessarily mean the contradiction could not have been mitigated. One of the rational approaches is appointing officials possessing demonstrable capability and innovative entrepreneurship to leadership positions within the local government. Their individual capabilities and change agency can then be diffused downwards — through the establishment of formal and informal institutions — to mid-level cadres and grassroots officials, like as we see in the Hefei's case.

The TBNA government initially had such a top leader. In 2009, reflecting the strategic importance of TBNA's development to the northern China, He Lifeng, then serving as Party Secretary of Xiamen, currently serving as Vice Premier of the State Council overseeing economic, financial, and technological affairs, was appointed as the first Party Secretary of the Tianjin Binhai New Area Committee (Bo, 2010, p. 28). But this naturally raises the subsequent question: why did the diffusion of change agency and capabilities of local leaders not occur in the TBNA government?

Reinforcement of Perception: Leadership and External Shocks

When establishing TBNA government in 2009, the personnel appointments of cadres — predominantly those experienced in administrative district management rather than functional zone operations — resulted in an institutional structure that was “streamlined yet underperforming”. These cadres, as have shown in the last section, had less agency in creating or developing SEIs in the region. However, this phenomenon was not unique to TBNA in the early 2010s. In the case of Hefei, for instance, a significant proportion of municipal officials, cadres, and grassroot officials similarly lacked the knowledge relevant to SEIs when the municipal government first tried to develop these industries (HF01). Even in recent years, Hefei continued to assign cadres previously responsible for administrative districts management to positions which are highly linked to emerging industry development (HF01). It can be observed that in the Hefei case, despite initial unfamiliarity with technology or emerging industries, such cadres expeditiously adapted to their new jobs and did well in cultivating SEIs. This can be concluded as the diffusion and circulation of capacity and agency within local governance (see Chapter 4). In contrast, why did TBNA fail to exhibit comparable diffusion and circulation of capacity or agency? It can be posited that this discrepancy stems from the absence of leadership with continued and sustained agencies, and external events and their unexpected consequences.

Leadership

A contributing factor to explain why cadres and officials within the local government were unable to develop agency for cultivating emerging industries lies in the absence of leadership with consistently innovative entrepreneurship. Since its establishment in 2009, the TBNA government had four District Party Secretaries serving as its first-hand leadership. The first District Party Secretary, He Lifeng (currently Vice Premier of the State Council), was appointed from his prior position as Party Secretary of Xiamen Municipal Committee by the central government. When he was appointed to the TBNA leadership, Secretary He asserted that the local government's primary task was to “complete the ‘Ten Major Campaigns (shida zhanyi, 十大战役)’” with a total investment of 1.5 trillion yuan (Bo, 2010). The “Ten Major Campaigns” encompassed the construction of ten new functional zones: the TBNA Core City Area, Xiangluowan and Yujiapu Central Business Area, Nangang Industrial Zone, the Light Textile Industrial Park and Residential Area, Dongjiang Port Free Trade Zone and its supporting residential area, Beitang Area, Lingang Industrial Area, the Western Area, and the Sino-Singapore Tianjin Eco-City (as shown in Figure 6-2). According to Bo (2010), the priority assigned to these tasks strictly corresponded to their sequential order within the “Ten Major Campaigns”. In other words, tasks appearing earlier in the sequence were deemed by local leadership to warrant higher priority and required completion ahead of others.

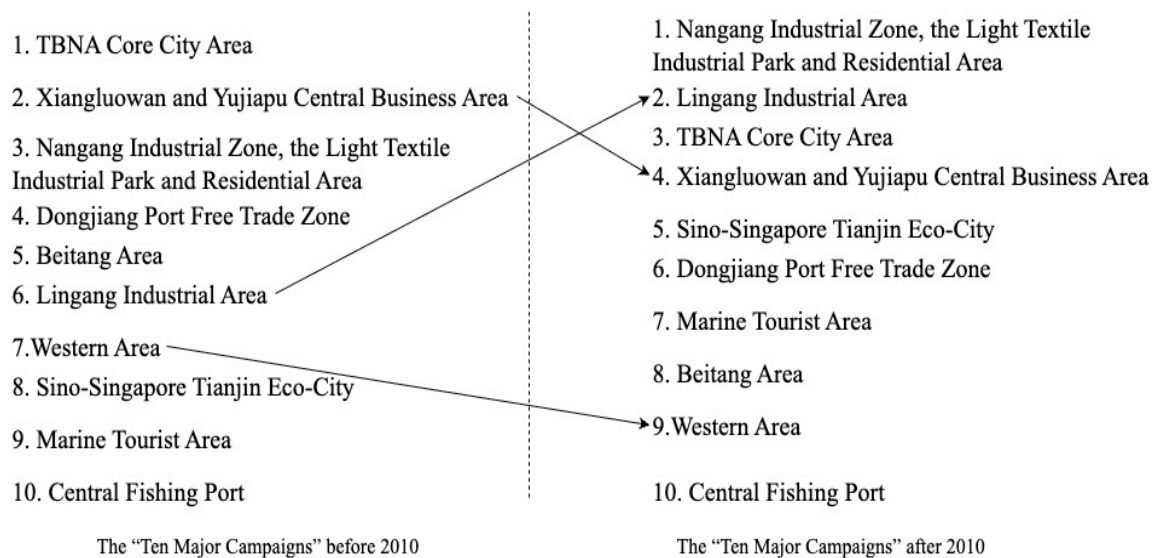


Figure 6-2 The “Ten Major Campaigns” in TBNA¹⁰⁵ (Data source: Bo (2010), Tianjin Municipal Government (2010))

¹⁰⁵ Tasks of “Lingang Industrial Area”, and “Western Area” were related to SEI creation. The task of “Lingang Industrial Area” was aiming at creating high-end manufacturing. The task of “Western Area” was aiming at creating aerospace industry.

Therefore, it is evident that at the very beginning, the creation of SEIs was not taken as the primary task by the first-hand leader in TBNA. In the initial development plan for TBNA, Secretary He gave significantly higher priority to the construction of infrastructure within the region (Tasks 1 and 2 before 2010). In terms of industrial development, cultivating Tianjin's traditional industries, such as petroleum and chemical industries, were considered more important than creating SEIs (Tasks 6 and 7).

After 2010, attention to innovative entrepreneurship in creating and developing SEIs began to emerge within the TBNA government leadership. In 2010, the State Council issued the *Decision on Accelerating the Cultivation and Development of Strategic Emerging Industries*, subsequently incorporating it into the national 12th Five-Year Plan. Consequently, the Tianjin municipal government accordingly made the decision on developing SEIs and then assigned this task to TBNA government (Tianjin Municipal Government, 2011). Accordingly, Secretary He adjusted the priority of each task in his development plan for TBNA. In the revised "Ten Major Campaigns", the establishment and development of Lingang Industrial Area, previously ranked only sixth, was elevated to become TBNA's second-highest priority task. This means creating SEIs related to high-end equipment manufacturing, the main target of Lingang Industrial Area, was now given more priority than other tasks¹⁰⁶ (Bo, 2010). During this period, Zong Guoying, as the District Governor of TBNA, also emphasised the critical importance of science and technology for TBNA's future development. In 2013, Zong suggested that local government should also focus on cultivating industries with high technologies, which could be achieved through anchoring and mobilising technology-oriented small and medium-sized enterprises (technology SMEs) into the region (Ma, 2014). Consequently, over six thousand technology SMEs were attracted by the local government and moved into TBNA within the same year (Ma, 2014).

However, the top leaders' innovative entrepreneurship in creating SEIs rapidly disappeared with the turnover of leadership in 2014, even before it could be broader diffused within the local government. In 2014, Secretary He was promoted to the central government; Zong succeeded him as the new Party Secretary of the TBNA. Once taking in the charge, Zong exhibited a pronounced preference for the growth of GDP. His interest in "science and technology" was soon replaced by the rapid expansion of local GDP figures (TJ01). During Zong's tenure from 2014 to 2016, it was claimed that the average annual GDP growth rate of TBNA was exceeding 13%, despite the central government declaring in 2014 that China's

¹⁰⁶ Despite we can see the construction of Western Area (aiming at developing High-tech Zone and cultivating aerospace industry) was amended from ranking seven to ranking nine.

economic growth had entered “the new normal” stage¹⁰⁷. The claimed high growth rate was achieved by reinforcing TBNA’s traditional industries (petroleum and chemical industries), debt-fuelled investment, and extensive data manipulation (TJ01; TJ06). In 2018, an audit by the central government revealed severe GDP inflation within TBNA: the local government claimed the regional GDP was exceeding 1 trillion Yuan in 2016, which made TBNA as China’s first national-level new area to reach this milestone. However, the real figure of GDP was only 665.4 billion Yuan in that year, with one-third of the reported growth attributed to duplicate accounting and fabricated data¹⁰⁸ (Wang, 2018; TJ01). Thus, we can see that the top leaders’ mindset of creating of SEIs was replaced by the preference of GDP. And this pursuit of GDP was diffused downstream through formal institutions such as the performance evaluation system to cadres and more grassroots officials in the local government, and impeded the upward transmission of grassroots generated innovative entrepreneurship within the government¹⁰⁹. As one former official worked in investment promotion department during this period noted:

“During this period (2014-2016), departmental performance evaluations prioritised the extent to which our work *directly contributed* to regional GDP growth. Consequently, to fulfil mandated assessment targets, we were duty-bound to refocus investment promotion efforts towards traditional industrial projects; only through this way could we accomplish tasks assigned by higher authorities. Conversely, attracting enterprises in emerging industries — owing to their uncertainty and long incubation periods — would inevitably result in slow growth of regional GDP and thus falling short of leadership expectations (TJ06).”

The overemphasis on rapid GDP growth stemmed from two perspectives: on the one hand, the individual leader’s distorted attitude towards performance (TJ01); on the other hand, TBNA, as the only national-level new area in the unique northern China, had a unique political position (TJ01; TJ02; TJ05). It can be observed that leaders serving as TBNA Party Secretary were consistently promoted to decisive departments in the central government within three to five years¹¹⁰. There are two main hypotheses to explain this phenomenon.

¹⁰⁷ The “New Normal of China’s Economy” is characterised China’s economy growth is transferring high-speed growth to a relative moderated growth.

¹⁰⁸ The impact of GDP inflation will be discussed in section 6.3.2.

¹⁰⁹ Retrospectively, Zong’s tenure was a critical window of opportunity for agency formation within the TBNA government, as subsequent external shocks fostered greater conservatism among local officials. This will be discussed in the following subsection.

¹¹⁰ For instance, He Lifeng was appointed Vice-Chairman of the National Development and Reform Commission after he ended taking Party Secretary in TBNA in 2014; Zhang Yuzhuo, the successor of Zong Guoying, took the chairmanship of Sinopec Group after three years, later becoming Party Secretary of State-

Either, due to the unique political position of TBNA, leaders who performed very well — particularly in rapid regional GDP expansion — during their tenure, were promoted (TJ01). In this scenario, leaders are more likely to pursue traditional industries, as SEIs may not mature during their short tenure and thus cannot be counted as their performance for promotion. Or, these leaders were destined for taking important positions in the central government ab initio, with their TBNA postings merely expediting this trajectory (TJ02). Therefore, leaders are more incentivised to prioritise low-risk development strategies such as developing mature industries, thereby avoiding potential growth stagnation or decline caused by investing in SEIs (TJ02). Either scenario may have caused local government leaders to prioritise short-term goals, such as prioritising the development of mature industries and (by any means necessary) promoting GDP growth, while abandoning the pursuit of strategic emerging industries that are fraught with uncertainty, require long-term cultivation, and may not be realised during their tenure.

External Shocks

Beside the failure to diffuse the innovative entrepreneurship of SEIs top-down within the government, external shocks further entrenched risk aversion among local officials, particularly among cadres, thereby impeding the formation of change agency.

Two major exogenous events impacted the agency formation in the local government. The first event was the failure of the Nangang Industrial Zone (short for Nangang). When taking as the first priority task needed be achieved in 2010 (shown in Figure 6-2), the local government was pouring many resources, especially fiscal resources, into the establishment of Nangang¹¹¹ (Bo, 2010; TJ01; TJ05). In the local government's initial plan, the Nangang would serve to cultivate traditional industries in which Tianjin had a comparative advantage (e.g., petroleum, chemical, etc.) around 2010, and become the main engine of economic growth in the early years of TBNA. The return on investment in the Nangang could be used to develop other SEIs in the region.

However, the huge investment in Nangang did not pay off quickly. Back in 2010, two pivotal projects planned for Nangang were the Sino-Russian Oil Refining and Petrochemical Project

owned Assets Supervision and Administration Commissions (SASAC). Zong Guoying himself was appointed Standing Committee Member and Executive Vice-Governor of Yunnan Provincial Party Committee after taking leadership in TBNA, despite several external shocks such as TBNA Tianjin port 8.12 fire and explosion accident occurred during his tenure.

¹¹¹ This is partly because most of lands in Nangang were created through coastal reclamation, which was very costly (TJ01; TJ05).

(short for Sino-Russian Project) and the Sino-Saudi Polyethylene Production Project (short for Sino-Saudi Project) (TJ01; TJ02). The Sino-Russian Project originated from the Fundamental Principles for Establishing Sino-Russian Joint Ventures to Deepen Petroleum Cooperation, signed in 2006 (Chen, 2009). The project started in 2010 with the construction of infrastructure, carried out by the local government, in Nangang and was expected to bring more than 10.05 million tonnes of refined oil products per year to TBNA upon its completion in 2012 (State-owned Assets Supervision and Administration Commission of the State Council, 2010). However, due to changes in international crude oil prices¹¹², the Sino-Russian Project did not go into the production process even after the local government had completed all infrastructure construction for this project in 2012. This left the TBNA government with no return on its substantial investment (TJ01; TJ02). Second, Sino-Saudi Project, which was originated from a cooperation agreement signed between Sinopec and Saudi Basic Industries Corporation, was the largest industrial project initiated in TBNA after it was selected as a national new area, which also cost the local government a huge investment in land and infrastructure (National Development and Reform Commission, 2009; TJ02). Nevertheless, chronic oversupply of polyethylene in northern China rendered the project unprofitable for an extended period, failing to generate positive returns for TBNA (TJ02; TJ05). Subsequently, most of lands were unused and brought no pay back for the local government: the vacancy rate of land in Nangang was as high as 91 percent between 2010 and 2017 (China Chengxin International Credit Rating, 2024).

The second event was the “TBNA Tianjin Port 8.12 Fire and Explosion Accident” (short for TBNA 8.12 Accident). On August 12th, 2015, Ruihai Company hazardous goods warehouse, located in Tianjin port in the northeast of TBNA, caught fire and eventually caused a catastrophic explosion (Zhou and Fan, 2017). This accident resulted in 165 deaths, eight persons missing, and 798 injuries. Moreover, 304 buildings, 12,428 vehicles and 7,533 containers in the area were damaged, which caused more than 6.866 billion yuan in direct economic loss (Ministry of Emergency Management of the People’s Republic of China, 2016; Zhou and Fan, 2017).

The direct impact of these events on TBNA development, from an economic perspective, is that local government debt was expanding rapidly and could not be paid back. Between 2010-2018, the scale of funds used for TBNA construction may have reached between two

¹¹² Between 2010 and 2012, international crude oil prices continued to rise, reaching at the peak of US\$120 per barrel. As a result, in 2012, the Russian expected to supply China with crude oil in line with international crude oil prices, while the Chinese side (CNPC) wanted to buy crude oil at the fixed price of \$88 per barrel signed in the agreement. The disagreement on the price caused the eventually abortion of this project (TJ02).

and three trillion yuan, a large amount of which was loans from bank (Zhu and Zhang, 2017; TJ01). However, as the Nangang failed to become engine of regional economic growth, the local government lacked the capacity to service its debt burden for a prolonged period (TJ01; TJ02). Moreover, the TBNA 8.12 Accident exacerbated pressure on the *debt burden*, as the TBNA government took responsibility for compensation, resettlement, and reconstruction (TJ05; TJ06). As one of the interviewees noted:

“(After the TBNA 8.12 Accident), although Tianjin Port (as a state-owned enterprise) is directly managed by the Tianjin Municipal Government, the losses arising from the explosion, including compensation, resettlement and reconstruction, were mainly borne by the TBNA government, not the Tianjin Municipal Government. This became a heavy fiscal burden for the local government (TJ05).”

