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The Evolution of Logistics Networks:
A Study of the Sichuan-Chongqing Steel Industry

Qingren Chen

PhD Thesis

A thesis submitted for the Degree of Doctor of Philosophy in the Department of Geography,
Durham University

January 2026

Declaration

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Signature:

A handwritten signature in black ink that reads "Qingren Chen". The signature is written in a cursive style with a large initial 'Q'.

Abstract

Over the past three decades, China's logistics industry has undergone a profound transformation from internalised structures under the planned economy to multi-tiered outsourcing arrangements in the market economy. This transformation provides a valuable empirical case for understanding industrial network evolution. However, existing research has largely taken the emergence of independent logistics enterprises as a given, failing to examine the evolutionary processes through which logistics networks evolve from internalised to outsourced structures. This thesis addresses this gap by investigating *how logistics networks evolve from internalised structures to multi-tiered outsourcing arrangements*, focusing on the steel logistics industry in China's Sichuan-Chongqing region. It develops a synthesised theoretical framework that integrates Global Production Networks (GPN), Evolutionary Economic Geography (EEG), and institutional approaches to address the limitations of existing frameworks. This thesis employs a qualitative case study methodology adapted to the Chinese cultural context, involving 59 semi-structured interviews, participant observation through a month-long internship at a major steel plant in Sichuan-Chongqing region, and secondary data analysis. Through the process, this thesis obtains in-deeps exploration of informal practices which parallel with formal institutions. This thesis is structured around three research questions examined through separate empirical chapters. First, the thesis traces the overall evolutionary trajectory of steel logistics networks by analysing how various forms of *embeddedness* influence network formation and development. It disaggregates embeddedness into individual and organisational dimensions, revealing how different embeddedness forms of interact and reconfigure during institutional transformation. Second, it examines how *intermediaries*—including logistics subsidiaries, third-party logistics companies, fleets, and digital freight platforms—shape network structures and spatial configurations. It reveals how these intermediaries emerge through organisational functional differentiation and co-evolve with changing institutional contexts. Third, the research explores how top-down institutional logics and bottom-up actor strategies interact to form *network dynamics*. It identifies unique governance mechanisms under China's business context that contain both informal *guanxi* institutions and formal transaction-based institutions. These hybrid arrangements work together in sustaining multi-tiered outsourcing structures.

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Acronyms

3PL Third-Party Logistics enterprises

BRI Belt and Road Initiative

CPC Communist Party of China

EEG Evolutionary Economic Geography

GDP Gross Domestic Product

GPN Global Production Network (referring to the theoretical framework)

GPNs Global Production Networks (referring to actual networks)

NDRC National Development and Reform Commission

SME Small and Medium Enterprise

SOE State-Owned Enterprises

VAT Value-Added Tax

Glossary of Translated Terms

This thesis follows the pinyin system to Romanise Chinese terms and characters. To ensure both terminological precision and readability, Chinese terminology is presented according to the following conventions: For Core Academic Concepts: Key terms central to this research are presented in their original pinyin form in the main text to preserve conceptual accuracy and scholarly precision. These terms appear in the format: *pinyin* (Chinese characters, English translation). For General Terms: All other Chinese terms, including policy names, institutional names, place names, and general vocabulary, are presented primarily in English translation with Chinese characters provided in brackets for reference. Format: English translation (Chinese characters). For ease of reference, terms in this glossary are arranged alphabetically according to their English translations.

Administrative Measures for Small-Scale Taxpayers in Freight Transport Industry to Apply for Proxy Issuance of VAT Special Invoices (货物运输业小规模纳税人申请代开增值税专用发票管理办法, *Huowu yunshu xiao guimo nashui ren shenqing daikai zengzhi shui zhuanyong fapiao guanli banfa*)

Affection or feeling (情, *qing*)

Announcement on Value-Added Tax Issues Including Tax Exemption Filing for Cross-Border Taxable Activities (国家税务总局关于跨境应税行为免税备案等增值税问题的公告, *Guojia shuiwu zongju guanyu kuajing yingshui xingwie mianshui beian deng zengzhi shui wenti de gonggao*)

Automobile Loan Management Measures (汽车贷款管理办法, *Qiche daikuan guanli banfa*)

Chengdu Transfer Logistics Base (成都传化物流基地, *Chengdu Chuanhua wuliu jidi*)

China Communications and Transportation Association (中国交通运输协会, *Zhongguo Jiaotong Yunshu Xiehui*)

China Federation of Logistics and Purchasing (中国物流与采购联合会, *Zhongguo Wuliu yu Caigou Lianhehui*)

China Logistics Group Co., Ltd. (中国物流集团有限公司, *Zhongguo wuliu jituan youxian gongsi*)

Chinese online social media platforms - Maimai (脉脉), Douyin (抖音), and Xiaohongshu (小红书)

Chongqing Road Logistics Base (重庆公路物流基地, *Chongqing Gonglu Wuliu Jidi*)

Chongqing Steel Plant (重庆钢铁厂, *Chongqing Gangtie Chang*)

Chongqing Special Steel Plant (重庆特钢厂, *Chongqing Tegang Chang*)

Civil Code (民法典, *Min fadian*)

Civil Procedure Law Interpretation (2015) (中华人民共和国民事诉讼法, *Zhonghua renmin gongheguo minshi susong fa*)

Client relationships (客户关系, *Ke hu guanxi*)

Connection - (系, *Xi*)

Cuntan Port (寸滩港, *Cuntan Gang*)

Decision of the CPC Central Committee on Economic System Reform (中共中央关于经济体制改革的决定, *Zhonggong Zhongyang guanyu jingji dizhi gaige de jue ding*)

Decision on Several Issues Concerning the Establishment of a Socialist Market Economic System (中共中央关于完善社会主义市场经济体制若干问题的决定, *Zhonggong zhongyan guanyu wanshan shehui zhuyi shichang jingji tizhi ruogan wenti de jue ding*)

Educated Youth to the Countryside movement (知青下乡, *Zhi qing xia xiang*)

Emotional obligation or human sentiment (人情, *renqing*)

Enterprise groups (企业集团, *qiye jituan*)

Face or social standing (面子, *mianzi*)

Familiar acquaintances (熟人, *shuren*)

Find Coal Network (找煤网, *Zhao Mei Wang*)

Find Oil Network (找油网, *Zhao You Wang*)

Find Steel Network (找钢网, *Zhao Gang Wang*)

Freight Vehicle Home (货车之家, *Huoche Zhijia*)

Gate/channel (关, *Guan*)

Grasping the large (抓大, *zhua da*)

Grasping the large and releasing the small (抓大放小, *zhua da fang xiao*)

Great Leap Forward (大跃进, *Da yue jin*)

Guiding Opinions on Developing Personal Consumer Credit (关于开展个人消费信贷的指导意见, *Guanyu kaizhan geren xiaofei xindai de zhidao yijian*)

Guoyuan Port (果园港, *Guoyuan gang*)

Guoyuan Port Steel Market (果园港钢材市场, *Guoyuangang gangcai shichang*)

Hukou Zhengce (户口政策, Household registration policy)

Huochebang (货车帮)

Interim Measures for Road Freight Transport Management by Network Platforms (网络平台道路货物运输经营管理暂行办法, *Wangluo pingtai daolu yunshu jingying guanli zanxing banfa*)

International logistics hub park (国际物流枢纽园区, *Guoji wuliu Shuniu Yuanqu*)

International Trade and Logistics Park (国际商贸物流园, *Guoji Shangmao Wuliu Yuan*)

Labour Contract Law of the People's Republic of China (中华人民共和国劳动合同法, *Zhonghua renmin gonghe guo laodongfa*)