Consequently, TBNA government’s debt ratio¹¹³ started to rise rapidly after these events. Since statistical data became available in 2016, the TBNA government fiscal revenue remained relatively stable (Tianjin Binhai New Area Bureau of Finance, 2017, 2025). However, the local government’s total amount debt rose from 114.6 billion Yuan in 2017 to 322.7 billion Yuan in 2024, and debt ratio rose rapidly from 161.17% to 439.55% (Tianjin Binhai New Area Bureau of Finance, 2017, 2025). This significant debt burden became a major obstacle for local officials and cadres to form innovative entrepreneurship, which will be explored more in the next section¹¹⁴.

From a political perspective, how these events, especially the TBNA 8.12 Accident, were resolved also largely hampered the formation of cadres’ innovative entrepreneurship, and even exacerbated their conservative perception of fostering new industries. In the aftermath of the TBNA 8.12 Accident, 25 cadres within the local government were subjected to criminal coercive measures in accordance with the law (two at the departmental level, seven at the deputy departmental level, and 16 at the divisional level), and 74 cadres, including the secretary of party committee, were disciplined based on the party rules and regulations¹¹⁵

¹¹³ The government debt ratio is calculated as the amount of debt divided by the total fiscal revenue multiplied by 100 percent, which mainly reflects the capacity of local governments to service their debts.

¹¹⁴ The calculation of the debt ratio here is based on the explicit debt of local governments, implicit debt such as the debt borne by state-owned companies belong to local SASAC is not included. In other words, the status of TBNA local government debt will be even much worse if the implicit debt is concluded and calculated.

¹¹⁵ One special case was mentioned in the interview. One interviewee noted that a cadre in charge of safety supervision, who had just been in his position for no more than a month, was similarly subjected to criminal coercive measures when the higher level governments tried to find out who should be blamed for the TBNA 8.12 Accident. The interviewee argued that the manner in which the cadre was punished was unreasonable, as it was difficult for any cadre to familiarise himself with all the safety hazards in the TBNA within one month.

(Ministry of Emergency Management of the People's Republic of China, 2016). These officials worked in a wide range of departments including safety supervision, land planning and examination and approval (Ministry of Emergency Management of the People's Republic of China, 2016), which are also crucial for the development of emerging industries. After TBNA 8.12 Accident, cadres and officials within these departments, whether directly impacted or successors to sanctioned personnel, began to prioritise “safety”, “stability”, and “regulatory compliance” above all other considerations (TJ01; TJ02; TJ04). Regional development, including both economic and industrial, and even individual promotions were relegated to secondary importance (Ministry of Emergency Management of the People's Republic of China, 2016). This situation was not improved even after the change of leadership in the local government. As one of the interviewees noted:

“Cadres within the local government exhibit an excessive prioritisation of stability, particularly social stability, to the extent that they willingly chase development opportunities, both economic and within SEIs, to safeguard their positions in the government. This behavioural pattern has become a systematic challenge to TBNA's development (TJ04)”.

6.3 The Government without Agency: How it Impeded the Creation of SEIs?

When officials within local government, particularly cadres, persistently fail to form innovative entrepreneurship, the local government even becomes a barrier, rather than acting as the leader (as in Hefei's case) or the accelerator (as in Hangzhou's case) of the development of SEIs in the region. This absence of agency, compounded by an excessive emphasis on political and social stability, further diminishes officials' motivation to acquire knowledge about, or engage with, the technologies and enterprises vital to emerging industries (TJ01; TJ04). As a result, even if formal institutions that are proven to promote the development of SEIs elsewhere can be established in the region, they will become largely ineffective and fail to fulfil their original goal. Further, pre-existing knowledge, technology, talents and enterprises that are related to SEIs will gradually be lost, and new resources and assets from other regions cannot be anchored and mobilised. Ultimately, without the creation and development of SEIs, the region will be locked into traditional industries and have to accept its failure in the knowledge economy transition.

Nevertheless, the interviewee believed the “who is in charge, who is responsible, who will be punished (if mistake occurs)” had a considerable impact on the behaviour of other officials within TBNA government.

Formal Institutions

It is inaccurate to suggest that no effort was made by the TBNA government to create and develop SEIs. At least, after 2016, as more experienced officials were appointed from other regions and served as leaders in the local government, formal institutions that are proved to facilitate the creation of SEIs elsewhere were established in TBNA. These formal institutions were designed to provide service for enterprise, make decision on SEIs, and tolerate official's mistake and failure in the SEI creation. For instance, after 2016, newly appointed leaders attempted to improve the poor business environment caused by the excessive pursuit of GDP growth (TJ01). To this end, new leaders put forward a series of political agendas, including "entrepreneur is the boss (qiyejia laoda, 企业家老大)" and "when enterprises command, government immediately responds (qiye fahao zhengfu baodao, 企业发号 政府报道)", and required the government officials to provide services such as "one-day approval" (TJ01). Establishing the institution for service-providing is based on the belief that systematically and strategically providing service for enterprises from the local government will reduce enterprise's operational costs, and thus can attract and keep more SEI-related enterprises¹¹⁶. Second, the institution for making decisions on SEIs investment was built up in TBNA, which was designed to improve the local government capacity for mobilising innovation assets from other regions¹¹⁷. Last but not least, a tolerance of failure institution proven to be crucial to SEI creation and development in the previous two cases can also be observed in TBNA government. As one of the interviewees noted:

"In recent years, local leaders in TBNA come up with the political slogan 'wrong action is better than inaction'. Officials in the government were told that if they make unintentional mistakes in cultivating SEIs, the local government would tolerant their mistakes and cover the cost for them (TJ01)."

However, these formal rules of service providing, decision-making, and tolerance of failure were not working effectively as expected in TBNA¹¹⁸. Once again, the institutional inefficacy stemmed fundamentally from the absence of change agency among cadres and grassroot officials to create SEIs. First, although the tolerance of failure institution was

¹¹⁶ As we have demonstrated in Hangzhou's cases.

¹¹⁷ The institutional arrangement of decision making is quite similar to its in Hefei's case. Before making investment decisions on SEIs, the local officials need to do fieldwork, justify the need for mobilising assets, and then vote for investment decisions on SEIs (TJ01). This institutional arrangement in Hefei's case, as discussed in Chapter 4, ensures the rationality of investment decisions and reduces the likelihood of failure of SEI creation due to the mismatch of mobilised resources.

¹¹⁸ The enterprise service institution will be discussed in section 6.3.2 along with resources.

established at the district level, cadres in TBNA retained the perception, following the TBNA 8.12 Accident, that any error could potentially trigger accountability measures from higher-level governments (TJ01). The district-level tolerance of failure institution proved largely ineffective in shielding them from disciplinary or judicial consequences, or in mitigating the adverse impact of errors on their careers (TJ01). In other words, when officials in the local government were lacking the mindset and the willingness, their primary concern is how to avoid making mistakes rather than facilitating the creation of SEIs. Consequently, even when higher-level leaders established rules designed to tolerate failure and mistakes, few officials were willing to take actions.

The institutional arrangement for making decisions on SEIs was inefficient, partly due to the ineffectiveness of rules on tolerating failure. The institutional arrangement for making decisions in TBNA is similar to Hefei. In the case of Hefei, we can see that despite the complexity of the procedures, the institutional arrangement for making decisions was able to ensure that reasonable decisions were made in a relatively short period of time. This is because, in the perception of the local government cadres in Hefei, “getting results” had a higher priority than “completing the procedure”. In TBNA, however, the rule of decision-making was running in the opposite way: cadres in TBNA government believed that whether or not decisions were made in strict accordance with procedures was more important than the outcome of the decision itself (TJ01; TJ05). If decisions were made strictly adhering to procedures, the failure could be attributed to external factors rather than individual decision-making errors, and thus cadres who made the final decision could avoid accountability or negative impacts on their own career (TJ01; TJ05). This overly rigid emphasis on “procedural justice (chengxu zhengyi, 程序正义)” made TBNA decision-making in SEIs quite inefficient. For instance, at the “party committee voting” stage, cadres in the TBNA government were more concerned with “whether or not a vote had been taken” than “whether the vote could be taken in a timely manner.” This led to a gap of weeks or even months between the preliminary research and the final decision on whether to invest in enterprises related to SEIs (TJ05). This put the TBNA government at a disadvantage in competing for resources with other regions. As one of the interviewees noted:

“When the government was still discussing or trying to vote on whether SEI-related technologies and enterprises are worth investing in, there was a high likelihood that State-owned Assets Supervision and Administration Commissions (SASACs) from other regions would jump ahead and strike deals with those enterprises (TJ05).”

Moreover, the rapid growth and accumulated government debt further reduced the risk-taking capacity of cadres, making them more cautious in their decision-making. Under the condition of fiscal constraint, erroneous decisions increased the likelihood of accountability or sanctions, thereby rendering the decision-making protocols increasingly inefficient (TJ05). As a result, TBNA entered into a vicious circle: due to the inefficiency of the decision-making system, it was difficult for the local government to anchor and mobilise SEIs-related firms into the region in a timely manner, which made it difficult for emerging industries to be created or developed. Additionally, the absence of SEIs deprived the local government of the ability to mitigate or alleviate the debt crisis¹¹⁹. This can be exemplified by the attempt to create the new energy vehicle industry in TBNA:

“(When trying to cultivate the local new energy vehicle industry), one industrial fund enterprise, belong to TBNA’s SASAC, chose to work with XPENG, which was one China’s leading new energy vehicle companies. The industrial fund enterprise planned to mobilise XPENG to the region by setting up a new energy vehicle factory in TBNA. However, the district finance bureau was extremely reluctant in this process, as they feared that building a factory for XPENG would take up too much money but generate less. In the end, the enterprise could only choose to make an equity investment in XPENG. Although this ultimately realised the increase of state-owned assets, it failed to facilitate the development of new energy vehicles in TBNA (TJ05).”

Assets

In term of assets, the absence of innovative entrepreneurship among cadres resulted in three primary adverse consequences. First is that pre-existing resources related to SEIs kept leaving the region due to the absence of support from the local government. For instance, as mentioned above, around 2010, due to the reluctance of cadres to introduce small and medium-sized private firms upstream and downstream of the industrial chain, leading firms in the electronic information manufacturing industry chose to leave TBNA and set up new factories in other cities in southeast China (TJ04). The enterprise service institution that new leaders tried to establish not only failed to bring in new resources, but also failed to help

¹¹⁹ This was intensified after the central government began to emphasise that “economic development should not come at the cost of environmental pollution”. In 2018, the State Council issued the Three-Year Action Plan for Winning the Battle for the Blue Sky, stressing that reducing air pollution is an important task “related to meeting the people’s growing needs for a better life, building a moderately prosperous society, high-quality economic development, and the construction of a beautiful China”. The traditional industries in TBNA, which had been in a dominant position, were heavily affected: a number of enterprises engaged in the chemical, petroleum and traditional manufacturing industries were closed down or relocated to other regions, which further affects the ability of the TBNA government to mitigate the debt crisis.

TBNA stem the outflow of pre-existing resources. Although local leaders emphasised the need for the government to provide timely services to enterprises, the enterprise service institution was not well implemented due to the lack of cadres' agency. In actual implementation, when enterprises requested government services, government officials either refused to provide approvals because of the pursuit of stability, or required enterprises to strictly follow the procedures, which was extremely time-consuming. As one of the interviewees noted:

“The government would require enterprises to complete one procedure before filing the next, instead of proactively informing them of all the materials the government needed; moreover, if mistakes occurred in one of the procedures, the government often required the enterprise to start the process all over again to avoid being blamed for the “lack of procedure”. Therefore, it is quite common that enterprises have difficulty in accessing the service from the local government in time (TJ01).”

Second, resources that could have been used to create and develop SEIs were precluded from functioning effectively due to constraints imposed by the local government. Again, the lack of agency of the cadres, the pursuit of stability and their deep-rooted conservative perceptions overrode the attempts of the other actors in the region to develop new industries, even if the leaders had shown their interests in SEIs. For instance, when workers in the local state-owned enterprise, encouraged by the local leader, attempted to expand their business into areas related to SEIs, they found that:

“Our activities were not supported by the local government. Previously, when the TBNA district secretary visited our enterprise and learnt that we wanted to develop the SEI, he gave us encouragement and promised policy supports. However, when we contacted related departments in the local government and tried to implement the TBNA secretary's promise, the officials of in these department refused to provide us with approval with the excuse that the industry was not within the scope of our business. Therefore, we finally had to give up our intention to develop SEIs (TJ05).”

These phenomena can also be explained by the political motivations of leaders and cadres. Local leaders, although actively engaged in the establishment of institutions, lacked agency in monitoring the implementation of institutions (TJ01; TJ02; TJ05). From local leaders' perspective, as they are very likely to get promoted if they do not make serious mistakes that could jeopardise “social stability” during their short-term tenure, they have less motivation

to delegate their agency down to cadres, or supervise and discipline cadres' behaviour if they are reluctant to cultivate SEIs. From cadres' perspective, when they find they are less likely to face scrutiny from the leadership and are not punished for failing to provide timely services to the enterprises, they lack the motivation to cultivate emerging industries. On the contrary, if they make "mistakes" in the process of trying to help enterprises to develop SEIs, they are more likely to face scrutiny, as we have discussed in the Section 6.3.1.

Third, SEI-related technologies and enterprises could not be promptly identified, anchored, and mobilised from other regions. This can be attributed to the ineffectiveness of the enterprise service institution, as discussed above, and unreasonable management and use of the TBNA industrial fund. Again, this was caused by the lack of cadres' agency. In terms of private industrial funds, as mentioned above, when the power of institutional reform in the finance industry was decentralised to the TBNA government, private equity funds with a total size of more than 300 billion Yuan had already agglomerated in the region (Wu, 2012). These funds were supposed to become one of the fundamental resources of SEIs in the region (TJ05). However, between 2010 and 2012, incidents where certain enterprises engaged in illegal fundraising under the guise of equity investments — compromising, if not actively threatening, social stability — prompted local officials to suspend the private equity fund industry's development, and for a long time after that the development of the industry was at a standstill (TJ05). This "one-size-fits-all" approach, rather than attempting to regulate the development of the industry through supervision and guidance, again reflected cadres' cognitive prioritisation of "security" and "stability" over "growth" or "development" (TJ05). Ultimately, local government decisions led to a massive outflow of private equity funds from the TBNA, and thus local emerging industries lost the opportunity to develop with these funds (TJ05). In fact, even after the central government issued the Regulations on the Supervision and Administration of Private Equity Funds in 2023 and declared that this industry had entered the era of "strong regulation", there were still a lot of illegal phenomena in the private equity industry, including illegal fund-raising or misappropriation of funds (H. Li, 2024). As one of the interviewees noted:

"Illegal phenomenon in the private equity fund industry is not a city-specific problem; it is industry-wide and nationwide. Cadres in TBNA government actually overreacted when problems occurred in the private equity fund industry in the region (TJ05)."

In terms of industrial funds managed by the local government, inefficient decision-making institutions, caused by cadres' lack of agency and their reluctance to take risks, were

fundamentally contradictory to use of public industrial funds. TBNA was one of the earliest regions in China to establish a public industrial fund, much earlier than the establishment of the TBNA government. For instance, back in 2000, Tianjin TEDA Science and Technology Venture Capital Co., Ltd (later renamed Tianjin TEDA Science and Technology Investment Co., Ltd., short for TEDA Technology Investment) were set up by Tianjin municipal government, and the local government set up an industrial fund with a portion of the local fiscal revenue and used this company as a tunnel to invest in enterprises that possessed useful technology. In 2009, when operational control of TEDA Technology Investment was transferred to TBNA government, a fundamental contradiction emerged (TJ05). The hierarchical bureaucratic system, combined with cadres' lack of agency and unwillingness to take risks, proved incompatible with the requirement for swift, precise judgement across all investment fund management phases, including investment decisions, operation, exit strategy, and risk control (TJ05). For instance, workers in TEDA Technology Investment once made a decision to invest in Asymchem, one of the local leading companies in the biochemical industry. After they had completed their investment decision and already transferred the funds to Asymchem, cadres in the relevant department asked them to suspend this investment activity and withdraw the funds, as they thought the investment had not undergone enough evaluation and therefore, it was not compatible with "procedural justice" (TJ05). In the end, the core workers of TEDA Technology Investment chose to leave the administrative system of the TBNA government, even though it meant that they needed to give up their status and rights as civil servants (TJ05). This was also undoubtedly a loss for local SEIs' development. After leaving the government, TEDA Technology Investment continued to invest in emerging industries and has been successful in many areas such as semiconductors, biochemical, smart manufacturing, and ICTs. However, of the 26 listed companies they have successfully invested in, only two are from TBNA (TEDA Venture Capital, n.d.).