Large and comprehensive (大而全, *da er quan*)

Liangli Steel City (量力钢材城, *Liangli gangcai Cheng*)

Logistics business division (物流事业部, *wu liu shi ye bu*)

Luzhou city (泸州)

Manbang Group (满帮集团, *Manbang jituan*)

Master Planning of the New International Land-Sea Trade Corridor (西部陆海新通道总体规划, *Xibu luhai xin tongdao zongti guihua*)

Measures for the Administration of Automobile Consumer Loans (汽车消费贷款管理办法, *Qiche xiaofei daikuan guanli banfa*)

Mianyang City (绵阳)

Network freight (网络货运, *wangluo huoyun*)

Non-vehicle carriers (无车承运人, *wu che cheng yun ren*)

Non-vehicle transport (无车承运, *wu che cheng yun*)

Notice on Adjusting Value-Added Tax Rates (关于调整增值税税率的通知, *guanyu tiaozheng zengzhishui shuilv tongzhi*)

Notice on Comprehensively Implementing the Pilot Programme for Replacing Business Tax with Value-Added Tax (关于全面开展营改增试点工作的通知, *Guanyu quanmian kaizhan ying gai zeng shidian gongzuo de tongzhi*)

Notice on Piloting Work for Internet Logistics Platform Enterprises to Issue VAT Special Invoices on Behalf of Others (国家税务总局关于开展互联网物流平台企业代开增值税专用发票试点工作的通知, *Guojia shuiwu zongju guanyu kaizhan hulian wang wuliu pingtai qiye daikai zengzhi shui zhuan yong fapiao shidian gongzuo de tongzhi*)

Notice on the Release of China's Top 50 Logistics Enterprises and Top 50 Private Logistics Enterprises in 2024 (关于发布 2024 年度中国物流企业 50 强、民营物流企业 50 强通告, *Guanyu fabu 2024 niandu zhongguo wuliu qiye 50 qiang, minying wuliu qiye 50 qiang tonggao*)

Opinions on Promoting Reform Pilots to Accelerate Innovation in Non-Vehicle Transport Logistics Development (关于推进改革试点加快无车承运物流发展创新的意见, *Guanyu tuijin gaige shidian jiakuai wuche chengyun wuliu fazhan chuangxin de yijian*)

Panzhuhua Iron and Steel (Group) Company (攀枝花钢铁厂, *Panzhuhua gangtie chang*)

PDD (拼多多, *Pinduoduo*)

Personal relationship (关系, *guanxi*)

Power delegation and profit sharing (放权让利, *fang quan rang li*)

Reduce staff to increase efficiency (减员增效, *jian yuan zeng xiao*)

Reform and Opening-up (改革开放, *Gai ge kai fang*)

Releasing the small (放小, *fang xiao*)

Road Freight Transport and Station Management Regulations (道路货物运输及站场管理条例, *Daolu huowu yunshu ji zhanchang guanli tiaoli*)

Road Transport Regulations (道路运输条例, *Daolu yunshu tiaoli*)

Several Measures for the Promotion and Application of New Energy Medium and Heavy Commercial Vehicles in Sichuan Province (2024-2027) (四川省新能源中重型商用车推广应用若干办法(2024-2027年), *Sichuan sheng xin nengyuan zhong zhongxing shangyong che tuiguang yingyong banfa ruogan (2024-2027 nian)*)

Sichuan Province Carbon Peak Implementation Plan (四川省碳达峰实施方案, *Sichuan tan dafeng shishi fangan*)

Sichuan Province Third-Party Logistics System Construction Planning (2009-2012) (四川省第三方物流体系建设规划 2009-2012, *Sichuan sheng di sanfang wuliu tixi jianshe gui Hua 2009-2012*)

Sichuan Province Western Logistics Centre Construction Planning 2012 Implementation Plan (四川省西部物流中心建设规划 2012 年实施计划, *Sichuan sheng xibu wuliu zhongxin jianshe gui Hua 2012nian shishi jihua*)

Sichuan Shudao Logistics Group Co., Ltd. (四川蜀道物流集团有限公司, *Sichuan Shudao wuliu jituan youxian gongsi*)

Small and comprehensive (小而全, *xiao er quan*)

Truck Home (卡车之家, *Kache Zhijia*)

Tuc Media (运联, *Yunlian*)

2023 Report on the Employment Status of Truck Drivers (2023 年货车司机就业状况报告, *2023 nian huoche siji jiuye zhuangkuang baogao*)

2023 Survey Report on the Employment Status of Truck Drivers (2023 年货车司机从业状况调查报告, *2023 huoceh siji congye baogao*)

Up to the Mountains and Down to the Countryside (上山下乡, *Shangshan xiexiang*)

VAT Comprehensive Reform Pilot Policy Training Reference Materials ("营改增"专题业务培训参考材料, *"Ying gai zeng"zhuanti yewu peixun cankao cailiao*)

Work Injury Insurance Regulations (工伤保险条例, *Gongshang baoxian tiaoli*)

Work unit (单位, *danwei*)

Yunmanman (运满满)

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Chapter 1: Introduction

As the crucial link connecting production and consumption, logistics industry has consistently served as one of the core pillar industries in economic development. The fundamental value of logistics lies in coordinating the flow of materials through time and space, enabling physical entities to undergo spatial transfer through temporal progression. Whether from raw material production to factory processing, physical movement of components, delivery of finished products to consumers, or even recycling and reuse of waste materials, logistics permeates every aspect of daily life.

Over the past three decades, China's logistics industry has undergone tremendous transformation. During the planned economy period of the 1990s and earlier, under the "self-sufficiency" model. Substantial logistics activities were undertaken by storage and transportation enterprises within commercial, food, and transportation sectors. During this stage, China's logistics industry remained in an internalised logistics state. Logistics activities were primarily undertaken by production and manufacturing industries themselves, being viewed as one of the supporting functions for enterprise production and operations, which received limited attention from business strategies, government policies and academic research.

In the late 1990s and early 21st century, as China's economy underwent market-oriented institutional reforms, enterprises introduced a more refined division of labour. Accompanied by the privatisation process of state-owned enterprises (SOE), rapid macroeconomic growth, and related policy influences, third-party logistics (3PL) concepts began to emerge, and the rapid infrastructure development led to high-speed logistics industry growth, accelerating the industry's development and outsourcing processes. For example, China's State Council launched the Logistics Industry Adjustment and Revitalisation Plan in March 2009, where the logistics industry was the only service sector among the 10 industrial revitalisation and national investment plans. More broadly, since the mid-2000s, extensive legislation has made national logistics integration as one of the key strategic priorities (Liu et al., 2011). However, even by the early 2000s, global logistics outsourcing rates were only approximately 5% (Ojala et al., 2008), with China's logistics outsourcing rate around 2% circa 2005.

With the rapid development of logistics outsourcing processes, by the late first decade of the 21st century, China's logistics outsourcing market expanded rapidly at approximately 30% annual growth (Rushton, 2007). Subsequently, the past fifteen years' rapid development of information technology has introduced digital freight platforms, causing a new "logistics revolution." China's logistics industry has gradually transformed from the original internalised logistics model to the current multi-tiered outsourcing model. According to official data released by the China Federation of Logistics and Purchasing, the proportion of logistics outsourcing among China's key industrial enterprises exceeds 65%, with logistics enterprise supply chain order services continuing to rise at over 10% annual growth (China Federation of Logistics and Purchasing, 2025). Moreover, as a core pillar industry of economic operation, the latest data shows that China now has over 1.14 million logistics-related enterprises, including over 3,000 digital freight platform companies, together with approximately 17 million lorry drivers and over 11 million logistics operational vehicles in the logistics industry (Ministry of Transport of the People's Republic of China, 2023).

However, when reviewing economic geography and broader human geography research on the logistics industry, the issues regarding how the logistics industry evolves seem inadequately addressed. Scholars tend to view the emergence of independent logistics enterprises and the outsourcing structure of the logistics industry as a default, pre-existing perspective, conducting further research based on this assumption. From internalised logistics structures to the emergence of independent logistics companies, and subsequently to the appearance of digital freight platforms, it seems to be less research providing systematic study of this complete trajectory of logistics development.

As logistics industry economic activities have to depend on specific industries, majority of early logistics research did not view the logistics industry as an independent sector. More often, it was treated as a default existing industry or as an auxiliary factor for related industry research (Hall et al., 2006), i.e. it was taken for granted and constitutes a "missing link" (Coe, 2017) or "forgotten space" (Sekula et al., 2010). As Aoyama et al. (2006) describe, "logistics functions have often been viewed as tangential, auxiliary support services to production processes, providing rather simple and labour-intensive transportation and warehousing

services" (p. 331). This perspective is correct to some extent, as the logistics industry is a service sector that is "dependent" on production enterprises. Based on the specific industry that it serves; logistics is internally divided into multiple categories with varying commercial logics.

Reviewing early scholarly research on the logistics industry, the majority of these focused not on the logistics industry itself, but on how the logistics industry could better support the development of a specific industry. For example, research focused on fresh food industries (e.g., Vagneron et al., 2011; Vagneron et al., 2009), garment trade industries (e.g., Danskin et al., 2005; Schrank, 2004), and mobile communication manufacturing industries (e.g., Leinbach and Bowen, 2004) and so forth, with those products as the core analytical concern.

Undeniably, due to the characteristic of the "dependent" for logistics industry and the vast differences between logistics types, different types of logistics industries require separate examinations. This research approach focuses on the main industries per se, examining how related industries' supply chains are enhanced through the lens of the logistics industry. Similarly, logistics industry can also be served as the main research subject for in-depth exploration in analysis. Based on the development of supply chain and global production networks (GPNs) and the rise of outsourcing trends, scholars gradually recognised the importance of logistics research (Cowen, 2010), and the growing role of independent logistics in the global economy has received heightened attention (Coe, 2017). For the past 15 years, logistics has emerged as a main topic of considerable interest to numerous human geographers and related researchers (Coe, 2020). Numerous researchers have provided detailed descriptions of independent logistics industry's impact on economic development, such as Coe (2017; 2021), Hesse (2004; 2020), Aoyama et al. (2006), Sheffi (2012), and Danyluk (2018), amongst others. This generated substantive research on the logistics industry itself, including logistics and economics, regional development, labour relations, and political expansion and so forth.

Furthermore, rapid internet development has accelerated information flow within physical space and broken information barriers. This successful combination of physical material flow

with information flow in virtual space has promoted the emergence and development of digital freight platforms, causing a new "revolution" in the logistics industry. Some scholars discussed the impacts of the platform economy within the logistics industry. In geography, contributions are particularly prominent regarding research on how digital freight platforms affect labour practices (e.g., Helwing et al., 2023; Hill, 2020). This phenomenon has further drawn scholars' attention to the logistics industry.

Nevertheless, whilst these studies have conducted in-depth analyses of the logistics industry from various perspectives and scholars have successfully captured the changing trend from "non-independent" to "independent" logistics outsourcing business models. Numerous scholars view this tendency of logistics industry expansion as driven by the rapid expansion of manufacturing and other industries with logistics demands. They did not consider it from the perspective of logistics industry itself regarding how these changes emerged. For example, as Bonacich and Wilson (2008) state, the "logistics revolution" was ultimately driven by neoliberalism and regulatory backgrounds that allowed significant accumulation of retailer power. They consider that the development of logistics outsourcing seems to be driven by industry outsourcing in the wider economic environment.

These descriptions seem to be too deterministic. For example, regarding the development research of the manufacturing industry, in which the macroeconomic development can be viewed as an important factor in industrial evolution. However, the influence of industries' internal factors on industrial development cannot be ignored. Undeniably, supply chain outsourcing from manufacturing enterprises is one of the main factors which drives logistics outsourcing. When logistics industry per se is regarded as the main research subject, this factor cannot serve as its sole core influencing factor. This assertion ignores logistics industry participants' behaviours and their institutional background's impacts to some degree. Although the emergence of independent logistics enterprises brought the logistics industry—a sector with research value—into economic geography research perspectives (See Coe, 2020), how this transformation from "non-independent" to "independent" logistics structures unfolds remains an important yet underexplored issue.

In summary, there are two points that merit attention in the former discussion. First, China's logistics industry has transformed from the internalised logistics under the planned economy system to the current multi-tiered outsourcing structure due to various influences including economic market-oriented transformation, rapid 3PL development, and the emergence of digital freight platforms. This empirical shift provides a valuable research case for academic study. Second, whilst the importance of the logistics industry in academic research has gradually risen, as well as scholars have recognised this transformation of the logistics industry, exploration of logistics industry evolutionary processes remains insufficiently studied. Therefore, based on the above observations, I propose this thesis's research objective: ***How do logistics networks evolve from internalised structures to multi-tiered outsourcing arrangements?***

The logistics industry itself possesses strong localisation attributes. As Aoyama et al. (2006) describe, "this is because transportation is primarily a local industry that requires rich, geographically specific knowledge, even if the industry deals with international and widely geographically dispersed transactions" (p. 337). Consequently, the analysis of the logistics industry should be embedded in specific spatial configurations and geographical contexts, taking into account localized cultural and institutional backgrounds to achieve a comprehensive understanding of the industry. This emphasis on unique institutional backgrounds is equally one of the main research factors emphasised in economic geography research. As a key inland logistics hub within China's national logistics system, the Sichuan–Chongqing region is positioned at the intersection of three major trade corridors: the Belt and Road Initiative, the New International Land-Sea Trade Corridor, and the Yangtze River Economic Belt. Owing to its strategic importance within China's logistics network, this study selects the Sichuan–Chongqing region as the case study area. Furthermore, as previously described, logistics itself is an industry with particularly clear professional divisions. For example, from transportation mode divisions, it can be categorised into land transport, air transport, water transport, and railway transport, amongst others. From transportation type divisions, it can be categorised into express delivery, bulk cargo transport, hazardous material transport, cold chain transport, fresh transport and so on. To avoid ambiguity, in this thesis, the logistics I study primarily refers to steel land transport logistics. Against this background, the steel industry in the Sichuan–Chongqing region constitutes an appropriate empirical focus. This choice reflects not only the industry's economic significance within the region,

but also the close alignment between its industrial evolution and the evolutionary perspective adopted in this study. To avoid ambiguity, thus, in this thesis, the logistics I study primarily refer to steel land transport logistics.

To address the research gaps, this study develops a synthesised theoretical framework combining Global Production Networks (GPN), Evolutionary Economic Geography (EEG), and institutional approaches. The necessity of this integration lies in several factors. First, the EEG is highly consistent with the evolutionary focus of this study, particularly through its emphasis on evolutionary dynamics and path dependence, which effectively capture the dynamic processes of industrial evolution. However empirical analysis reveals that this perspective alone provides limited insight into the power dynamics and embedded relationships among participating actors. In this regard, core concepts from the GPN literature, notably embeddedness and power relations, offer important analytical complements by enabling a more nuanced examination of actor interdependencies and asymmetrical power structures between actors. However, although EEG and GPN emphasise institutional importance to varying degrees, they do not treat institutions as one of their core analytical concepts. Therefore, this study introduces the institutional approach as the third theoretical pillar, particularly focusing on the complexity of multiple institutional logics coexisting in regional economies. In addition, it also emphasises the investigation of the individual participants. This triple integration can simultaneously capture the interactions between network relationships (GPN), evolutionary dynamics (EEG), and institutional environments (institutional approaches), providing a systematic analytical framework for understanding logistics network evolution. Based on this research objective, this study is mobilised through three interrelated research questions:

The first question focuses on evolutionary origins: ***How do various forms of embeddedness influence the formation and development of logistics networks?*** This question emphasises understanding the macro-evolutionary trajectory of logistics networks' transformation from internalisation to outsourcing, revealing the driving mechanisms of this structural transformation through embeddedness analysis.