Several public industrial funds were recently set up by the local government around 2020, such as the TBNA Industry Development Fund, TBNA TEDA Haihe Smart Manufacturing Industry Development Fund, etc. Although these newly established industrial funds are beginning to provide capital to companies in the region engaged in emerging industries (Tianjin Economic and Development Area, 2021), the extent to which they are able to attract resources from extra-region is still questionable. This is because, many cities in China have already established and begun to use industrial funds to attract, even compete for, high-

quality companies related to SEIs¹²⁰ (Qu, 2023). Within this competitive landscape, TBNA government persists in mandating a “1:2” matching requirement – whereby recipient enterprises must invest twice the government-invested funds within the region – whereas a “1:1” ratio prevails elsewhere (TJ05). Consequently, TBNA’s industrial funds exhibit a clear comparative disadvantage in interregional competition. Moreover, there has been no significant change in the administrative system and the cadres who manage the funds. Cadres continue to exhibit insufficient agency in fund deployment alongside insufficient knowledge of SEI-related technologies, which leads to a situation where:

“Even when the government is willing to invest in enterprises, enterprises frequently show distrust of the government after they engage with some cadres. In certain instances, enterprises would even refuse to receive the investment from TBNA government (TJ04).”

The increase of government debt and investigations of GDP manipulation further eroded the ability of local governments to mobilise resources. In general, local governments promise policy incentives, such as direct awards or tax reductions, when they try to mobilise more SEIs-related enterprises, as we have seen in Hefei and Hangzhou’s case. In TBNA, similar commitments were given to enterprises when the government attempts to attract and mobilise resources (TJ05). However, these policy incentives were usually difficult to deliver within a short period, because of the debt crisis faced by local governments (TJ02; TJ05). For instance, in other regions, such as Suzhou or Hangzhou, the local government could provide direct cash incentives to enterprises even before they engaged in innovation or production activities (TJ05; TJ06). While in TBNA, the local government could only deliver the same bonus for enterprises after they had contributed to local fiscal revenue (TJ05). This caused some firms, especially technology SMEs at the start-up stage to bypass TBNA because of the government’s inability to provide funding for them (TJ02). Again, this led TBNA easily into a vicious circle: increased debt led to a reduction in the local government’s ability to mobilise resources, and the inability to attract and retain resources led to a slowdown in the development of SEIs, and thus damaged the local government’s ability to service its debt. The situation become even worse after the investigation of GDP manipulation in 2018. After the investigation, many enterprises, especially financial enterprises, began to lose confidence in the future development of TBNA, as one of the interviewees noted:

¹²⁰ By the end of 2022, China have established a cumulative total of 2,107 government industrial investment funds, with a total size of approximately 12.84 trillion Yuan (Qu, 2023).

“According to cadres working in the TBNA Statistics Bureau, the investigation of GDP manipulation in 2018 had an even greater and more lasting impact than the TBNA 8.12 Accident, as it almost destroyed the ‘financial credit (jinrong xinyong, 金融信用)’ of the local government. After the investigation, it became very difficult for the local government to develop emerging or even new industries through the channel of loans (TJ06).”

6.4 Discussion and Conclusion

Tianjin’s lagging behind in the knowledge economy transition is not due to the lack of regional innovative resources. On the contrary, compared with Hefei or Hangzhou, Tianjin initially had more potential to make such a transition. On the one hand, Tianjin possesses abundant reserves of innovation resources. The legacy of the planned economy left Tianjin with a dense concentration of research institutes and universities. On the other hand, when selecting as a national-level new area, the knowledge transition in TBNA gained a considerable institutional advantage. Specifically, a marketised financial system directly benefited SEIs fundraising was established within the region, and redundant government departments were streamlined, and the area was deemed capable of providing public services to enterprises efficiently. As we see in Chapter 4 and 5, these resource endowments and institutional reforms have been proved efficient in SEIs creation.

The slow progress of Tianjin’s transition towards the knowledge economy was either not attributed to the absence of regional enterprises or local leader’s change agency. Like Hangzhou and other developed regions, TBNA initially agglomerated a considerable cohort of innovative enterprises endowed with innovative entrepreneurship. These firms had already engaged in creating SEI-related industries. Moreover, after the establishment of the TBNA government, the newly appointed local leader was by no means apathetic towards the knowledge economy transition. On the contrary, the development of emerging industries was accorded a high priority within the new government’s strategic planning. Therefore, judged solely by its preconditions, TBNA was fully equipped to make the transition towards the knowledge economy. By possessing both proactive local leadership and highly innovative enterprises, TBNA synthesised the advantages of both Hefei and Hangzhou.

Tianjin’s case proves that the change agency in creating SEIs cannot be confined to enterprises or individual local leaders. Rather, this change agency needs to be diffused and formed in the whole government, as demonstrated in both Hefei and Hangzhou’s case. In Tianjin’s case, the TBNA government neither acquired the mindset to create SEIs

exogenously from enterprises, as was the case in Hangzhou, nor diffused it endogenously downwards via local leadership, as observed in Hefei. Consequently, the local government without innovative entrepreneurship failed to function as an institutional entrepreneur or a place-based leader. Instead, it even impeded the process of resource anchoring and industrial related diversification, and failed to reconfigure resources essential for retaining innovative enterprises. Ultimately, the local government itself became an impediment to the creation and development of SEIs.

In contrast to Hangzhou, the failure of the TBNA government to acquire change agency exogenously stems, in part, from the absence of a leading innovative enterprise wielding sufficient influence over local economic development (akin to Alibaba in Hangzhou). As we can see, although TBNA had begun to agglomerate a certain number of innovative firms, enterprises engaged in traditional sectors exerted a far more profound impact on local economic growth. Moreover, after the turnover of local leadership, a preoccupation with GDP figures rather than structural industrial change amplified the dominance of traditional industries, which further diminished the likelihood of innovative enterprises influencing local government strategy. After the external shocks, SEIs perceiving as higher risks were increasingly marginalised within the local growth agenda. In fact, the reality that change agency was not exogenously formed in TBNA government corroborates the argument presented in Chapter 5: the transmission of change agency for creating SEIs from enterprises to the state is not unconditional. Rather, it necessitates a specific window of opportunity. Such a window is most likely to materialise during periods of regional economic stagnation, when the local government is compelled to seek novel solutions to revitalise economic growth.

In comparison to Hefei, despite possessing a similarly proactive leader initially, the TBNA government failed to generate the change agency endogenously. This failure occurred because the TBNA government, unlike its counterpart in Hefei, did not successfully complete the downward diffusion of agency during the tenure of the leader possessing the innovative entrepreneurship. During Secretary He Lifeng's tenure, although the creation of SEIs was clearly given a high priority in the government's development strategy, there was no observable, deliberate effort by the leadership to reform bureaucratic conduct. Moreover, there were no institutional adjustments made to the performance evaluation or promotion systems explicitly aimed at incentivising the creation of SEIs. Consequently, the vision for creating emerging industries likely remained confined to a specific few top leader, failing to diffuse downwards through the administrative hierarchy. Upon leadership turnover,

succeeding officials did not necessarily share the same vision or commitment to create SEIs. The lower-level officials thus lost the source of innovative entrepreneurship, rendering it highly improbable for the whole local government to acquire the change agency. This corroborates the argument discussed in Chapter 4: the endogenous diffusion of change agency needs be completed and institutionalised within the tenure of leader who has the mindset to create SEIs; otherwise, leadership turnover is highly likely to disrupt the entire process.

Tianjin's case also proves that institutional arrangements designed to facilitate SEIs creation need be recalibrated to suit local conditions, a process contingent upon the local government first acquiring change agency. Essentially, effective institutions are inherently localised and deeply embedded within the region's specific political-economic context. The mere transplantation of institutions is highly unlikely to catalyse local industrial creation if the change agency is not formed in the local government. As we can see, even if some institutional arrangements proven effective elsewhere¹²¹ in facilitating SEI creation were established by new leaders within TBNA, officials who were lacking the innovative entrepreneurship would lead to the institutional inefficiency. For instance, due to the lack of innovative entrepreneurship, officials in the local government were unwilling to take the risks of creating SEIs, and they would even refuse to provide innovative enterprises with the necessary funding, services, or approvals mandated by formal institutions (TJ01). This caused enterprises (or other entities) had difficulties to realise their mindset of SEI creation within the region. Ultimately, we can observe that the TBNA experienced an erosion of its knowledge and innovation base: pre-existing technological and human capital resources gradually flowed out, while the local government cannot act as the place-based leader to anchor and mobilise extra-regional resources as we see in Hefei's case.

¹²¹ How these institutional arrangements facilitate the SEI creation can be found in previous two chapter. (For instance, service providing in Hangzhou, decision-making in Tianjin. Tolerance of failure can be found in both cases.)

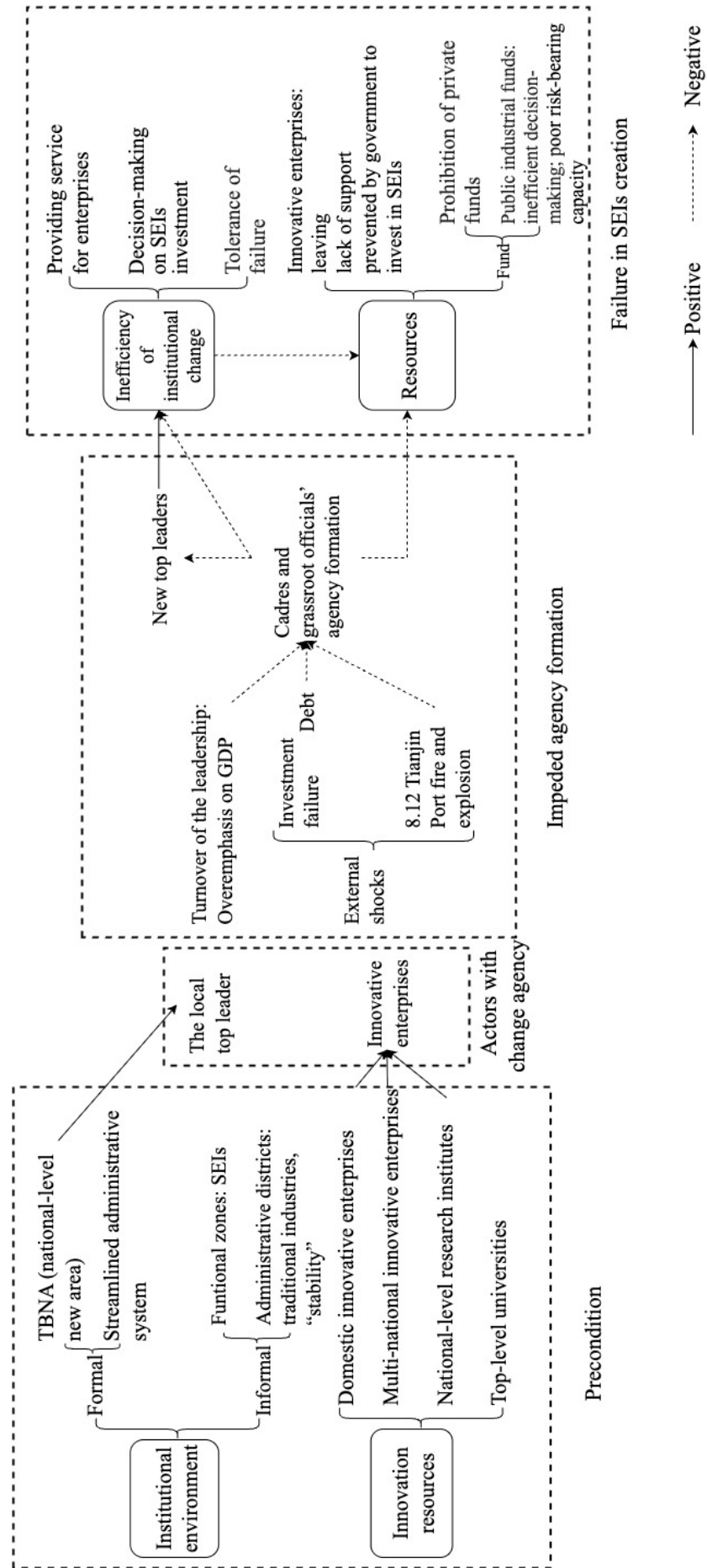


Figure 6-3 The Lag-behind Transition to the Knowledge Economy in Tianjin (Source: the Author)

In sum, Tianjin's case reflects how the absence of change agency formed in the local government would lead the failure in knowledge economy transition. When the local government did not have the mindset to create SEIs, or acting as the innovative entrepreneur, the formal institutional arrangements were rendered ineffective, innovative resources were lost, and SEI creation could not be realised. The local government would even impede other actors in the region to realise their mindset to the reality. This case highlights the importance of change agency formation in the local government, especially when comparing with Hefei and Hangzhou's case.

Chapter 7: How Can China Make the Knowledge Economy Transition

The development of strategic emerging industries (SEIs) to facilitate the transition to the knowledge-based economy has emerged in some Chinese cities since the 2010s. This transition has become increasingly important in recent years as the central state has placed greater emphasis on innovation (State Council, 2021; Ang *et al.*, 2023; National Development and Reform Commission, 2024). SEIs are not only prevalent in China's leading economic regions (the southeastern coastal areas) but are also beginning to be observed more widely in inland cities in central or western areas. Meanwhile, SEIs begin (or have already) to become the primary drivers of economic growth in some cities, marking the success of these regions in their transition to the knowledge economy. These phenomena go beyond scholars' previous understanding of China's knowledge economy transition as "the agglomeration of economic activities and the externalities it produces" (Crescenzi, Rodríguez-Pose and Storper, 2012; Rodríguez-Pose and Wilkie, 2016; Crescenzi and Rodríguez-Pose, 2017). After all, if China's knowledge economy transition were driven only by the aggregation of resources, whether knowledge or human capital, it could only occur in a metropolis which sucks knowledge and technologies from its neighbours, such as Beijing, Shanghai, or Shenzhen. Other surrounding cities or those further located in inland areas would never make such a transformation.

In this chapter, based on new empirical data presented in Chapters 4–6, a process-based framework for explaining China's knowledge economy transition is developed. In this framework, China's knowledge economy transition is understood and conceptualised as the cumulative industrialisation of regional and extra-regional knowledge and technologies, leading to the creation, development, diversification, and expansion of technology-intensive, high-value-added industries that can even generate monopoly profits within the region. Viewing China's knowledge economy as a *process* of industrial development provides the opportunity to trace its origins, and offers context for analysing which factors and how their interplay underpins this process.

This chapter proceeds as follows. First, key elements of the process-based framework for explaining China's knowledge economy transition will be introduced, with a focus on why agency formation of the local government stands at the core of the whole process of knowledge economy transition in China. This chapter then explains mechanisms of agency formation within the local government through cross case comparison, provides the typology

of agency formation and shows its power in explaining the difference. The third part of the chapter will then show how this process-based framework contribute to our understanding of China innovation and knowledge economy transition. The fourth part of the chapter assesses the significance of researching on China's knowledge economy transition for the theories of industrial path creation, especially for theorising path creation in peripheral regions. The significance on turning from change agency to its formation is discussed in this part. This chapter will conclude with a set of issues for future research.

7.1 The Process-based Framework: Viewing China's Knowledge Economy from an Industrial Perspective

China's knowledge economy transition, as noted above, is conceptualised as the process of continuously industrialising knowledge and technology, thereby creating and developing emerging industries that are technology-intensive, high-value-added, and capable of generating monopoly profits even at the national or international level. This understanding distinctly differs from the prevailing perception of knowledge economy transition as the transition caused by the application of new technologies represented by innovation and communication technologies (ICTs) in the production (Iversen and Soskice, 2019) (see Chapter 2). After all, if the sole criterion for assessing the knowledge economy transition is whether new technologies drive productivity and economic growth, then any technological advancement in human history can possibly be labelled as such. The distinct characteristics of the so-called "knowledge economy transition" occurring in the 21st century lie in two aspects. First, the widespread industrialisation of new technologies represented by ICTs¹²² caused the fundamental changes of the mode of production, with labour beginning to be liberated from simple and repetitive production activities, and the means of production beginning to shift from land, natural resources, or large-scale labour to knowledge, technology, and complex skills. Second, industries generated by these new technologies are characterised as *exclusive* due to legal protection of access to knowledge and technology, thereby possessing the potential to generate monopoly profits¹²³.

¹²² The industrialisation of new technologies here encompasses two aspects: first, these technologies are used to upgrade and transform traditional industries; second, these technologies themselves are industrialised, causing the creation and development of emerging industries.

¹²³ This does not imply that the knowledge economy will inevitably produce sectors or industries capable of capturing monopoly profits, but rather discusses its potential and possibility. This potential becomes reality if the following conditions are satisfied: 1) The technology is irreplaceable; 2) The new technology becomes the industry standard and is widely recognised and accepted by consumers; 3) The technology is monopolised by individuals or a small group of interest groups; 4) These individuals or interest groups establish patent barriers to significantly reduce the likelihood of competing technologies emerging.

China's recent economic transition is consistent with these two characteristics: first, labour-intensive industries have begun to disappear in some regions of China. Replacing them are the emergent and rapidly developing technology- and knowledge-intensive industries, which have gradually become the main engines of economic growth in these regions. Moreover, China's SEIs, which are created and driven by domestic enterprises, have begun to break the previous situation where foreign or multinational companies monopolised technology to extract excessive or even monopoly profits in the Chinese market, which signifies China's progress in innovation and technology. In other words, this also implies that, if foreign competitors are absent, these emerging industries possess the *capability* and *potential* to generate monopoly profits (Marco Colino, 2022).

Nevertheless, when China's knowledge economy transition is understood as the collection of SEI's creation and development, a process-based framework, following up on the theories of industrial path creation, needs to be introduced to understand how those emerging industries are created and developed in China. After all, although scholars have recognised that China's innovation is the result of the interplay between the state, enterprises, and entrepreneurs¹²⁴, we still do not understand the mechanisms behind this interplay. In other words, how does the (positive) interaction between the government, enterprises, entrepreneurs, or other actors lead to the creation and development of SEIs? In the framework outlined in Figure 2.5, the creation and development of SEIs in China is decomposed into the iteration of three key elements: 1) the preconditions, 2) a dynamic process of agency formation, and 3) the actions to drive the creation and development of SEIs after actors acquiring change agency. This section will then discuss each of these three elements and show their significance in understanding China's knowledge economy transition.

Precondition: Resource stock, Market, and Institutional Environment

The precondition of China's knowledge economy, following up on the conceptualisation of economic geographers, refers to the combination of resources, markets, and institutional environment that can be used to facilitate (or hinder) the creation and development of emerging industries in the region (Binz, Truffer and Coenen, 2016; MacKinnon *et al.*, 2019; Gong and Binz, 2023).

¹²⁴ For instance, see Lan, 2021; Zhang, Dodgson and Gann, 2021; Jin, 2023.

First, the resource stock refers to the combination of region-specific, industry-specific and extra-regional resources (MacKinnon *et al.*, 2019; Gong and Binz, 2023). In addition to resources defined in the most general sense, such as natural resources (land, gas, oil, coal, forest), infrastructural resources (IT infrastructure, road, port), the most significant resources that can facilitate the creation of SEIs in China mainly include *knowledge and technology* resources, and *financial* sources. The knowledge and technology resources in China's case are those enterprises with innovative capabilities¹²⁵, research institutes, and universities. The financial resources may include funds raised through financial markets, supporting funding initiatives established by multi-level governments (tax incentives, direct rewards), and industrial development funds.

The thickness or thinness of regional resources influences but does not determine the success of the transition to the knowledge economy¹²⁶. In other words, while we can easily classify regions as thick or thin based on their resource stocks, particularly technology and financial resources, this does not mean that regions with less resources are destined to fail in the knowledge economy transition. This is because, in China's context, the scarcity of resource stocks can be mitigated by appealing for and mobilising resources from other regions. For example, in Hefei's case, we can see that at the initial stage, the knowledge and technological resources used to develop and create SEIs primarily came from other regions. While financial resources were addressed through local fiscal revenues, the local government also attempted to raise funding through securing loans from national development banks and other financial organisations based on the local government credit guarantee. Conversely, as shown in Chapter 6, Tianjin initially possessed more abundant knowledge, technology, and financial resources, but the city ultimately failed to achieve the transition to a knowledge economy.

Second, at the very early stage of China's knowledge economy, the market originated from the demand for technology from regional and domestic enterprises and industries. This means that in the early stage, the market was mature, with clear technological requirements, users, and producers (typically foreign or multinational companies)¹²⁷ (Naughton, 2007; Branstetter and Lardy, 2008; X. Liu, 2010; Bao, Lu and Xiong, 2017; Li, Capone and

¹²⁵ Under the "independent innovation (zizhu chuangxin, 自主创新)" political campaign, these enterprises more often refer to domestic enterprises rather than foreign or multinational enterprises.

¹²⁶ How resource stocks influence the SEI creation will be discussed more in Section 7.2.

¹²⁷ For instance, as we see in the cases of Hefei and Hangzhou, the market for Hefei's display panel industry originated from the demand of the local home appliance industry, the core technological suppliers of which were large multinational corporations like Samsung and LG; in Hangzhou's case, the market for the e-commerce industry was initially dominated by multinational corporations like eBay.

Malerba, 2019). This differs from scholars' previous understanding of market conditions based on the experiences of developed countries or regions: in developed countries and regions, emerging technologies often precede the formation of markets (Bergek *et al.*, 2008; Uyarra and Flanagan, 2022). However, in developing countries and regions, it is more likely to see that emerging technologies are *new to the region*, rather than new to the world. Therefore, domestic enterprises will have to compete with more technologically advanced competitors for market share in mature markets by increasing R&D investments and reduce the price of their productions¹²⁸. This does not mean there is no room left for niche markets in China's knowledge economy transition. When domestic enterprises capture market share, generate and circulate value, and reinvest the value they create into research and development, emerging technologies can transition from being new to the region to being new to the world (as seen in Hangzhou's case). In such circumstances, establishing and protecting niche markets through the creation of technological standards, ecosystems, or government procurement becomes more critical (Uyarra and Flanagan, 2022).

Third, in China's knowledge economy transition, the institutional environment is shaped by the interplay of formal rules and informal norms at the local, regional, and national levels (Lan, 2021; Ang *et al.*, 2023). First, the political campaign and development agenda (e.g., independent innovation, strategic emerging industries, new quality productive forces, etc.) initiated by the central government penetrates the bureaucratic system from top to bottom, influencing the choices and behaviour of regional and local actors. This is evident from the fact that the choice of industries by the local governments is listed in the central government's classification of SEIs. Second, local development plans, informal institutions rooted in locally embedded culture and habits, such as government preferences for certain types of enterprises (private or state-owned) or perceptions of technological risks or opportunities, also impact the creation and development of SEIs in the region.

Once again, we can easily classify regions based on whether they possess abundant innovation resource stocks initially, but this does not constitute the necessity of success in knowledge economy transition. For instance, some regions may initially have more resource stocks, market opportunities, or an institutional environment that is more conducive to the development of emerging industries. However, this does not mean that regions with more favourable preconditions can always make the transition. As shown below, whether key actors can form change agency and actively participate in the reconfiguration of regional

¹²⁸ The other example also see China's telecommunication industry (X. Liu, 2010).

preconditions actually underpins the success or failure of regional knowledge economy transition. Otherwise, even if a region possesses abundant resources and market opportunities, the lack of effective utilisation of these resources will ultimately lead to a failure, as we have seen in the case of Tianjin.

Agency Formation

The formation of change agency within local government, particularly innovative entrepreneurship, is the key *trigger* for SEIs' creation and development, and the transition to the knowledge economy within the region. The definition of change agency following the conceptualisation of economic geographers, refers to social, spatial, and temporal embedded actors, who are influenced and formed by the past, attempt to change the status quo, proactively plan for the future and realise the ideal vision, and so generate new options and initiatives for the future (MacKinnon *et al.*, 2019; Grillitsch and Sotarauta, 2020). Change agency is thus distinguished with the reproductive agency which attempts to maintain the existing industrial paths (Coe and Jordhus-Lier, 2011; Grillitsch and Sotarauta, 2020).

As we have seen in the preceding chapters, innovative entrepreneurship that drives the creation of SEIs does not necessarily originate first within government, and may even first appear in innovative enterprises¹²⁹. However, only when innovative entrepreneurship is formed within the local government can it trigger and initiate the regional knowledge economy transition. This is evident by the within-case comparison of Hangzhou and the cross-case comparison between Hangzhou and Tianjin. In Hangzhou's case, we can see that although Alibaba, as a leading company with innovative entrepreneurship, drove the creation and development of several new industries between 2003 and 2014, due to the local government's indecision about developing traditional manufacturing or the digital economy, Hangzhou did not undergo a large-scale transition to the knowledge economy during this period. It was not until 2014, when the local government changed its expectations due to economic stagnation and decided to use SEIs as the main engine of economic growth, that the city saw the formation of change agency in the local government, Hangzhou had just started to make the transition the knowledge economy. When comparing Hangzhou and Tianjin, we can observe that both regions possessed abundant innovative resources and market opportunities, and enterprises within both regions had innovative entrepreneurship.

¹²⁹ For instance, in Hangzhou's case, innovative entrepreneurship first appeared in Alibaba.

Tianjin failed to make the transition like Hangzhou did is connected to disrupted formation of change agency in the local government due to the turnover of the top leader.

Once it has become an innovative entrepreneur, the local government can easily also take the role of the institutional entrepreneur and place-based leader¹³⁰. This is not only because of the intrinsic connection between the three types of change agency¹³¹, but also due to the power relations between the local government and other actors in China's knowledge economy transition. On the one hand, the local government has the power to govern local social and economic affairs, which gives it inherent legitimacy in institutional reform, making it more likely to become an institutional entrepreneur. Moreover, the local government may use their powers in land use, project approval, and finance capabilities to shape preferences and behaviours of other actors (especially enterprises), thereby turning themselves into place-based leaders. While the local government cannot compel enterprises to participate in the SEI creation through administrative orders, it can influence and coordinate the behaviour of enterprises through financial capabilities, for instance, offering tax incentives, rewards, or investments through state-owned assets for specific industries¹³². In addition, as the local government control the power over land use and project approvals, it can facilitate approvals and land use for SEIs¹³³, thereby encouraging more enterprises to participate in the creation and development of emerging industries. For instance, in the case of Hefei, to facilitate the creation of the chip industry, the local government even specifically authorised the production of related chemicals that had previously been strictly controlled¹³⁴ (HF01).

Focusing the analysis on the *formation* of change agency rather than change agency itself is crucial to understand China's knowledge economy transition. If the analysis focuses on change agency, empirically, we will seek to identify actors with change agency and analyse their actions in innovation or institutional reform. However, the key problem here is that we may find that many actors all have change agency in China's knowledge economy transition.

¹³⁰ Although this does not mean that local governments will always take these roles.

¹³¹ The intrinsic connection means when actors have the will to leave the existing path and attempt create and establish new ones, they then have more motivations to seek for the opportunity to change institutions and make impact on other actors to coordinate and form collective actions.

¹³² Cooperation with the government is often perceived by the enterprise as good or "high-quality" opportunities, told by interviewees in three cities.

¹³³ This approach can be observed in both Hefei and Hangzhou's case. For instance, the local government in Hefei designated industrial land for the ICT industry before it determined to create such an industry (HF01). In Hangzhou's case, the local government reallocated extensive land in the Yuhang District for Alibaba to facilitate the creation of ICT-related industries (HZ02; HZ03).

¹³⁴ Due to the consideration for environmental protection, obtaining approval to establish new chemical production factories has become extremely difficult in China (TJ01; HF01).

If merely identifying actors' agency without examining the process by which their agency emerges, we will struggle to determine and evaluate which actor's change agency is more significant for the knowledge economy transition. For instance, in the case of Hangzhou, we can see that both the local government and Alibaba demonstrated innovative entrepreneurship in 2014. How should we judge whose agency was more important? The analysis of agency formation allows the tracing, and then comparing, which actors' change agency can actually trigger the knowledge economy transition. Otherwise, we might draw some inaccurate conclusions, such as, only when both the government and enterprises have the innovative entrepreneurship can the knowledge economy transition be triggered.

Shifting attention from *agency* to *agency formation* can effectively address this issue. By comparing the sequence of agency formation of different actors and aligning them with the critical junctures of the knowledge economy transition, we can determine whose agency actually and finally triggers the initiative of the knowledge economy transition, thereby assessing the importance of different actors' agency to regional knowledge economy transition. On the other hand, analysing mechanisms of agency formation under complex and diverse contexts opens up avenues for explaining the differences in policy tools, industries and their trajectories, and outcomes of knowledge economy transition across different types of regions (as discussed in Section 7.2).

This analysis of the formation of change agency marks a departure from previous literature. On the one hand, a significant body of research concentrated on how change agency is manifested in industrial path creation, such as through the opportunity space (MacKinnon *et al.*, 2019; Grillitsch and Sotarauta, 2020; Uyarra and Flanagan, 2022; Gong and Binz, 2023; Gong *et al.*, 2024). As a result, case studies on regional industrial path creation often take actors endowed with change agency as a given and the starting point of analysis, leaving the process by which this agency is acquired outside the scope.

On the other hand, research on change agency tended to focus on its potential sources rather than its formation process. For instance, the source of innovative entrepreneurship can be regional institutions, support systems, or specific agents perceiving market opportunities (Grillitsch, 2019; Grillitsch and Sotarauta, 2020). Yet, how these structures systematically generate change agency was still underexplored. This leaves a crucial question: why do key actors in some regions successfully form change agency while those in other regions, under comparable circumstances, do not? Specifically, in China's knowledge economy transition, we can see that the macro-institutional setting is basically the same for all regions, dictated

by the central government's mandate for indigenous innovation and strategic emerging industries. Indeed, in every case we found, this top-down initiative was one of the sources for the innovative entrepreneurship of various local actors, from government officials to entrepreneurs in the private sectors. Nevertheless, despite observing this potential source of change agency, we still have less knowledge on why Tianjin never formed change agency within its local government to facilitate the creation of SEIs as Hefei and Hangzhou did, which directly caused the lagging behind of Tianjin's knowledge economy transition (as discussed in Chapter 6). The key to understanding these divergent outcomes, therefore, is not merely to identify the possible sources of change agency, but to systematically explore the process by which change agency is formed¹³⁵.

Industrial Path Creation

When actors, especially the local government, acquire certain types of change agency, a series of actions to facilitate the creation and development of SEIs will then emerge in the region. These actions mainly include facilitating innovation and technology, identifying/constructing (niche) markets, anchoring, and mobilising assets and resources, and modifying locally embedded institutions.

First, technological innovation and its commercialisation in China's knowledge economy transition are typically carried out by enterprises¹³⁶. However, this does not mean that other actors are not involved in the process. In general, the local government provides financial support to those innovative enterprises to encourage them to actively participate in innovation activities. The local government also initiated the local talent policies to attract more skilled talents and knowledge resources. Thus, in any circumstances in China's knowledge economy transition, technological innovation is a game of "public-private collaboration". And we can even see several extreme versions of this collaboration. For instance, in the case of Hangzhou, the local government directly signs strategic cooperation agreements with local enterprises (such as Alibaba). In the case of Hefei, the local government acts as an investor and shareholder in enterprises, directly providing funding through state-owned assets for enterprises and technologies it wants to cultivate.

¹³⁵ The agency formation and its explanatory power on different trajectory of China's SEI creation will be explored more in Section 7.2.