The second question delves into key participants: *How do intermediaries shape the power structure and spatial configuration of logistics networks?* Building on understanding overall evolutionary trajectories, this question focuses on specific participants, which emphasises how various intermediaries emerge and are reshaped during institutional change, in return shaping the institutional background.

The third question turns to governance dynamics: *How do top-down institutional logics and bottom-up actor strategies interact to form network dynamics?* This question explores the operational mechanisms of multi-tiered outsourcing structures, revealing how formal and informal institutions interact to maintain network stability.

To address those research questions, this thesis employs research methods adapted to the Chinese cultural context. My local background advantages provide distinctive advantages for obtaining authentic and reliable primary data. It refers to the ability to conduct in-depth interviews using the Sichuan-Chongqing dialect, extensive social networks, and a deep understanding of local institutional culture background. In terms of methods, this study combines semi-structured interviews (59 sessions), participant observation (one-month internship at a major Steel Plant), and secondary data analysis. Particularly during interviews, a series of communication strategies was employed for different types of participants (from steel plant executives to lorry drivers), both adhering to ethical standards and adapting to Chinese cultural contexts. This flexibility enables the research to in-depth examination of informal practices behind formal institutions, capturing "insider perspectives" of the participant practices. Through cross-verification and triangulation of multiple data sources, this study ensures data authenticity and analytical objectivity, providing a solid empirical foundation for understanding industrial network evolution in China's economic context.

This thesis aims to contribute at three levels. First, through the case study of steel logistics networks, it seeks to illuminate the broader mechanism of transformation in China's logistics industry from internalised structures to multi-tiered outsourcing arrangements. Second, it addresses the research gap in economic geography regarding logistics industry evolutionary

pathways, an area that has received limited systematic attention despite the sector's economic importance. Third, it develops a more nuanced analytical framework for studying industrial evolution that integrates network, evolutionary, and institutional perspectives, providing methodological tools for future research on industrial transformation processes.

1.1 Thesis Structure

This thesis is structured as follows. After this introductory chapter, Chapter 2 presents the literature review. This chapter first reviews EEG and GPN. Through literature study, it emerges that the existing combination of EEG and GPN frameworks tends to be insufficient to satisfy this thesis's requirements for logistics industry evolution research. The fundamental reason lies in frameworks established for such sub-national regional network evolution research being insufficiently detailed, overlooking multi-dimensional participants in regional economies and the importance of institutional backgrounds. Accordingly, situating within the EEG paradigm and employing the GPN framework, this thesis introduces institutional approaches to address the research issues. This synthesised theoretical framework provides a systematic understanding of the sub-national regional industrial network evolution studied herein.

Building upon the three core research questions proposed in the literature review, Chapter 3 discusses research method design and case selection. This chapter first explains the reasons for case study selection. Second, to address the research questions proposed in this thesis, I collected research data using semi-structured interviews, participant observation, and secondary data analysis methods. Regarding research method design, it emphasises on how to conduct effective data collection by combining existing analytical method theories within China's cultural background environment. Detailed descriptions of my data collection stages are provided according to different research phases. Furthermore, this chapter includes how I conducted multiple cross-verifications among these three different data sources to ensure data authenticity, as well as issues of ethics, data collection, processing, and reflexivity.

Empirical research is presented through Chapters 4, 5, and 6. These three chapters form a progressive argumentation structure: from overall evolutionary trajectories (embeddedness

analysis) to specific participant mechanisms (intermediary analysis), returning to overall governance dynamics (network analysis), ultimately constructing a complete analytical framework for understanding industrial network evolutionary pathway.

Chapter 4 traces the overall evolutionary trajectory of steel logistics networks through case analysis of a large steel plant's (T Steel Plant) logistics department in the Sichuan-Chongqing region, addressing the first research question. This chapter begins with the over-embeddedness model presented by steel plants and their logistics departments under China's planned economy *Dawei* (单位, work unit) system, then analyses how this steel plant logistics sector transformed from the over-embeddedness model's internalised logistics structure through five stages to form existing multi-tiered outsourcing logistics structures. This process reveals the participant pyramid structure in steel logistics networks. During analysis, since original embeddedness analytical frameworks appeared insufficient to explain the entire transformation process, I disaggregated embeddedness into individual embeddedness and organisational embeddedness. Through this more detailed approach, it enhances the explanatory power of embeddedness theoretical frameworks. This detailed perspective provides rich insights into the interrelationships between territorial, societal, and network embeddedness, and how they influence industrial transformation. Additionally, it shows how various forms of embeddedness change alongside industrial evolution during this process.

Building upon the previous chapter's research on steel logistics network evolution pathways, Chapter 5 treats key participants in steel logistics networks as intermediaries, which link the entire logistics network. This chapter first introduces "traditional" intermediaries in steel logistics networks. Distinguished from independent 3PL companies in numerous studies, this chapter also identifies steel logistics subsidiaries and various-scale fleets as key participants in the industry. Research finds that these "traditional" intermediaries emerge from original organisational internal functional differentiation being recombined into institutional entities assuming different specific roles. This forms unique risk allocation and capacity management mechanisms in China steel logistics networks. Furthermore, this chapter studies digital freight platforms as an emerging intermediary, which gradually transformed from original informal modes to digital freight platform modes under formal institutional frameworks due to national-level strategic needs. Subsequently, it demonstrates how participants' actions

reciprocally reshape the institutional framework following the emergence of digital freight platforms. Through studying participants in logistics networks and their institutional backgrounds, this chapter demonstrates how participants mutually influence institutions and co-evolve during regional evolution processes, thereby addressing this thesis's second research question.

Building upon the previous two chapters' research on overall logistics network evolution pathways and participants analysis. Chapter 6 addresses the third research question by analysing overall steel logistics network dynamics, which emphasises how such massive outsourcing structures operate. Distinguished from singular top-down or bottom-up research perspectives, this thesis adopts dual-directional research strategies, analysing factors shaping logistics network dynamics from both perspectives. Research finds that besides formal regulations and transaction-based commercial factors, another major factor supporting logistics network operation is China's unique *guanxi* (关系, personal relationship) institution. This chapter resolves the ambiguous relationship between formal and informal institutions in existing research, revealing how unique "*guanxi*-based" mechanisms in Chinese logistics networks combine with formal transaction-based institution. This hybrid model of formal and informal institutions forms unique operational mechanisms in Chinese logistics networks. The empirical analysis shows that the top-down "Strategic Payment Postponement" and bottom-up "Deliberate Profit Sacrifice" mechanisms are keys of supporting overall logistics network operation and broader Chinese business operations.