¹³⁶ The ways in which enterprises conduct technological research and improve the quality of innovation include increasing R&D investment, appealing talents and purchasing patents from other regions (particularly technologically advanced countries or regions), or cooperating with research institutes and universities within and outside the region.

Second, in terms of the market, depending on the resource stock and the phase of development, market construction primarily takes two forms: first, capturing mature markets¹³⁷; second, establishing and protecting niche markets. Again, regardless of the method of market construction, it is not a purely economic activity, and local governments are actively involved in this process. For instance, Hefei's display panel industry benefited from the "Home Appliances going to the Countryside (*jiadian xiaxiang*, 家电下乡)" policy and the increase in tariffs on liquid crystal panels when competing with its international counterparts to take market share (Zhao, 2009; Customs Tariff Commission of the State Council, 2012). Once SEIs have developed to a certain extent and technologies become new to the world, local governments also actively use policy tools to construct and protect (niche) markets. For instance, the local government may create the niche market by procurement and protect it by linking the new technologies with traditional industries, as seen in Hangzhou's case.

Third, in terms of asset and resource mobilisation, identifying and anchoring one or several "dragonhead" enterprises¹³⁸ to attract innovation and knowledge resources has been proven effective in several cases (Gong *et al.*, 2024). The local government can select or mobilise leading enterprises in the industries they wish to create and use them as the anchor to attract more talent or enterprises from upstream and downstream in the industrial chain (Binz, Truffer and Coenen, 2016). In this sense, these leading enterprises serve not only as innovation resources but also as catalysts for resource mobilisation. For instance, in Hefei's case, we can find that the local government initially chose to anchor and mobilise BOE to facilitate the creation of flat panel display industry. With the cooperation of BOE, over 200 enterprises engaged in the display industry were subsequently attracted and mobilised to Hefei (HF04)¹³⁹. Therefore, the key issue becomes how the local governments can identify and utilise these leading enterprises (discussed in Section 7.2).

In addition to financial markets, tax incentives, and direct rewards, the distinctive feature of financial asset mobilisation in China's knowledge economy lies in how state-owned assets

¹³⁷ Although using the term "market construction" to describe this behaviour is not entirely accurate, as markets already exist rather than being created, this type of market construction can also be understood as establishing markets for domestic enterprises and technologies.

¹³⁸ This means the leading or flagship companies with technologies and innovative capacity in the certain industry.

¹³⁹ We can find several cases in both Hefei and Hangzhou's case. For instance, the Hefei local government initially chose to mobilise BOE to create the flat panel display industry and selected Powerchip and GigaDevice to advance the creation of chip industry. The Hangzhou government opted for cooperation with Alibaba to facilitate cloud computing industry and selected Hikvision and Dahua to foster the creation of the Internet of Things industry.

were systematically used to finance innovative activities. These state-owned assets, supervised by the State-owned Assets Supervision and Administration Commission but managed and operated in a market-oriented manner, provide resources for enterprise innovation activities through industrial funds¹⁴⁰. From an investment perspective, these industrial funds do not differ significantly from private funds, but, as noted above, profit-seeking is not their priority. When managing industrial funds, some local governments allow these funds to operate at a loss or fail to generate profits in the short term, as long as they can significantly facilitate enterprise participation in innovative activities and drive regional SEI creation and development¹⁴¹.

Last but not least, several formal institutions established by the local government have been proven to play a key role in SEI creation and knowledge economy transition. This includes institutions ensuring the rationality of decisions on investments for technologies, systematically providing services to enterprises, and a willingness to forgive errors (in investment decisions or wrong selections of technological routes). In addition to the establishment of these formal institutions, more importantly, the formation of change agency is accompanied by shifts in norms and rules. This is first reflected in the change of local government officials' perceptions of economic growth patterns. Before change agency is formed, the prevailing perception is that economic growth should be promoted by any feasible means¹⁴² (He, 2021; Lan, 2021; Zhou, 2022). After change agency is formed, the notion that economic growth should be driven by technology, knowledge, and innovation begins to replace the previous understanding, leading to subsequent actions on facilitating the creation of SEIs. For instance, in Hefei's case, after the local government acquired agency, they swiftly began seeking for innovative enterprises to collaborate with to drive the creation of the display panel industry, despite their limited funds at the time. In Hangzhou, after acquiring change agency, the local government swiftly abandoned their plans to develop traditional manufacturing and took the creation of SEIs as the sole guiding principle for Hangzhou's future economic growth.

¹⁴⁰ By 2024, China has cumulatively established 2,126 government-owned industrial funds, with a total scale of 12.82 trillion Yuan, mainly targeting and covering strategic emerging industries (Securities Daily, 2025; Zero2IPO Research Centre, 2025).

¹⁴¹ Though this raises the concern for the sustainability of industrial funds, particularly in the context of collapse of the land finance in some regions after 2021.

¹⁴² This is why, in the case of Hangzhou, we can see the "Industrial Development Strategy for Urban Revitalisation (gongye xingshi, 工业兴市)" of promoting traditional manufacturing and the Project No. 1 (yihao gongcheng, 一号工程) strategy of emphasising information technology-driven growth coexisting for a quite long period.

The prevalence of the new norm on driving growth through SEI creation can to a significant extent mitigate the negative impact of the leader's preferences and unwillingness to support transition to the knowledge economy. The turnover of the local leader can easily disrupt the process of SEI creation and development, particularly the transition between the first leader to recognise technology and knowledge as the primary drivers of economic growth and his or her successor¹⁴³. This is because investments in technology and innovation are inherently full of uncertainty, and may not produce economic returns or growth in the short term. This conflicts with the interests of local leaders who need to seek promotion through a good performance in economic growth (typically measured by GDP) (He, 2021; Lan, 2021; Zhou, 2022). This can be mitigated by the bottom-up agency diffusion. Once the mindset of creating SEIs is widely diffused and becomes the collective vision before the turnover of the local leader, grassroots officials can exert influence on, and transmit their agency, to new top leaders, thereby ensuring that the development strategy of facilitating economic growth through SEI creation will not be interrupted by the turnover of leadership¹⁴⁴. On the contrary, if the turnover of leadership occurs before the formation of new norm, it is hard to prevent new leaders prioritising short-term GDP growth and giving up the creation of SEIs, thereby disrupting the transition to the knowledge economy (as seen in Tianjin's case).

Changes in the evaluation and promotion rules may also occur along with agency formation in the local government. Although economic growth still accounts for a large proportion in the formal official evaluation and promotion system, in some regions, such as Hefei, we can find that to what extent the officials understand and are familiar with technologies and SEIs has become a new informal rule in evaluating officials' performance. In other words, officials who actively contribute to the creation and development of SEIs have more chance to get promotion. Although currently there is not sufficient evidence to prove whether the new rules for evaluating and promoting will be formally institutionalised, this is undoubtedly a revision to the previous understanding of official behaviour, which was solely based on their performance in the economic growth (e.g., the promotion tournaments theory (Zhou, 2022)).

In short, China's knowledge economy transition is a dynamic process that primarily involves the continuous industrialisation of knowledge, technology, and innovation, as well as the

¹⁴³ When emerging industries continue to develop, subsequent leaders are more likely to benefit from the economic growth driven by these industries, thereby having less incentive to hinder investments in SEIs.

¹⁴⁴ In reality, it is more likely that the new leader will request investment in projects that can bring about immediate GDP growth, but will not oppose the development plan on SEIs set by the previous leader. This phenomenon has also been observed in other cities, such as Suzhou (TJ06).

ongoing creation and development of emerging industries. In this process, the abundance of knowledge, technology, and financial resources does not determine the success of a local knowledge economy transformation. Instead, the formation of change agency in regional actors, particularly in the local government, is the key trigger for knowledge economy transition. This point of view, as discussed below, enrich our understanding on the role of government and direct the analysis from solely on industrial policy to a holistic framework. However, this raises the question: although we recognise the importance of local government's change agency formation, what mechanisms underpin the formation of these agencies? And how the agency formation underpinning the creation of SEIs and knowledge economy transition in China's context?

7.2 The Mechanism of Change Agency Formation

In China's knowledge economy transition, the formation of change agency in the local government is locally embedded. While their formation is influenced by the central state (e.g., through political campaigns such as "independent innovation" (Ang *et al.*, 2023)), it is rooted in specific local conditions and contexts. Based on whether leading enterprises possessing innovative entrepreneurship exist within a region, agency formation of the local government can be categorised into at least two types: the exogenous and endogenous model. If the region has a leading enterprise with innovative entrepreneurship, and if it is "big" enough to influence regional economic growth, under specific circumstances and opportunities, it can serve as *exogenous* agency sources and transmit change agency to the local government. If such enterprises do not initially exist in the region, the formation of change agency is more likely to *endogenously* occur within the local government. Regardless of the type, the top-down diffusion of agency from leadership to lower-level officials runs throughout the entire process of agency formation.

The Exogenous Model

In more developed regions (such as cities in the southeast coastal areas), innovative entrepreneurship in creating SEIs may be formed before it can emerge in the local government. This is because, on the one hand, the profit-seeking nature of enterprises makes them more likely to expect to generate profits by creating emerging industries. On the other hand, in regions with good performance in economic growth, such as rapid GDP growth, the local government normally has less motivation to pursue economic structural adjustments or

shifts of the economic growth pattern¹⁴⁵. Therefore, in these regions, while the local government may need to incorporate the cultivation of SEIs into their development plans to respond to requirements from the provincial or central government, it just layers the creation of SEIs onto existing economic development models. As a result, in these regions, while the local government may demonstrate interest in new technologies and some SEIs, they do not overwhelmingly abandon past economic growth models and pour all resources into SEIs. Thus, during the phase of rapid economic growth, multiple economic growth models may coexist for a long time. SEIs, due to their uncertainty and significant potential risks, are less likely to replace traditional industries (resource-intensive and labour-intensive industries) as the primary drivers of local economic growth when traditional industries can sustain the rapid economic growth.

The window of opportunity for change agency formation in the local government in this scenario arises when the growth relying on traditional industries collapses, which may result from an international financial crisis or changes in the international division of labour. As noted above, maintaining local economic growth still is the primary task and goal for the top leader in the local government. Therefore, when other traditional industries start to decline, leading to a slowdown or even recession in local economic growth, SEIs that still have the capacity to maintain growth are likely to attract the top leader's attention. In such a circumstance, enterprises engaged in innovation (particularly leading enterprises) also have greater motivation to persuade the top leader(s) to shift the focus of future development toward technology and innovation. Once successful, these enterprises can benefit from the innovation-supportive policies established by the local government. For the top leader, collaborating with leading enterprises to revive regional economic growth is also a reasonable choice. Thus, innovative entrepreneurship flows from the innovative enterprise to the local top leader.

The diffusion of innovative entrepreneurship from the top leader to lower-level cadres or grassroots officials is relatively straightforward, as officials at all levels need to address and resolve the impact of slowing economic growth on their personal promotion. In Hangzhou's case, we can see that the innovative entrepreneurship was swiftly diffused downwards through leading group meetings (H. Wang, 2015; Yu and Tang, 2017). On the other hand, the formal evaluation system passes the top leader's innovative entrepreneurship down to more grassroots officials. However, there is currently insufficient evidence to indicate

¹⁴⁵ Except in some economic special zones or pilot areas.

whether other informal institutions facilitate the diffusion of change agency in the exogenous model. For instance, in Hangzhou's case, high-level leaders do not use officials' knowledge and familiarity with the digital economy as an informal criterion for evaluation or promotion. This is because, in most circumstances, officials in related department only need to provide services for leading companies rather than interfering in their technical decision-making (HZ02; HZ03). As shown below, this differs significantly from the endogenous model.

In the diffusion of innovative entrepreneurship within the exogenous model, what the local government receives from enterprises is the will to create SEIs, rather than the capability to do so. This is because, in the exogenous model, technological innovation, the identification of (niche) markets, and even the anchoring and mobilisation of resources from other regions, can all be accomplished by the leading enterprise. Therefore, the local government shows less interest in the process of technological innovation and its industrialisation. This means while the local government may want to create and develop SEIs, officials are more likely to let the company take the lead, rather than use government intervention to drive the process¹⁴⁶. This leads to two primary consequences. First, as the local government knows less about the detail of technologies, it normally does not take the role of place-based leader. The work of articulating the future and forming expectations and collective actions may still be carried out by the local leading enterprise¹⁴⁷. Second, when innovative entrepreneurship is widely diffused among officials at all levels, the local governments will also actively facilitate institutional reforms and act as the institutional entrepreneur. In this context, the purpose of institutional reform is to establish institutions that can provide better services for enterprises, particularly for the leading enterprises¹⁴⁸. For instance, in Hangzhou's case, the local government established dedicated service system, Qincheng Ban (亲橙办), for Alibaba, which was used to help Alibaba, and keep it in the region, to continuously contribute to the creation of SEIs (HZ02; HZ03). Therefore, we can observe that in the exogenous model, the local government shows their preference for formal institutional reforms related to serving enterprises¹⁴⁹, and thus the local government turns itself into the "(public) service provider".

¹⁴⁶ This also implies that the local government is unable create SEIs independently as it in the endogenous model. For instance, in Hangzhou's case, we can see that after 2019 the local government attempted, for political reasons, to promote the creation of manufacturing-related SEIs within the region (HZ04). However, while the government had the will, it lacked the requisite capacities, so that the creation of emerging manufacturing industries in Hangzhou remained for a considerable period largely confined to plans and official documents but could be realised (HZ03; HZ04).

¹⁴⁷ Supportive policies initiated by the local government may accelerate this process.

¹⁴⁸ For instance, in Hangzhou's case, we can see that the local government establish institutions aimed at enhancing the administrative efficiency and enabling them to response to enterprises needs as soon as possible.

¹⁴⁹ The consequences of overreliance on leading enterprises will be discussed in Section 7.2.3

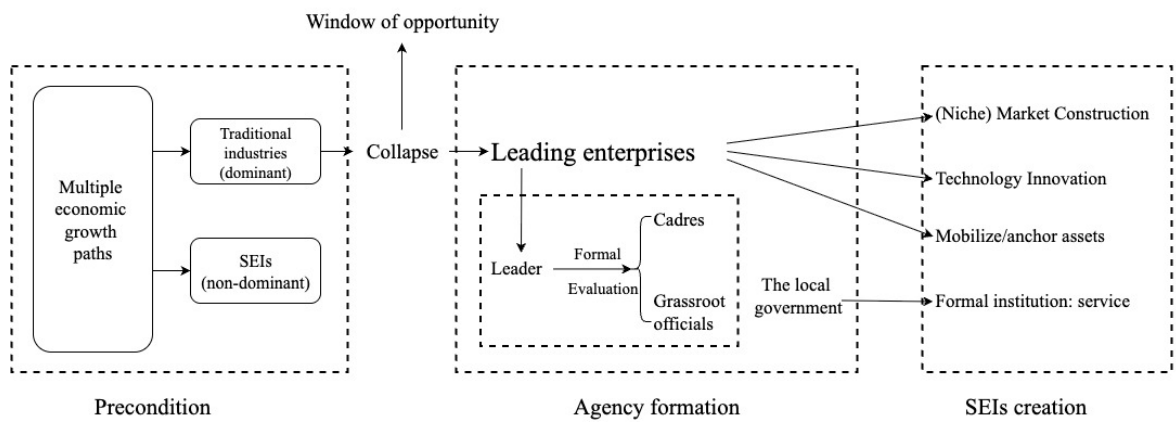


Figure 7-1 The Exogenous Model (Source: the Author)

Now we can merge the elements and revise the analytical framework based on the exogenous model. As shown in Figure 7-1, in the exogenous model, the innovative entrepreneurship is transmitted by pre-existing giant innovative enterprises within the region to leaders in local government during the window of opportunity, typically when the traditional industry-dominated economic growth model collapses. Through the reform of the formal evaluation system, innovative entrepreneurship can be rapidly disseminated and diffused within the entire local government. Once both the local government and leading enterprises have the mindset, they will actively and collaboratively facilitate the creation and SEIs: leading enterprises, as the place-based leaders, engage in innovative activities, resource mobilisation, and market construction, while the local government can transform itself into the service provider to assist leading enterprises and other innovators in achieving the industrialisation of technology and innovation. The exogenous model illustrates that the pre-existence of innovation resources within a region does not necessarily lead to the creation of SEIs. The key lies in whether enterprises with innovative entrepreneurship can transmit their agency to the government within the window of opportunity, and whether the entire government can reach a consensus, and have the mindset and will to create SEIs.

The Endogenous Model

If a region initially lacks leading enterprises with innovative entrepreneurship (a situation which normally can be observed in peripheral regions), change agency formation within the local government is endogenous. At the initial stage, the source of the agency may come from the local leader of the local government. In both Hefei and Tianjin's case, it can be observed that the mindset of creating and developing SEIs initially originated from the top leader of the local government. Although there is still insufficient evidence to judge where the leader's personal innovative entrepreneurship comes from, by comparing Hefei and

Tianjin, we can observe that these leaders share some similarities. For instance, they were not promoted locally and had maintained close relationships with the central government prior to their appointment as administrative leaders in the region¹⁵⁰. Therefore, a reasonable inference is that, due to their close ties with the central government, these local leaders are more likely to be influenced by the central government, coordinate the local economic growth model with central government advocacy, and thus have the idea of innovative entrepreneurship in creating SEIs¹⁵¹.

The top-down diffusion of innovative entrepreneurship in the endogenous models relies on changes in both formal and informal institutions. This requires that, at the very initial stage, the top leader not only possesses innovative entrepreneurship in SEIs but also acts as the institutional entrepreneur, passing and diffusing the innovative entrepreneurship down through new institutional arrangements. Several formal and informal institutions are found to facilitate the diffusion of change agency. First, changes in the formal evaluation system can compel cadres and grassroots officials to participate in the creation of SEIs. For instance, in Hefei's case, government officials at all levels were required to complete assessments and studies of a certain number of technologies and emerging industries, which were formally incorporated into the evaluation of their performance. Second, some changes in informal institutions, such as the criteria for officials' promotion, can also promote the downward diffusion of innovative entrepreneurship. What is transmitted downward through the formal evaluation system is *pressure* rather than *motivation*. Grassroots officials are sometimes compelled to participate in the creation of SEIs because of the necessity to complete tasks, rather than because of their personal willingness or choice. In this context, grassroots officials function more as extensions of top leaders' will rather than as proactive actors. In contrast, reforms to the informal rule of promotion can transfer more motivations than pressure. When lower-level officials find that the higher-level officials use the extent to which lower-level officials have knowledge of regional technology, innovative enterprises, and SEIs as informal criteria to evaluate and promote them, rather than solely focusing on how good the economic performance of their departments is, grassroots officials are more

¹⁵⁰ For instance, Secretary Sun Jinlong served as the Standing Secretary of the Central Committee of the Communist Youth League before becoming the Party Secretary of Hefei. Secretary He Lifeng did not serve in the central government before becoming the Party Secretary of TBNA, but his appointment was directly carried out by the central government.

¹⁵¹ There is currently insufficient evidence to indicate whether their agency formation is related to the formal incentive and promotion institutions established by the central government. For example, we cannot currently judge whether leaders who actively engage in innovation and its industrialisation are more likely to get promotion. But this provides a potential research topic, to see how institutional arrangements at the central government (not only promotion, but also institutions related to learning, educating or discipline) influence the agency formation of the local leaders.

likely to actively learn about technologies and participate in the creation of SEIs. The pressure imposed by the formal evaluation system is thus transformed into personal innovative entrepreneurship. By combining these changes in formal and informal institutions, innovative entrepreneurship can spread from the individual local leader to the entire government.

The key challenge of the endogenous model lies in whether the top leader can successfully diffuse innovation entrepreneurship within their limited tenure. According to Zhang and Li (2020), between 2003 and 2012, the average tenure of party secretaries in China's prefecture-level cities was approximately 3.7 years, and this figure further decreased to 2.1 years after 2013. It is challenging to achieve the diffusion of innovative entrepreneurship within such a short tenure. As noted above, the diffusion of innovative entrepreneurship is likely to be interrupted due to the turnover of local leaders, particularly between the first two leaders. Therefore, to ensure the continuous diffusion of innovative entrepreneurship, a feasible way for the top leader is to promote and appoint a group of officials who share the same mindset with the leader to serve as the "second-in-command" during their tenure. In this way, even if a specific top leader leaves his/her position, "second-in-command" officials can ensure continuous diffusion of innovative entrepreneurship either by succeeding to the position or influencing the new top leader's understanding and perception on SEIs¹⁵².

In the endogenous model, capability is diffused downward accompanied with the will to act in the diffusion of the innovative entrepreneurship¹⁵³. Due to the lack of leading enterprises, the local government also need to possess corresponding capabilities in the creation of SEIs. These capabilities may include learning (innovation and technologies), sensing (local and national market opportunities), coordinating (with innovative enterprises and other actors), seizing (anchoring and mobilising resources in real time), and reconfiguring (regional assets to ensure them compatible with SEIs) (Gong *et al.*, 2024). Initially, these capabilities may only be possessed by one or a small group of local leaders. With the change of formal and informal institutions, these capabilities can also be diffused downward along with the innovative entrepreneurship. In Hefei's case, we can see that higher-level cadres tend to evaluate and promote grassroots officials based on their knowledge (familiarity) of technology, markets, and industries¹⁵⁴. The reason why they can make a fair judgement is

¹⁵² For instance, they can help explain the significance of emerging industries for the region's future, ensuring that new leaders do not abandon previous development plans.

¹⁵³ The discussion of capability follows the point view that capability is the bridge between the change agency and the actual actions of industrial creation (Labory and Bianchi, 2021; Laasonen, 2024).

¹⁵⁴ This is generally informal. For instance, in the Hefei government, cadres assess the extent to which grassroots officials know technologies and industries by inquiring about the alignment between technology and local SEIs.

because they themselves are evaluated and promoted in the same way. In this process, more local government officials acquire the capabilities needed in SEI creation, and as shown in Chapter 4, they transform themselves into *techno-internalised bureaucrats*.

Unlike the exogenous model, once the innovative entrepreneurship and capabilities widely spread, the local government can easily take the role of place-based leadership, as officials in the local government clearly know which SEIs they want to create, and what they should do to drive this process. On the other hand, the local government also actively acts as an institutional entrepreneur, like in the exogenous model, to change formal institutions to encourage more actors to engage in the creation of SEIs. However, the connotation and outcomes of institutional entrepreneurship differs fundamentally from the exogenous model. In the endogenous model, officials understand that they need to anchor and mobilise resources from other regions to drive the creation of SEIs. Therefore, the local government as the institutional entrepreneur has preferences about which formal institutions can win the resource competition with other regions (and how to build them). As a result, in the endogenous model, we can observe that the local government exhibits a preference for institutions that can finance the enterprises¹⁵⁵, particularly enterprises with technologies and innovative capabilities. Formal institutions related to enterprise service, unlike in the exogenous model, are given much lower priority. Therefore, in this model, the local government transforms itself into an *investment promotion machine* through reforms of enterprise financing institutions, rather than acting as a (public) service provider as in the exogenous model.

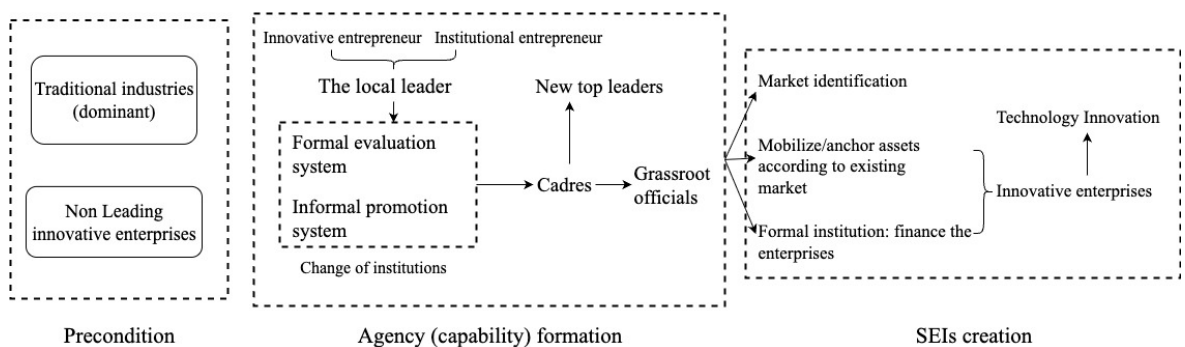


Figure 7-2 The Endogenous Model (Source: the Author)

Of course, this is based on the cadres themselves having sufficient understanding and knowledge of technology and industries.

¹⁵⁵ For instance, how to systematically and institutionally use state-owned assets to finance these enterprises.

The endogenous model can thus be framed as such. In endogenous models, innovative entrepreneurship typically originates from the top leader(s) in the local government due to the absence of leading enterprises. The top leader(s) should both be the innovative entrepreneur and institutional entrepreneur to diffuse his/her agency to others in the government. Through reforms of institutional arrangements, including the formal evaluation system and informal promotion mechanisms, the top leader can transmit their agency downwards, and capabilities such as market identification and learning technology also spread and diffuse alongside in this process. When more cadres and grassroots officials acquire agency and capabilities, they can become techno-internalised bureaucrats and easily transform the government into an investment promotion machine: officials in the local government can and will proactively identify local markets and seek for and anchor innovative enterprises suitable for these markets; and to mobilise these enterprises (normally a competitive process) into the region, a series of formal institutions related to finance the enterprise will be established. Once change agency is widely existing in the local government, the turnover of leadership is unlikely to hinder the creation of emerging industries in the region. This is because cadres with change agency will actively influence the new leader's behaviour by persuading, assisting in familiarisation and learning, as we see in Hefei's case (HF01; HF04).

The endogenous model provides a path for regions (particular the peripheral ones) that initially lack innovative resources to create SEIs, and once again demonstrates that the abundance of innovative resources does not determine the success of SEI creation. On the other hand, the endogenous model also indicates that in these regions (especially peripheral regions), the creation of SEIs is by no means a simple process of resource anchoring and mobilisation. The key lies in the fact that while officials' agency is being formed, they also need to acquire the corresponding capabilities and mindset to ensure that their goals can be realised.

Explaining the Difference through the Mechanism of Agency Formation

China's knowledge economy transition, as shown above, is a process full of diversity and complexity. This process, as shown above, may vary significantly across different regions and contexts. Therefore, regardless of the theoretical framework used to explain China's innovation and knowledge economy transition, explanations for these differences should be incorporated into the analysis. This thesis attempts to explain these differences by examining the heterogeneous mechanisms in local government agency formation across different regions.

As shown in the last two sub-sections, although local governments all gained innovative entrepreneurship in the knowledge economy transition, whether the capability is transmitted alongside agency constitutes the key distinction. In the exogenous model, the formation of innovative entrepreneurship in the local government manifest in its will to facilitate the creation and development of SEIs, as proposed by Grillitsch and Sotarauta (2020). In the endogenous model, the capabilities, alongside with the will to create SEIs, are formed in the local government. This difference, as shown in the last two sub-sections, is caused by different mechanisms of agency formation, and determine whether local governments can ultimately become place-based leaders in regional emerging industry creation. This difference also leads to notable variations in the change of institutions, policy tool selection (both as shown above), and industrial path selection and industrial path legitimisation across different models. The combination of these differences ultimately results in varying outcomes across regions in SEI creation and the knowledge economy transition.

Capabilities	Hefei (The Endogenous Model)	Hangzhou (The Exogenous Model)	Tianjin
Learning	Local Government (LG): Officials systematically learn technological and industrial knowledge	Firm: Learning and creating new technological knowledge	Firm: Learning new technological knowledge
Sensing	LG: Actively searching for potential innovative enterprises with high growth potentials	Firm: Sensing market demands and global technological dynamics	Firm: Sense technological changes strictly within their specific industries.
Seizing	LG: Using state-owned assets to make equity investments in enterprises	Firm: Seizing opportunities for cooperation with other enterprises	(Not evidently demonstrated)
Coordinating	LG: Coordinating the allocation of resources across multiple SEIs within the region	LG & Firm: Jointly creating markets and facilitating the participation of multiple actors	(Not evidently demonstrated)
Institutionalizing	LG: Institutionalising the evaluation and promotion of officials based on SEIs creation; institutionalising policy tools for sensing and seizing innovative enterprises	LG: Engaging in institutional reforms, establishing a service-oriented government to thoroughly support enterprises	(Not evidently demonstrated)
Reconfiguring	LG: Adapting regional resource base to the mobilised innovative enterprises' needs	Firms: Establishing regional and (inter-)national innovation networks LG: Investing in physical infrastructures and providing public services	(Not evidently demonstrated)

Table 7-1 Comparative Analysis of Actors Capabilities Across Three Cases

In terms of the selection of industries, in the endogenous model, since innovative entrepreneurship is transmitted and diffused top-down within the government by the top leader(s), the selection of SEIs inevitably reflects the personal preferences of the top leader(s). For instance, in Hefei's case, the decision to develop the semiconductor industry

stemmed from Secretary Sun Jinlong's personal aspirations (HF01). While his successors did not deny his decision on developing the semiconductor industry, they also demonstrated their own preference for other SEIs (such as electronic vehicles) (HF01, HF05). Thus, in the endogenous model, the local government may exhibit diverse and sometimes dispersed choices in SEIs, with weak technological relatedness among different industrial paths. In contrast, in the exogenous model, since the local government's innovative entrepreneurship is primarily passing from leading enterprises, the local government are more likely to choose the specific SEI(s) which leading enterprises are expert in. In Hangzhou's case, we can see that the local government's choices of SEIs basically followed industries in which Alibaba was engaged. In this scenario, in the exogenous model, the industrial paths chosen by the local government may exhibit stronger technological relatedness.

There are significant differences in the process of legitimizing industrial paths between two models, which are caused by whether capacity is transmitted and diffused alongside with change agency. In the endogenous model, since capacity spreads alongside agency within the local government, the process of legitimizing industrial paths (such as discussions on the rationality of technologies) occurs within the local government, enabling it to select, create, and develop the industrial paths they most desire. In the exogenous model, however, since what spreads within the government is the "will to act" without "capability", the local government find it difficult to take the leadership in the process of legitimizing industrial paths. Decision-making on the choice of technologies, industries, and drawing future expectations are more likely to occur outside the government (e.g., within leading enterprises). This means that even if the local government wishes to develop industrial paths inconsistent with those of local leading enterprises for other reasons (such as pressure from higher-level governments), it cannot independently complete the task of legitimisation of industrial paths as the local government does in the endogenous model. Ultimately, local industrial paths will still follow the preferences of leading enterprises. For instance, in Hangzhou's case, we can see that in 2019, due to the low proportion of manufacturing in economic growth, the Hangzhou municipal government, under pressure from the Zhejiang provincial government, sought to create and develop SEIs related to manufacturing within the region (HZ04). However, due to its lack of capacity to legitimise industrial paths internally, the Hangzhou government failed to facilitate the creation and development of manufacturing-related SEIs within the region, despite the fact that local government officials

quickly made and initiated relevant industrial plans as soon as they received the order from Zhejiang provincial government (HZ04)¹⁵⁶.

7.3 Approaching China's Knowledge Economy Transition: Beyond Industrial Policy

This section demonstrates how the process-based framework, and the analysis of agency formation can deepen and enrich our understanding on China's innovation and knowledge economy transition. Current research widely acknowledges the pivotal role of (local) governments in China's transition to the knowledge economy (Gao and Yi, 2021; Lan, 2021; Jin, 2023; Liu, 2025). This research on the function of governments to some extent challenges the economic theory assertion that knowledge economy transition in China can only occur in metropolitan regions (Crescenzi, Rodriguez-Pose and Storper, 2012; Rodríguez-Pose and Wilkie, 2016; Crescenzi and Rodríguez-Pose, 2017). By deploying non-market instruments, such as formulating targeted industrial policies, governments can adjust and reconfigure local innovation resources, thereby creating opportunities for industrial path creation and knowledge economy transition in non-metropolitan cities in China (Gong *et al.*, 2024). As we seen in Hefei's case, officials in the local government frequently and systematically visited metropolises like Shanghai and Nanjing to proactively search innovation resources, and under favourable conditions¹⁵⁷ to mobilise these resources to relocate to Hefei, thus facilitating Hefei's knowledge economy transition (HF05).