The conclusion is presented in Chapter 7. This chapter first reconstructs the complete evolutionary pathway of China's steel logistics networks by connecting insights from the three analytical chapters. Second, it focuses on the synthesised research framework established in Chapter 2, critically evaluating its broader applicability beyond the specific case of China's steel logistics. Particular attention is given to three methodological innovations: incorporating individual participants through role-based analysis; adopting dual-directional analytical perspectives that capture both top-down institutional influences and bottom-up actor strategies; and systematically examining formal-informal institutional interactions that shape regional development trajectories. The third section presents two core theoretical contributions emerging from the empirical analysis: refining embeddedness theory

and conceptualisation of *guanxi* within contemporary Chinese commercial contexts. Furthermore, the conclusion also presents reflections on this study's limitations and directions for future research.

Having established the research puzzle and identified gaps in existing literature, the following chapter develops the theoretical framework necessary to address these complexities. The next chapter examines how existing economic geography approaches require integration with institutional methods to capture the dynamics of logistics network evolution.

Chapter 2 Literature Review

Within economic geography, Evolutionary Economic Geography (EEG) and Global Production Networks (GPN) have emerged as influential approaches for analysing industrial development and regional economic dynamics. In recent years, academic research has witnessed new scholarly efforts to integrate them, seeking to provide a more comprehensive understanding of regional economic development (e.g., Mackinnon, 2012; Rodríguez-Pose, 2021; Yeung, 2024). GPN emphasises leading firm-level influences, whereby multinational corporations are conceptualised as key actors (Coe and Yeung, 2015). EEG prioritises wider institutions and historical contexts, wherein individual regional actors are regarded as fundamental drivers of regional evolution (Boschma and Frenken, 2018). As Poon (2024) notes, both of them possess robust analytical capabilities that constitute essential components for explaining regional development. The divergent analytical entry points between them provide substantial scope for theoretical integration.

However, through a systematic literature review, this study identifies that relying solely on the combination of GPN and EEG is insufficient to provide adequately nuanced insights into regional industrial economic development. Both EEG and GPN overlook detailed examination of institutional frameworks within regions and the roles that individual actors assume in regional economies. These limitations may result in neglect of multi-dimensional interactions amongst actors within regions during analytical processes, as well as the crucial role of informality within regional contexts. They may diminish the explanatory power of integrated frameworks regarding industrial evolution within regions. Therefore, building upon the synthesis of EEG and GPN literature, this study introduces institutional approach into the integrated theoretical framework, addressing the limitations to construct a systemically analytical framework for industrial evolutionary trajectories. In doing so, this study develops an integrated research approach specifically tailored to address the analytical objectives of this investigation.

To address the research objective: *How do logistics networks evolve from internalized structures to multi-tiered outsourcing arrangements?* This theoretical framework divided it into three interconnected research questions:

1. How do various forms of embeddedness influence the formation and development of logistics networks?
2. How do intermediaries (such as logistics companies, transportation fleets, and digital logistics platforms) shape the power structure and spatial configuration of logistics networks?
3. In the evolution of logistics networks, how do top-down institutional logics and bottom-up actor strategies interact to form network dynamics?

The remainder of this chapter is structured as follows. Sections 2.1 and 2.2 first examine EEG and GPN literature, highlighting their complementary strengths and persistent limitations. Section 2.3 reviews existing integration attempts, identifying gaps in the GPN-EEG research framework. To address these gaps, Section 2.4 introduces institutional approaches as a complementary framework. Section 2.5 presents the resulting synthesised framework through three analytical perspectives, before Section 2.6 summarises the theoretical arguments.

2.1 Evolutionary Economic Geography

EEG provides a dynamic, historically sensitive analytical perspective for understanding regional economic development. It emphasises the evolutionary nature of regional economic systems, focuses on how core concepts such as path dependence, lock-in, variation, selection, retention and so forth shape regional development trajectories. This approach abandons the static equilibrium assumptions of traditional economic geography, instead examining the generation of novelty, the development cycles of industries and firms, and the evolutionary processes of entire regional economic systems (Boschma and Martin, 2010).

In research applications, EEG values geographical differences by assuming that economic behaviour is contextual rather than driven by maximising calculations. Furthermore, it prioritises the micro-foundations of the economy, emphasising the importance of

organisational routines (Hassink et al., 2019). EEG particularly values how historical trajectories influence future developmental possibilities and how regions form unique competitive advantages and specialisation patterns through self-reinforcing processes. By introducing evolutionary thinking into economic geographical analysis, EEG provides powerful theoretical tools for understanding the adaptability, resilience, and transformation of regional economies (Martin and Sunley, 2006). For a comprehensive understanding of EEG, reference may be made to Boschma and Martin (2010), Martin and Sunley (2006), and Boschma and Frenken (2006).

2.1.1 Path Dependence

EEG literatures are characterised by a plurality of analytical emphases rather than convergence around a single core theoretical concept. For example, Coe (2011), in an overview of the field, identifies three main concepts of EEG: research on path dependence and lock-in across different geographical contexts; studies examining clustering, local learning, and related variety; and analysis of spatial industrial evolution in economic landscapes. Other scholars develop more specific analytical concepts within particular empirical and methodological contexts. For example, Frenken et al. (2007) introduce the concepts of related and unrelated variety to explain regional economic development. "Related variety" encompasses intra-sectoral knowledge spillovers between firms, whilst "unrelated variety" captures knowledge flow combinations across different sectors (Yeung, 2021). Alongside these strands, EEG scholarship also places strong emphasis on path dependence (Martin, 2010) and on explicitly dynamic analytical perspectives (Boschma & Martin, 2010; Kogler, 2015).

Given this concepts' diversity of EEG paradigm, this study adopts a pragmatic approach, selecting the path dependence concept which is most pertinent to the research objectives, for detailed examination rather than asserting hierarchical importance amongst EEG's various theoretical contributions.

Path dependence provides a lens through which to examine how historical trajectories influence current and future developmental possibilities, as well as the uneven spatial

development and transformation of economic landscapes (Martin and Sunley, 2006). This concept proves crucial for understanding why regions develop certain economic characteristics over time. Martin and Sunley (2006) define path dependence as:

"[...] intended to capture the way in which small, historically contingent events can set off self-reinforcing mechanisms and processes that lock in particular structures and pathways of development. Which structures and paths become locked in depends on the particular sequence of events that unfold" (p. 5-6).

Path dependence suggests that regional economies develop over time, with past decisions and events influencing current and future economic structures. Moreover, a region's economic trajectory is largely shaped by its historical development path and accumulated capabilities, such as technological know-how, skilled labour, and established industrial structures (Martin and Sunley, 2006). Existing regional assets and capabilities evolve through the complex interactions of path-dependent processes and new path creation, shaping possibilities for future development (Boschma and Martin, 2010). This self-reinforcing nature may lead to regional lock-in, where historical choices limit future options, but it can also create opportunities for path creation and regional resilience (Hassink, 2010).

Utilising this concept, the EEG approach successfully explains the uneven geographical distribution of economic activities and regional technological development trajectories in terms of past accumulated capabilities, as well as how existing regional knowledge bases both constrain and promote the development of new technologies and development paths (Boschma et al., 2017). For example, Wei et al. (2017) employed this concept to explain the evolution of urban land expansion in Chinese cities under different regional policies, demonstrating how decades of unbalanced development policies created different development paths across regions. Similarly, Notteboom and Rodrigue (2005) utilised it to analyse the spatial configuration of logistics networks, focusing on the crucial role of infrastructure investment. They demonstrated how early decisions in port and transport infrastructure development created self-reinforcing mechanisms that shaped the long-term evolution of logistics corridors and hubs. These studies illustrate how path dependence provides a powerful explanatory framework for understanding the long-term trajectories of regional economies, highlighting the critical role of historical conditions and early

development in shaping the persistent economic structures and opportunities within the regional industries.

2.1.2 Limitations of EEG

EEG provides unique insights into regional economic development from dynamic and institution-focused perspectives. As an important paradigm within this study's synthesised framework, it largely addresses criticisms of time-specific analysis in GPN frameworks through dynamic examination of path dependence concepts. However, EEG continues to face criticism for its limited multi-dimensional actor consideration.

EEG seems to rarely focus on the roles of actors other than firms in new path development, such as universities and research institutions, policy actors, and the state (e.g., Hassink et al., 2019). This tendency to downplay multi-scalar relationships limits its ability to explain interactions across different geographical scales (MacKinnon et al., 2009). This approach may limit the explanatory power of path dependence by oversimplifying the complex dynamics of regional economic evolution, particularly in rapidly changing environments such as emerging economies (Martin and Sunley, 2006). One of the fundamental reasons for this phenomenon appears to be that EEG's privileging of firms as initiators of economic change neglects the importance of other actors (such as the state, labour, and civil society groups) and leads to overlooking firms' positioning within broader networks, processes, and structures, thereby reducing the influence of other spatial scales, such as embeddedness in global production networks (MacKinnon et al., 2009, p. 139).

Some scholars are attempting to incorporate more non-corporate actors into EEG to enrich the explanatory power. For example, focusing on actors other than companies and entrepreneurs (MacKinnon et al., 2019), assets other than technical knowledge and skills (Carvalho & Vale, 2018), and Isaksen et al. (2018) demonstrate how individual entrepreneurs' behaviour is constrained and driven by regional institutional frameworks. Nevertheless, these studies remain characterised by a firm-centric research model to some extent. Their focus is primarily on how incorporating these perspectives can better explain firm behaviour or overall regional economic operations, rather than truly placing attention on individual actors

and understanding how individual actors' behaviour and motivations change in response to institutional environment evolution during evolutionary processes.

This pattern is evident in the majority of explanations in EEG research; these descriptions centre on organisations (including corporate and non-corporate institutions) rather than exploring the economic behavioural evolution paths of individual actors within regions. As Hassink et al. (2019) note, the impact of high-skilled talent outflow on path development has hardly been investigated and remains little known. This discussion demonstrates certain risks of firm-centrism, with excessive focus on corporate and government-level changes potentially overlooking the impact of individual actor levels, such as labour issues (Boschma, 2025). For example, at the regional logistics level involved in this research, there are numerous individual actors, such as lorry drivers, and research on how the economic activity trajectories of such bottom-tier workers are affected by overall evolutionary paths remains a research gap.

As Yeung (2021) describes, whilst acknowledging the progress made by EEG, he suggests that this approach could benefit from more comprehensive integration of non-corporate actors, particularly in understanding their roles in shaping regional economies. This multi-scalar lens could enable researchers to study how institutions at different levels interact and influence economic outcomes. They emphasise the need for a multi-scale approach that appropriately emphasises how regional development trajectories are shaped by interactions of organisations and institutions at different geographical levels: local/regional, national, and global (Zukauskaite et al., 2017).

2.2 Global Production Networks

GPN research has emerged as one of the most significant theoretical frameworks in economic geography in recent decades, providing a vital analytical framework for understanding the complexity and interconnectedness of the global economy in the post-Fordist era. This approach represents a relational turn in economic geography (Bathelt and Glückler, 2017; Jones, 2014), emphasising actor networks and interdependencies, power dynamics, social agency, the socio-cultural embeddedness of actors within multiple networks, and the multi-

scalar interrelationships of individual actors. GPN framework abandons the linear vertical supply chain framework of value chain analysis, instead proposing a broader network concept that encompasses both corporate and non-corporate actors organised around lead firms (typically multinational enterprises), with primary focus on the strategic coupling processes between local actors and regional assets (Dicken et al., 2001).

By emphasising the importance of institutional frameworks and multi-scalar processes, GPN theory provides a more comprehensive analytical framework for examining regional economic development than traditional approaches (Bathelt and Glückler, 2011). For more detailed examination of GPN framework, readers may refer to Henderson et al. (2002), Coe and Yeung (2015), and Yeung (2021).

The adoption of the GPN framework in this research is not primarily because of its global scope, but because of its strong emphasis on relationality, particularly the concepts of embeddedness and power. Embeddedness enables an analysis of industrial evolution by capturing the complex entanglements among actors, as well as between actors and places. Moreover, *guanxi* (关系), a key relational practice rooted in the Chinese sociocultural context and commonly translated as particularistic ties or personal networks (Gold et al., 2002), can be productively understood through a relational perspective that foregrounds embeddedness and power. Although the concept of *guanxi* is not explicitly used in GPN research, in this sense, *guanxi* constitutes an important relational mechanism through which power is generated, exercised, and negotiated among actors. A detailed discussion of *guanxi* is provided in Section 2.4.4. Accordingly, the GPN framework offers a particularly suitable analytical lens for examining industry evolution in the Chinese context from a relational perspective.

2.2.1 Power and Embeddedness

Under this network-based analytical approach, Henderson et al. (2002) introduced a comprehensive framework built upon three interdependent fundamental concepts: value, power, and embeddedness. These concepts, further developed by scholars such as Coe and Yeung (2015), form the analytical pillars of GPN research, providing a multi-dimensional

perspective for examining global economic processes. Nevertheless, this research primarily draws on the GPN concepts of power and embeddedness, which constitute the main analytical focus.

Power

Power is defined as "the capacity of an actor to exercise and achieve control over a particular strategic outcome in its own interests that can be realised only through the process of exercising" (Coe & Yeung, 2015, p. 66). Contrary to traditional linear conceptions, power within GPNs is often relative and subject to change (Allen, 2011). It is exercised not only by lead firms but also by suppliers, intermediaries, and even non-corporate actors such as state institutions or labour organisations (Coe et al., 2008). Examining the interconnected power relationships among different participants within GPNs enables a deeper understanding of power dynamics in production networks across the production, distribution, and consumption of specific goods, commodities, or services. Power within GPNs can manifest in various forms, such as the capacity to set standards, control key technologies, or influence market access (Gibbon and Ponte, 2005). Through this multi-dimensional, multi-scalar, networked approach, GPN emphasises the interconnections and tensions between firms and extra-firm network participants (including territorial institutions), and how these participants engage in value creation, enhancement, and capture processes, and how these processes are organised both organisationally and territorially (Dicken, 2015). Furthermore, as Levy (2008) points out, power relations in GPNs are not merely economic but profoundly political, involving contestation and negotiation among various actors.

One primary manifestation of power is bargaining power between participants. Within GPNs, this concept can be understood as the capacity of actors in production networks to exercise and achieve control over desired strategic outcomes through dynamic, contingent, multi-scalar, multi-factor relational interactions (see Coe et al., 2008; Bridge, 2008). In bargaining processes, network participants utilise their resources (including power and their own value) to achieve their objectives under multiple constraints (Arias-Loyola, 2024). Bargaining outcomes often determine who can create and capture value within networks (Gereffi et al., 2005).

Embeddedness

Embeddedness is crucial for understanding the structure and dynamics of complex industrial development. GPNs are viewed as dynamic practice topologies connecting different places and territories (see Amin, 2002). This perspective inherently considers the multi-scalar nature of embeddedness and its development over time, creating an "archipelago economy" composed of many places and regions (see Jessop, 2001). These dispersed archipelagos are spatially linked through the relationships of embedded actors and change shape and scope over time.

This concept proves crucial for understanding how GPNs are grounded in specific geographical, social, and institutional contexts, and how these contexts influence network operations and outcomes (Henderson et al., 2002). Moreover, embeddedness is a dynamic process that evolves as networks develop and adapt to changing environments (Coe et al., 2008). Embeddedness involves how firms are "anchored" in specific places and how this affects their behaviour and relationships (Dicken and Malmberg, 2001). As Coe et al. (2017) argue, the embeddedness of economic actors in locally specific institutional arrangements and regulatory structures significantly influences the developmental outcomes of regions integrated into GPNs.