Debates about the role of government in the knowledge-economy transition span from the central to the local level (Yu *et al.*, 2017; Zhao *et al.*, 2019; Bazavan, 2020; Xue, Li and Yu, 2021; Zhang, Dodgson and Gann, 2021; Li *et al.*, 2022; Zhang and Lan, 2023). The former typically focusing on the role of central government on providing the macro-level direction of industrial development, formulating national standards and industrial policies; while the latter is focusing how local governments use the policy instruments and tools to facilitate regional industrial path creation and knowledge economy transition. Therefore, more researchers show their interests on how industrial policy published by the local government can facilitate the region's knowledge economy transition, suggesting that such policies promote the creation of emerging industries through government procurement and

¹⁵⁶ The specific industrial plan is "Hangzhou's New Manufacturing Plan (Hangzhou xin zhizaoye jihua, 杭州新制造业计划)". According to interviewees, the New Manufacturing Plan was initially made to meet the requirements of the higher-level government, but local officials were unclear about what the "new" manufacturing actually means and which industries should be created (HZ03; HZ04).

¹⁵⁷ Such as Hefei's lower land and labour costs, convenient high-speed railway system or generous government investment funds.

subsidies(Zhao *et al.*, 2019; Zhang, 2020; Gao and Yi, 2021; Zhu and Tan, 2022; Chen *et al.*, 2024).

However, there are also some cases where local government intervention failed or even produced negative outcomes in the knowledge economy transition. For instance, some local governments blindly mobilised firms misaligned with local resource endowments when facilitating the knowledge economy transition, which finally caused the heavy debt burden in the city (HF01). In some contexts, government intervention led to rent-seeking and corruption rather than economic transition (Lan, 2021). Other examples include the misallocation of substantial resources to non-innovative or low-quality patenting activities under the incentives of political promotion tournaments, which ultimately obstructs regional knowledge economy transition (Ang, 2023).

This controversy over the role of local government is, in essence, a debate about its proper boundaries within the knowledge economy transition. While proactive government can certainly accelerate this process, key elements such as innovation, capital flows, and talent mobility are directed by complex market forces that may lie beyond the government's capacity to intervene (Lan, 2021). Consequently, framing the government's role as simply promoting or hindering knowledge economy transition is overly simplistic. This is because government's actions can only be effective and efficient when certain causal forces are activated in certain contexts. The core question, therefore, should shift from *what* the government does, to *what* mechanisms that determine if and how the government can act effectively within specific contexts. This leads to more nuanced questions, such as: under what conditions is government intervention most effective? And how should government choose its strategies in the different stages of knowledge economy transition to ensure desirable outcomes?

As shown above, conceptualising China's knowledge economy transition as a dynamic process of industrial path creation, and placing the government action within this process, allows for a more nuanced explanation of local governments' roles. First, we do not argue that (local) governments should adopt a uniform, fixed behavioral pattern when promoting knowledge economy transition. For instance, local governments should not assume that simply mimicking the industrial policies of other cities will automatically generate the creation of emerging industries at home. On the contrary, government behavior to some extent is shaped by regional specific initial conditions. For instance, governments possessing

markedly different resource endowments, such as Hefei and Hangzhou, should adopt entirely different strategies in their transitions to the knowledge economy.

Second, viewing China's knowledge economy transition as a process enables us to move beyond static, one-directional causal analysis and to examine the timing of interventions and the changing roles governments play at different stages. Existing studies often treat government actions, such as the enactment of industrial policies, as isolated and independent, thereby overlooking the timing, sequencing, and stage-specific consequences of such actions (Gao and Yi, 2021). As our empirical chapters demonstrate, the opportunities and methods for local governments to intervene in the knowledge economy transition can vary across different contexts. In Hefei, the local government needed to be involved from the very beginning and acted to anchor and mobilise innovation resources. In Hangzhou, by contrast, what the local government needed was to adjust its economic development strategy at the proper time. Tianjin's case shows that missing the window of opportunity can make it difficult to facilitate the knowledge economy transition, even when industrial policies and relevant institutions are later established. Moreover, the role governments may change in different stages of knowledge economy transition. For instance, when facilitating the creation of manufacturing-related emerging industries in Hangzhou, the local government needed and began to take the leadership rather than only providing services for enterprises (HZ04). Incorporating the temporal and process dimension into the analysis reveals that effective interventions require local governments to select strategies suited to their contexts at the right time, which is still missing in the non-processual research paradigm.

Third, and most critically, tracing the process enables an analysis of the underlying causal mechanisms driving China's knowledge economy transition, moving beyond the focus on observable government actions that are emphasised most in previous research (Vinig and Bossink, 2015; Gao, 2018; Zhao *et al.*, 2019; Li, Ji and Zhang, 2020; Zhang, Dodgson and Gann, 2021; Zhang and Lan, 2023; Yan *et al.*, 2024). By clarifying the internal causal forces at play, we can shift the debate from *whether* the government is effective to *why* it is effective. This shift is crucial for explaining the central puzzle of why some cities successfully made the transition while others could not. As shown in the proceeding chapters, the formation of local government change agency is crucial, sometimes decisive, in the city's knowledge economy transition, rather than the presence of innovation resources, institutions, or industrial policies discussed in previous literature. Such a finding moves the research beyond merely documenting government behaviour and towards a deeper explanation of how and

why that behaviour can become effective, thereby engaging in revealing the causal mechanisms underpinning China's knowledge economy transition.

Finally, interpreting local government behaviour through the lens of agency formation significantly broadens the traditional narratives of Chinese political economy. Focusing on agency fundamentally differs from the conventional theoretical assumption based on incentives in Chinese political studies. Existing theories, whether the promotion tournament or franchising the bureaucracy, predicate their theoretical assumptions on officials' rational pursuit of material or political rewards, presuming government officials are interest-driven individuals motivated by external payoffs (Zhang, 2005; Ang, 2016; Zhou, 2022). However, this research shows that once officials acquire change agency (i.e., having the mindset or reaching the consensus on SEIs creation), their behavioural pattern shifts from being profit-driven to mission-driven. This perspective explains how officials in the local government can transcend the constraints of short-term incentive brought by structures such as promotion. This means if the change agency is formed and internalised, officials are not only passive calculators of performance metrics but active architects of development visions. This ensures officials to take the risk to choose innovative-intensive, but high-risk and long-cycle industries to drive regional economic transition, even if these industries might negatively slow down short-term local GDP growth. Thus, examining agency and its formation breaks with the traditional understanding that officials solely pursue "certain rewards", offering a novel perspective to explain why some local governments remain proactive in the regional development despite the change of the accountability system.

The research on agency and its formation by no means denies the importance of institutional incentives. On the contrary, incentive structures might act as catalysts for the formation of agency. For instance, in Hangzhou's case, the performance pressure stemming from promotion incentives compelled the local government to proactively seek cooperation with regional leading enterprises during the economic stagnation, thereby creating a window of opportunity for the exogenous formation of change agency. However, the incentive structure exhibits a profound internal tension within the context of the knowledge economy transition, which explains why the formation of change agency is not a universal phenomenon in China, but rather manifests as highly dispersed and fragmented. In the context of economic decentralisation, although local governments possess the discretionary power on economic development, the GDP-centred performance evaluation system frequently induces officials to avoid high-risk, long-cycle, and slow-return SEIs. Consequently, this serves as a substantive institutional impediment to regional knowledge economy transitions. This

misalignment between macro-level incentives and the inherent risks of transition dictates that the formation of local change agency needs to rely upon specific micro-level variables, such as visionary leaders or technologically leading firms. This implies that isolated research on incentives is insufficient to uncover how government functioning in China's knowledge economy transition. The research on agency provides the channel for researching on the dynamic interplay between the two, enabling the analysis on the specific contexts under which either force exerts a more dominant influence on local state actions.

The research on agency further directs the focus on localised informal institutions. Distinct from the concept of delegation of discretionary power emphasised in the administrative subcontracting theory (Zhou, 2017), the formation of change agency places a critical emphasis on ensuring that lower-level governments maintain alignment with higher-level governments regarding regional industrial selection and developmental strategies, even as power is decentralised. This implies that the genesis of change agency formation transcends the simple top-down assignment of tasks; rather, it constitutes a process of ideological and cognitive shaping, alongside capability empowerment within specific contexts, that spans bureaucratic boundaries. This ensures that whilst grassroots officials exercise flexibility and even innovate policy instruments to achieve developmental objectives, they remain consistently synchronised with the overarching developmental strategies of their superiors. On the other hand, the formation of agency is not exclusively driven by formal institutional frameworks; informal institutions that evolve within specific contexts are equally indispensable. For instance, this is manifested in the modes of state-business collaboration observed in the Hangzhou case, and in the Hefei case, through informal promotion criteria based on officials' familiarity with technology and industry, as well as a fault-tolerance institution that implicitly exempts non-corrupt, trial-and-error failures from penalty. Ultimately, researching the formation of agency steers the theoretical lens towards these distinctive, context-specific informal institutions, thereby providing a crucial supplement to the prevailing tendency within Chinese political economy literature to emphasise formal institutional analyses.

In conclusion, approaching China's knowledge economy transition requires looking far beyond the mere formulation of industrial policies. While policies are the visible tools, the invisible engine is the cognitive and behavioural transformation caused by the change agency formation of the local state apparatus itself. Tracing the origins and diffusion of change agency allows us to uncover not only the institutional factors that foster this process, but also that the mechanisms of change agency formation in different contexts. This

approach not only exposes the source of the divergent pathways observed in China's knowledge economy transition, but constitutes the important complement to current incentive-oriented and formal institution-based Chinese political studies.

7.4 Explaining Path Creation: From Agency to Its Formation

This section will primarily discuss the theoretical contributions that research on China's knowledge economy transition can make to the study of industrial path creation. In previous theories of industrial path, the change agency is treated as an independent variable, focusing on how change agency and the actors possessing which impact the process of regional industrial path creation (MacKinnon *et al.*, 2019; Grillitsch and Sotarauta, 2020; Grillitsch, Asheim and Nielsen, 2022; Grillitsch *et al.*, 2022; Uyarra and Flanagan, 2022). The research on China's regional industrial path creation shows that, the change agency of key actors who drive the path creation does not pre-exist in the region initially. In other words, a region may initially consist of diverse subjects, including local governments, firms, and universities. Only if these subjects acquire the change agency, they can transform themselves into pivotal actors driving industrial path creation.

Research on agency formation rests upon the fundamental premise that the ideas, mindsets, intentions, and visions of regional subjects are malleable and changeable. As demonstrated in the empirical chapters, the formation of change agency is essentially a process through which potential regional subjects (e.g., firms, local authorities, research institutions, and universities) acquire the specific idea, mindset, and vision to create new industries. This process facilitates passive, interest-driven subjects to transfer themselves into active, mission-oriented actors, allowing them to actively take advantage of regional and extra-regional resources to foster the creation of new regional industries. From this perspective, the formation of change agency functions as the crucial bridge connecting intangible ideas and visions with tangible entrepreneurial endeavours, institutional reforms, and leadership actions.

Empirical evidence from China's knowledge economy transition indicates that, in the industrial path creation, change agency can evolve from a singular source (such as highly perceptive entrepreneurs or visionary local officials) to the organisational level. For instance, in Hefei's case, the change agency in the local government originated from the specific top leader but was formed through the diffusion of the leader's mindset and vision to the whole local government. This dynamic is critical as it reveals that the change agency formation

might be the diffusion of individual's mindset or visions of path creation throughout the whole organisation. Consequently, this implies that the theorisation of industrial path creation should go beyond identifying the sources of agency (cf. Grillitsch and Trippel, 2018; Grillitsch, 2019; Grillitsch and Sotarauta, 2020), and further focus on how specific structures enable the diffusion of agency from a small group to broader organisational or even system levels.

Shifting the analytical focus from change agency *per se* to its formation process suggests that re-examination of the logical starting point for investigating industrial path creation. If change agency does not naturally pre-exist within the region, but is instead gradually acquired by key actors, it implies that the true genesis of industrial creation may occur much earlier than any actual, observable industrial creation events. For instance, in Hefei's case, a crucial prerequisite for the local government to acquire change agency was the prior rectification of bureaucratic discipline and administrative behaviour orchestrated by the leadership. Without investigation of change agency formation, such antecedent events or institutional reconfigurations, which might appear extraneous to industrial development yet are vital for triggering path creation, risk being entirely omitted from the analysis. In other words, regional industrial path creation may have been incubating before any conspicuous industrial events manifest. This implies that the analysis of industrial path creation can begin by identifying the key actors, and then analysing the conditions under which they acquire the ideas and visions to drive industrial creation.

The empirical cases demonstrate that specific institutional arrangements are instrumental in fostering the formation of agency (see Section 7.3). This implies that in the study of industrial path creation, we not only need to look beyond how change agency alters institutions, but also examine whether and how region-specific institutions can stimulate the formation of change agency. Essentially, this offers a vital complement to the existing theoretical discourse on the relationship between institutions and agency within industrial path creation. While prevailing theories predominantly explore how institutions constrain or facilitate the *behaviour* of key actors, a focus on the *formation* of agency necessitates our attention towards a distinct category of institutional arrangements. Specifically, these are arrangements that impact whether change agency can be diffused or transmitted from one or a few individuals to a broader range of actors, thereby enabling the transfer of personal willingness into collective actions that drives industrial creation.

Furthermore, contextualising the agency formation within the Chinese setting not only enriches the aforementioned theoretical debates but also advances the theory of industrial path creation for developing and peripheral regions. Current literature on peripheral regions grapples with a distinct theoretical paradox: while industrial breakthroughs are widely acknowledged as the outcome of proactive, deliberate planning by regional actors (Gong *et al.*, 2024), these regions, often constrained by deficits in resources and knowledge, rarely witness the spontaneous emergence of actors endowed with the change agency (Boschma *et al.*, 2017). The explication of agency formation mechanisms within the Chinese context effectively bridges this theoretical gap. It demonstrates how, even in environments where vibrant market actors are largely absent, change agency can be formed through antecedent or deliberate institutional arrangements.

The discussion of change agency formation also has implications for researching on dynamic capabilities in industrial path creation. Current literature emphasises that dynamic capabilities serve as a key mediator between structure and agency, asserting that in the absence of agency, dynamic capabilities cannot be developed (Labory and Bianchi, 2021; Laasonen, 2024). However, existing studies rarely address how these capabilities are actually formed, particularly within the context of peripheral regions (Gong *et al.*, 2024). Investigating the formation of agency provides a channel for understanding capability formation in regional industrial path creation. For instance, the Hefei case demonstrates that the development of capabilities can occur concurrently with the diffusion of change agency through specific institutional settings. Furthermore, the comparative analysis of Hangzhou and Hefei reveals that divergent pathways of agency formation profoundly influence, and even dictate, both the process of capability formation and the specific types of capabilities ultimately acquired by key actors (see Table 7-1).

7.5 Conclusion and Future Research

China is now continuously applying knowledge, technology, and innovation to create innovation-intensive and high value-added industries, particularly strategic emerging industries. While this process initially tends to occur in a limited number of cities with highly concentrated innovation resources, it has progressively expanded to more inland cities over time. Adopting a holistic process framework enables the integration of multiple actors, such as government, market, and enterprises, etc., into the analytical framework, thereby avoiding overly one-sided explanations of China's knowledge economy transition that place excessive emphasis on either governmental or market forces. Across different contexts, cities exhibit

diverse trajectories in SEI creation and in their knowledge economy transition. Nevertheless, change agency of the local government stands at the core of this process. In the Chinese context, even in regions endowed with abundant innovation resources, or where certain actors have already developed the mindset to create SEIs, the absence of governmental change agency often results in the failure of SEI creation and knowledge economy transition. On the other hand, change agency of the local government is not inherently given or pre-existing at the very beginning. It may emerge exogenously, transmitted from the innovative enterprises within the region, or endogenously, originating from the top leader(s) and subsequently diffusing downward through institutional reforms. This perspective moves beyond conventional theories of industrial path development that focus solely on agency itself. Instead, it emphasises the processes through which agency is formed, illustrating that a local government (especially in a peripheral area) that does not have change agency at the initial stage can also acquire it through learning, diffusion, and dissemination, thereby opening up the opportunities for SEI creation and knowledge economy transition in the region.