The concept of embeddedness was originally introduced by Karl Polanyi in the 1940s, he argues that, under modern market economies, "instead of economy being embedded in social relations, social relations are embedded in the economic system" (Polanyi, 1944, p. 57). Building upon this foundational insight, Mark Granovetter (1985) reconceptualised embeddedness at the micro level by focusing on how individual and organisational economic actions are embedded within concrete social networks. He further differentiated between strong ties and weak ties, where strong ties are associated with frequent interaction, trust, and relational stability, whilst weak ties facilitate access to novel information and opportunities across social groups. Subsequently, Uzzi (1996, 1997) advanced the concept by conceptualising embeddedness as a logic of exchange shaped not only by local institutions and macro-structural conditions but also by the social relations among community members and

individual actors who constitute organisations. Drawing on Burt's (1992) discussion of how social structure generates imperfect competition, Uzzi (1997) further introduced the notion of over-embeddedness, which he defined as situations "when all firms in a network are connected through embedded ties" (p. 232). Under such conditions, excessive relational closure may stifle effective economic action, causing "the network becomes ossified and out of step with the demands of its environment, ultimately leading to decline" (Uzzi, 1997, p. 232).

More recently, Hess (2004), drawing on the rhizome metaphor from actor–network theory (see Deleuze and Guattari, 1988), reconceptualised embeddedness as a dynamic, multi-dimensional process akin to a plant's root system, from which he derived the three interrelated forms of societal, network, and territorial embeddedness. Societal embeddedness refers to how actors' social and cultural backgrounds influence their behaviour and decision-making processes within logistics networks. This dimension proves particularly important for understanding how cultural norms and social expectations shape business practices across different regional contexts. Network embeddedness focuses on the structure of relationships between participants in GPNs. This aspect proves crucial for understanding information flows, trust building, and collaboration formation in logistics operations. As Yeung (1998) points out, network embeddedness can be viewed as the product of trust-building processes between network agents, which is essential for successful and stable relationships. Even within intra-firm networks, where relationships are constituted by ownership integration and control, trust between different company units and different stakeholders may be a key factor, such as in joint ventures. Territorial embeddedness involves how participants are "anchored" in specific locations, a concept particularly relevant to logistics networks due to their inherent spatial nature. For GPNs themselves, the global nature of economic development is by no means de-territorialised (Hess, 2004); for example, territorial embeddedness occurs when foreign actors establish considerable connections with actors within their respective host countries.

These three forms of embeddedness are closely interconnected and often have blurred boundaries. As Hess (2004) argues, social and cultural contexts (societal embeddedness) shape how economic actors behave and interact within networks (network embeddedness) and territories (territorial embeddedness). For instance, Sheffi's (2012) analysis of logistics

clusters demonstrates how geographical proximity (territorial embeddedness) and inter-firm relationships (network embeddedness) jointly shape regional logistics capabilities, embodying the multi-dimensional approach to embeddedness. Similarly, Coe and Yeung (2015) provide a theoretical framework illustrating how local factors interact with global networks to form logistics systems, emphasising the strategic coupling processes between regional assets and global production networks. As Yeung (2009) emphasises, the multi-dimensionality and dynamism of embeddedness in economic activities encourage researchers to conduct more nuanced analyses of how these factors interact and reinforce each other in shaping logistics networks. This interconnectedness is evident in various studies across different contexts. As demonstrated by these various studies, the complex interactions between these embedded forms emphasise the critical role of considering all three dimensions in shaping logistics networks and regional development, providing more nuanced understanding of how various factors intersect to influence economic landscapes (Grabher, 2006).

Embeddedness emerges as particularly significant for this research. Given the spatial and relational nature of logistics networks, embeddedness provides essential insights into how these networks are simultaneously shaped by and reshape their social, institutional, and territorial contexts. This perspective enables examination of how logistics actors navigate between local institutional frameworks and global economic pressures, creating hybrid arrangements that reflect multiple spatial scales of operation (Dicken and Malmberg, 2001). Importantly, emphasising embeddedness does not diminish the analytical value of power; rather, it offers a foundational lens through which these processes can be understood within their specific geographical and institutional contexts (Yeung, 2009).

2.2.2 Limitations of GPN

One of the most significant limitations of GPN analysis may be its tendency to provide static snapshot views of production networks, often failing to capture their dynamic and evolutionary nature over time (Fuller & Phelps, 2018). As Yeung (2018) acknowledges in his description of GPNs, this static nature stems from:

"[...] many empirical studies [...] have taken for granted the initial origin and formation of GPNs, preferring to investigate their internal dynamics only in the post-establishment stage" (p. 397). (See Boschma, 2022, p.127)

This temporal limitation may lead to incomplete understanding of how global production networks develop, adapt, and transform in response to changing economic, social, and environmental conditions. By focusing on fixed time points, GPN research may overlook critical processes of network evolution, power shifts between participants, and the emergence of new production configurations (MacKinnon, 2012). Moreover, this static approach fails to capture the dynamic nature of power relations within GPNs, which may change significantly over time (MacKinnon, 2012), such as the emergence of new lead firms or changes in governance structures (Horner, 2014), thereby limiting the theory's capacity to explain and predict economic geographical changes (Coe & Yeung, 2015). In the research context of this thesis, such static snapshot studies might identify key institutional changes during China's macroeconomic transformation process in the logistics industry as default elements, whilst overlooking their processes of change alongside industrial development. As Coe & Yeung (2015) point out, the rapidly changing nature of GPNs require analytical frameworks capable of explaining temporal dynamics; ignoring these dynamics may lead to incomplete or outdated understanding of how global production networks operate and evolve (Werner, 2016).

In response to this criticism, recent GPN research has increasingly adopted more dynamic perspectives. For example, Yeung & Coe (2015) proposed the GPN 2.0 framework, emphasising competitive dynamics and risk environments that influence network configurations over time. This approach attempts to capture the fluidity of global production by focusing on key drivers of network change. Strategic coupling research has also partially addressed deficiencies that might arise from such static studies. Scholars attempting to combine EEG frameworks with GPN frameworks are making similar efforts (see Section 2.4). Although fully capturing the evolutionary nature of these networks remains an ongoing challenge for GPN research, these developments represent important steps towards more nuanced understanding of regional economic development through this research approach.

2.3 Conceptual Insights from EEG and GPN Approaches

In the field of economic geography, the past decade has witnessed extensive debate regarding how GPN and EEG literature can engage in promising cross-fertilisation and leverage potential synergies (e.g., Yeung, 2021; Boschma, 2022). Reviewing GPN and EEG-related literature reveals that whilst the evolutionary research paradigm (EEG) and relational turn research framework (GPN) each emphasise different dimensions, they also demonstrate strong complementarity. Whether considering the temporal dimension of research (static/dynamic), the focus of research perspectives (inside-out/outside-in), or the selection of research objects (corporate/non-corporate organisations), these aspects all demonstrate complementary potential. Indeed, the synthesis of these two approaches has become one of the central topics in economic geography over the past decade, with scholars making considerable efforts towards the combination (e.g., De Propris, 2024; Poon, 2024; Rodriguez-Pose, 2021; Yeung, 2024).