Although it is believed that the formation of change agency in the local government, whether exogenous or endogenous, is the key trigger, it is clear that three cases will not be able to cover all mechanisms of agency formation of all trajectories of knowledge economy transition in China. Some examples discussed in the models are still context-specific. For instance, in Hefei's case, the source of agency formation stems from the personal willingness and capabilities of the top leader who previously served in central government departments. However, in other peripheral cities (particularly non-provincial capital cities), such an opportunity may not be available. In the Hangzhou's case, the uniqueness of Alibaba as a leading enterprise lies not only in its innovative entrepreneurship but also in its having sufficient scale to exert a significant influence on regional economic growth. In other regions, although there are also leading enterprises with innovative entrepreneurship, these enterprises may not be "large" enough to influence local economic growth. Thus, the window of opportunity for the private sector to influence the local government and transmit their innovative entrepreneurship will be much narrower. This thesis has shown that context really matters: mechanisms of agency formation in different contexts affect the results of industrial path creation and knowledge economy transition.

China's knowledge economy transition is still ongoing and far from complete, and top leaders in the Central Committee have demonstrated their ambition to make China a global technology leader. In this context, more cross-regional and national institutional

arrangements, such as “the New National System of Scientific and Technological Innovation” (keji chuangxin xinxing juguo tizhi, 科技创新新型举国体制) and the regional integration development strategy, were proposed and established. Additionally, after the 18th National Congress, the central party strengthened its control over local governments through intra-party regulations, resulting in a noticeable contraction of local government autonomy. Under these macro-level political and policy changes, how the agency formation of the local government is influenced and how it, in turn, influences the creation of local SEIs is worthy of study. On the other hand, changes in the micro-level context, especially the collapse of land finance after 2021, and how these changes impact local governments’ change agency formation remain under-explored¹⁵⁸.

The modelling of change agency formation is proposed not merely as a guide for future research in China, but also as a potentially fruitful framework for understanding industrial path creation in various context and for opening up new avenues of research in comparative geopolitical economy. In this regard, modelling agency formation can serve as a starting point for tracing the processes of industrial path creation, while deepening the explanation of actors’ behaviour — from the question of *what* they have done to the more fundamental question of *why* they were able to do so — offers new perspectives for interpreting divergence in industrial path creation.

¹⁵⁸ For instance, during the fieldwork in Hefei, local officials expressed concern that a significant decline in land-related fiscal revenue could affect their investment decisions in SEIs to a certain extent, as the risk-bearing capacity of the local government decreased.

Appendix 1: List of Interviewees

Number	Position	Notes
HF01	Director General Working in Relevant Department	Directly participated in Hefei's new energy vehicle and semiconductor industrial creation
HF02	Deputy General Manager Working in Relevant Enterprise	Familiar with Hefei's industrial investment funds
HF03	Professor at the Research Institute	Familiar with Hefei's industrial development
HF04	Head Working in Relevant Department	Directly participated in Hefei's flat-panel display and semiconductor industrial creation, familiar with the operation of Hefei's industrial investment funds
HF05	Director Working in Relevant Department	Directly participated in Hefei's industrialization of cutting-edge technologies, familiar with the operation of Hefei's industrial investment funds
HF06	Professor at the University	Familiar with Hefei's industrial development
HF07	Former Second-level Inspector Working in Relevant Department	Directly participated in Hefei's industrial path creation, familiar with the operation of Hefei's industrial investment funds
HZ01	Section Chief Working in Relevant Department	Familiar with Hangzhou's industrial development
HZ02	Section Chief Working in Relevant Department	Directly participated in government cooperation with Alibaba, familiar with locally formal institutions
HZ03	Director Working in Relevant Department	Directly made the plan for and participated in Hangzhou's digital economy development
HZ04	Head of Research Institute	Directly participated and made the plan for Hangzhou's digital economy development
HZ05	President Assistant of Research Think Tank	Familiar with Hangzhou's industrial development
TJ01	Deputy of the People's Congress	Familiar with officials in the local government
TJ02	Deputy General Manager Working in Relevant State-owned Enterprise	Familiar with officials in the local government, familiar with TBNA's industrial development
TJ03	Deputy of the People's Congress	Familiar with officials in the local government

TJ04	Director Working in Investment Promotion Related Office	Official in the local government
TJ05	Manager Working in Innovative Funding Related Enterprise	Familiar with officials in the local government, familiar with the operation of industrial funds in Tianjin
TJ06	Former Section Chief Working in Investment Promotion Related Office	Official in the local government, familiar with the investment promotion in TBNA

Appendix 2: Interview Question List

Questions for government officials in Hefei's case:

- 1) 合肥战略性新兴产业最初的发展源自京东方带动的新型显示产业（2008 年），当时政府是出于什么考虑想要发展新兴产业？

The initial development of Hefei's strategic emerging industries stemmed from the flat panel display industry spearheaded by BOE (2008). What considerations prompted the government to pursue the development of emerging industries at that time?

- 2) 就您的了解，当时合肥市的领导（例如孙金龙书记）是如何影响本地新兴产业发展的？

To your knowledge, how did the leadership of Hefei at the time (for instance, Secretary Sun Jinlong) influence the development of local emerging industries?

- 3) 就您的了解，在合肥政府培育新兴产业的过程中，更基层的政府工作人员（例如一线的管理者、招商引资的工作人员）的积极性和创造力是如何被激发的？

To your knowledge, how are the initiative and creativity of more grassroots government personnel—for instance, frontline managers and investment promotion officers—stimulated during Hefei's efforts to cultivate emerging industries?

- 4) 您认为合肥在挑选合作的对象（京东方、蔚来、晶合集成、联想或兆易创新等）来带动本地的产业发展时，具备哪些特征的企业会优先成为政府考虑的对象？

When selecting cooperation partners (such as BOE, NIO, Lenovo, or Giga Device) to drive local industrial development, what characteristics do you believe the Hefei government prioritises in potential enterprises?

- 5) 合肥“以投带引”发展新兴产业的模式已经非常成熟，这也源自 2008 年与京东方合作的经验。就您的了解，在一开始与京东方合作时，政府是否考虑或担心投资的风险？哪些做法保障了“以投带引”中产业基金运用的合理性？

Hefei's model of developing emerging industries through government investment has matured, drawing upon the experience gained from its 2008 cooperation with BOE. To your knowledge, did the government

consider or harbour concerns regarding investment risks when initially entering into the cooperation with BOE? What measures ensured the rational deployment of industrial funds within this process?

- 6) 在发展显示产业时也出现一些投资“失利”(等离子面板)的情况,地方政府如何对待这些“失利”?如果一个项目的投资不如预期呢?

In developing the display industry, certain investment setbacks (such as plasma panels) have also occurred. How should the local government address these failures? What if a project's investment yields less than anticipated?

- 7) 很多其他地方的政府来合肥学习“合肥模式”、“合肥经验”,您认为他们能从合肥政府的工作方式中学习到哪些经验?

Many other local governments have come to Hefei to study the “Hefei Model” and “Hefei Experience”. What lessons do you believe they can learn from the working methods of the Hefei municipal government?

- 8) 在您看来,合肥新兴产业的发展在多大程度上受益于“长三角一体化进程”?

To what extent, in your view, has the development of emerging industries in Hefei benefited from the “Yangtze River Delta integration process”?

- 9) 在其他城市的调研中,一些受访者提到合肥市政府“行政成本比较高”,您怎么看?

In surveys conducted in other cities, some respondents mentioned that the Hefei municipal government has “relatively high administrative costs”. What is your view on this?

Questions for researchers in Hefei's case:

- 10) 您认为合肥市近年来最显著的城市或产业变化是什么?在您看来,合肥的经济在过去二十年间经历了怎样的发展?

What do you consider to be the most significant urban or industrial transformation in Hefei in recent years? In your view, how has Hefei's economy developed over the past two decades?

- 11) 在合肥战略性新兴产业的发展中,地方政府发挥了重要的作用(例如,通过产业基金“以投带引”),也被认为是“有为政府”的典型。在您看来,合肥市政

府是如何做到“有为”？

In the development of Hefei's strategic emerging industries, the local government has played a pivotal role (for instance, by leveraging industrial funds to attract investment through investment-led approaches) and is widely regarded as a model of an 'effective government'. In your view, how has the Hefei municipal government become effective?

- 12) 在一些城市中，地方政府也在积极的以招商引资为城市带来新兴产业，但这不总能带来好的结果（例如，投资失败为城市带来债务）。您认为合肥市政府是如何做到“有为”而不“乱为”？

In some cities, local governments are also actively attracting investment to bring emerging industries to their urban areas, though this does not always yield good outcomes (for instance, failed investments can burden cities with debt). How do you think the Hefei government manages to be proactive without being reckless?

- 13) 就您的了解，当时合肥市的地方领导是如何影响本地新兴产业发展的？

To your knowledge, how did the local leadership in Hefei at that time influence the development of emerging industries in the region?

- 14) 就您的了解，在合肥政府培育新兴产业的过程中，更基层的政府工作人员（例如一线的管理者、招商引资的工作人员）的积极性和创造力是如何被激发的？

To your knowledge, how are the initiative and creativity of more grassroots government personnel—for instance, frontline managers and investment promotion officers—stimulated during Hefei's efforts to cultivate emerging industries?

- 15) 您认为合肥本地的资源（例如，中科大、合肥工业大学等）对合肥战略性新兴产业的发展有何影响？

What impact do you believe local resources in Hefei (for instance, the University of Science and Technology of China and Hefei University of Technology) have on the development of the city's strategic emerging industries?

- 16) 合肥一方面距离长三角地区很近，可能享受来自长三角地区的产业转移；但另一方面，人才也有可能因为距离长三角地区太近而被其他城市吸走。在您看来，

地理位置会对合肥的战略战略性新兴产业发展带来什么影响？

On the one hand, Hefei's proximity to the Yangtze River Delta region may enable it to benefit from industrial relocation from that area; on the other hand, however, talent may be drawn away to other cities precisely because of its closeness to the Delta. In your view, what impact will this geographical location have on the development of strategic emerging industries in Hefei?

- 17) 在您看来，合肥新兴产业的发展在多大程度上受益于“长三角一体化进程”？中央政策是如何影响合肥市战略性新兴产业发展的进程的？

To what extent, in your view, has the development of emerging industries in Hefei benefited from the “Yangtze River Delta integration process”? How have central government policies influenced the progress of strategic emerging industries in Hefei?

Questions for government officials in Hangzhou's case:

- 18) 杭州最为人称道的战略性新兴产业当属“数字经济”相关产业，但是在 2011 年之前，杭州一直以“工业兴市”作为发展战略，就您的了解，是什么因素推动了杭州从制造业转向了“数字经济”？

Hangzhou's most celebrated strategic emerging industries undoubtedly pertain to the digital economy. However, prior to 2011, the city consistently pursued an “industrial development” strategy. In your view, what factors facilitated Hangzhou's transition from manufacturing towards the digital economy?

- 19) 在 2014 年确定“数字经济”产业作为发展战略后，就您的了解，杭州市政府（或区政府）是如何与相关企业，如阿里巴巴，展开合作的？

Following the designation of the “digital economy” sector as a strategic development priority in 2014, to your knowledge, how has the Hangzhou municipal government (or district authorities) engaged in cooperation with relevant enterprises such as Alibaba?

- 20) 杭州是很早提出“建设服务型政府”的地区之一，杭州市战略性新兴产业的成功也必然离不开政府部门的努力。您认为杭州的服务型政府和其他地区有何不

同？政府部门在杭州战略性新兴产业的成功中发挥着什么样的作用？

Hangzhou was among the earliest regions to propose the concept of “building a service-oriented government”. The success of Hangzhou’s strategic emerging industries is undoubtedly inseparable from the efforts of government departments. How do you perceive the differences between Hangzhou’s service-oriented government and those in other regions? What role have government departments played in the success of Hangzhou’s strategic emerging industries?

- 21) 就您的了解，杭州市倾向于从别的地区引进拥有新技术的企业，还是更倾向于培养本地区的企业？

To your knowledge, does Hangzhou favour attracting enterprises with new technologies from other regions, or does it place greater emphasis on nurturing local enterprises?

- 22) 您认为还有哪些因素最终决定了杭州战略性新兴产业发展的成功？

What other factors do you believe ultimately determined the success of Hangzhou’s strategic emerging industries development?

- 23) 在我调研其他城市的时候发现，有些城市的工作人员（比如天津）会因为害怕投资失败、担责而不作为，因为新兴产业必然伴随着更多的风险，在杭州的情况是什么样的？如果一个项目的发展不如预期呢？

During my research in other cities, I observed that officials in some municipalities (such as Tianjin) may refrain from taking action out of fear of investment failures and accountability, as emerging industries inherently carry greater risks. What is the situation in Hangzhou? What happens if a project’s development falls short of expectations?

- 24) 在战略性新兴产业发展的过程中，您觉得最值得关注的要点什么？企业的技术、国家资金的安全、还是收益？

In the development of strategic emerging industries, what do you consider the most crucial points to focus on? Is it corporate technology, the security of state funding, or profitability?

- 25) 自 2019 年起，杭州重新将战略性新兴产业的发展目标定位到（先进）制造业上，而不仅仅关注“数字经济”。就您的了解，是什么原因导致了这种转变？

Since 2019, Hangzhou has refocused its development objectives for strategic emerging industries on (cutting-edge) manufacturing, rather than solely prioritising the digital economy. To your knowledge, what factors prompted this shift?

- 26) 尤其考虑到杭州工业用地的紧张,就您的了解,杭州(该)如何重新发展制造业相关的战略性新兴产业?

Given the constraints on industrial land in Hangzhou, to your knowledge, how might Hangzhou redevelop manufacturing-related strategic emerging industries?

Questions for government officials and staff in enterprises in Tianjin's case:

- 27) 滨海新区关于招商引资这一块的主要的主要工作内容有哪些?

What are the primary tasks undertaken by Binhai New Area in investment promotion?

- 28) 目前滨海新区关于招商引资的重点是什么?推进的情况如何?

What are the current priorities for investment promotion in Binhai New Area? What progress has been made?

- 29) 就您的了解,目前滨海新区有没有针对新兴产业,比如、医药、信息技术、航空航天、新材料新能源这些产业安排具体的人员或者部门?

To your knowledge, has Binhai New Area currently designated specific personnel or departments to oversee SEIs such as pharmaceuticals, information technology, aerospace, new materials, and new energy?

- 30) 目前在招商引资的时候有没有针对“新兴产业”出台专门的要求或者考核指标?

Are there currently any specific requirements or assessment criteria in place for SEIs when promoting investment?

- 31) 您觉得滨海新区有没有必要把“新兴产业”或者高技术产业的招商作为工作或者未来工作的重点?

Do you consider it necessary for Binhai New Area to prioritise attracting investment in SEIs or high-tech sectors as a key focus of its current or future work?

- 32) 就您的了解, 您觉得滨海新区在招商引资的时候哪些方面做的很好? 有哪些方面可能做的没有那么让人满意?

In your view, what aspects do you consider particularly well executed by Binhai New Area in its investment promotion efforts? Conversely, which areas might be deemed less satisfactory?

- 33) 在和企业的洽谈中, 你觉得更应该关注企业能带来的直接经济效益(税收、就业)还是企业拥有更先进的技术或者创新能力?

When negotiating with enterprises, do you believe greater emphasis should be placed on the direct economic benefits they can generate (tax revenue, employment) or on whether they possess cutting-edge technology or innovative capabilities?

- 34) 就您的了解, 在滨海新区招商引资的过程中面临的困难都有哪些? 这些困难是否能够得到解决?

To your knowledge, what difficulties has Binhai New Area encountered in its investment promotion efforts? Can these difficulties be resolved?

- 35) 就您的了解, 在招商引资的过程中, 政府里的其他部门是否会积极的和您的单位进行合作?(如果没有, 为什么会这样?)

To your knowledge, during the process of investment, do other government departments actively engage in cooperation with your organisation? (If not, why is this the case?)

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