As Boschma (2022) evaluates GPNs, there remains limited understanding about how GPNs are formed. This evolutionary thinking is precisely what EEG can provide (see also Dawley et al., 2015; MacKinnon et al., 2019). This exploration of network relationships and the evolution advocated by EEG has become the key bridge for mutual compatibility between these two concepts. Therefore, a relatively broad trend demonstrates that scholars attempt to integrate dynamic evolutionary concepts from EEG into GPN frameworks, seeking to explore the emergence processes of GPNs and the influence of historical factors on their subsequent development from an evolutionary perspective. In this synthesis, GPN can provide sufficient explanatory power for the network relationships constituted by actors in economic activities (Coe, 2004). As Coe et al. (2008) state, the GPN approach provides a comprehensive relational framework for studying economic globalisation, aiming to 'incorporate all kinds of network relationships' and to 'encompass all relevant sets of actors and relationships' (p. 272). Lee (2024) evaluates this approach as a synthesis emphasising networks with one emphasising evolution.

MacKinnon (2012) was among the first to establish connections between these two perspectives. After criticising the GPN literature for insufficient attention to the evolution of production networks over time, he attempted to establish dialogue between these two perspectives by connecting path dependence concepts from EEG literature with concepts such as coupling, decoupling, and re-coupling from GPN literature. Subsequently, numerous EEG and GPN scholars explored how these two theories could be more effectively connected. For example, Barratt and Ellem (2019) utilised longitudinal analytical methods, incorporating evolutionary processes into analytical frameworks to explore how GPNs emerge over time. Yang (2012) examined and compared the transformation of cross-border production networks driven by multinational corporations in Hong Kong and Taiwan.

2.3.1 Institutional Neglect in GPN-EEG Framework

Although recent academic research has made significant progress in integrating GPN and EEG approaches (Lee, 2024; Boschma, 2022; Yeung, 2024). Reviewing GPN and EEG-related literature reveals that whilst most studies mention "institutional contexts", the influence of these institutional environments has been largely overlooked or taken for granted by scholars. It fails to theoretically integrate institutional approaches as important analytical factors into analytical frameworks. For example, in EEG's path dependence concept, borrowing social and pluralistic concepts of institutions and agency establishes connections between EEG and institutional economics (MacKinnon et al., 2009), as well as the informal habits and behavioural norms contained within evolutionary economic geography (Hodgson, 2006). Alternatively, for regional path dependence concepts, these are rooted in the stratification, transformation, and reorganisation of regional institutions themselves (Martin, 2010). Nevertheless, these institutional dimensions are typically invoked as contextual factors rather than analysed as central mechanisms through which network evolution and regional development occur.

Although this phenomenon has been considerably improved, and this neglect of institutions has been recognised and raised by many scholars (e.g., Pike et al., 2016; MacKinnon et al., 2009; Hassink et al., 2019; Rodríguez-Pose, 2021; Boschma, 2025). Particularly in EEG literature where scholars are gradually recognising the need to separately examine the role of institutions, this call for institutional examination is particularly evident (e.g., Boschma et al.,

2017; Boschma & Capone, 2015). As noted by Gong and Hassink (2019), these include lack of theoretically grounded definitions, excessive emphasis on unidirectional institutional effects on industries, and insufficient exploration of the nature of change. However, this examination of institutions is still not received fundamental attention.

The origins of this institutional neglect lack clear consensus, it may be caused by three primary factors. First, institutions are manifested in different roles within EEG and GPN research, such as state policies, behavioural habits, and various forms of material institutional organisations (formal or informal). Therefore, many economic geographers view the institutional backgrounds behind these actors' behaviours as fixed and existing by default, without exploring the fundamental reasons for the emergence of these behavioural logics. This phenomenon is acknowledged by institutional economists, as scholars observe that institutions may be so routine and "taken-for-granted" that they transcend conscious scrutiny (Berger and Luckmann, 2016; Zucker, 1983). For explaining transformation, sociological institutionalists often point to an exogenous entity or force, such as new interpretive frameworks imported or imposed from outside (Fligstein, 1996) or the evolution of broader political, legal, and market "fields" (e.g., DiMaggio and Powell, 1983; Hannan and Freeman, 1989). This leads to the emergence of institutional concepts often being accompanied by other concepts, thus overlooking examination of institutions themselves. However, for factors such as policy and environmental changes, they are also continuously shaped by actors during evolutionary processes. The relationship between actors and institutions during evolution should be described as a state of mutual influence (detail see Section 2.4.2). As Campbell (2011) describes, existing institutional legacies may severely constrain the types and directions of institutional change. This insight is also emphasised by Gertler (2001):

"If one accepts the central insight of Polanyi (1944) that the market is socially constructed and governed - and not a 'natural', given, inevitable form - then it makes perfect sense that firms in market economies should also be 'constructed' to some extent by their social-institutional environment" (p. 20).

Therefore, this unilateral neglect of institutions may create risks of logical determinism and structural determinism. Furthermore, regarding Gertler's (2010) explanation, the second key reason appears to be the underdeveloped toolkit acquired by some economic geographers

during their journey through graduate school into future careers in the field. They become overly immersed in using these research tools whilst neglecting familiarity with cognate literature outside geography itself that helps understand the social foundations of economic processes and practices. Simultaneously, Gertler (2010) provides a reasonable explanation for this fundamental phenomenon, arguing that this occurs because these researchers, in their eagerness to document the seemingly endless ways in which actors and networks produce specific outcomes, overlook the larger institutional architectures that shape and constrain individual choices and create geographical divides and discontinuities in the global economy. He describes the fundamental reason for this phenomenon as "too much actor, not enough structure" (p. 4).

The third reason lies in the tendency for these studies to focus excessively on macro-national and/or transnational dimensions whilst neglecting analysis at other scales (Peck and Theodore, 2007). Of course, for global economic changes affecting localities, this focus is understandable, and even one of GPN framework's core elements is "global". It must be acknowledged that at national/supranational dimensions, these studies have thoroughly analysed the internal mechanisms of such economic changes. However, this excessive focus on macro-scale research may overlook many crucial issues. When shifting research perspectives to sub-national regions or smaller localities rather than global dimensions in GPNs, even individual behaviours become crucial factors affecting economic development. Therefore, understanding any specific scale of institutional context proves meaningful because they are also influenced by institutional frameworks established at other scales and interact with them (Gertler, 2010). For example, based on Chinese regional development research, Wei (2015) emphasises how national policies interact with local institutional arrangements to create diverse regional outcomes. Similarly, Coe and Yeung (2015) demonstrate how GPNs are shaped by institutional contexts spanning multiple scales, emphasising the need for a more nuanced, multi-scale approach to understanding economic geography.

This neglect of more dimensional (primarily micro-dimensional) institutional contexts proves problematic, especially in emerging economies, such as China. Continuous economic reforms have fundamentally changed local institutional arrangements and led to significant spatial

differences in economic and institutional landscapes (He et al., 2008). For example, the privatisation of state-owned enterprise stimulated knowledge and technology exchange between enterprises of different ownership types and led to increased knowledge spillovers, particularly amongst private enterprises (Guo & He, 2017). China's decentralised governance model enables local governments to actively intervene in regional economic development (Gao et al., 2019; He et al., 2008; Zhu & He, 2016). Particularly for this research spanning China's major economic institutional reforms from planned economy to market economy reforms, understanding the impact of institutional changes at different scales on regional economies is crucial. Combined with the recent emergence of information technology, such as digital freight platforms, research focusing on fixed dimension institutional context seems unable to adequately capture the role multiple factors.

The importance of this multi-dimensional examination is explained by Berger and Luckmann's (1967) understanding of social construction: society consists of three levels—competing and negotiating individuals, conflicting and coordinating organisations, and contradictory and interdependent institutions. All three levels are necessary for comprehensive understanding of society. These three levels are nested (embedded) when organisations and institutions designate progressively higher constraint levels and opportunities for individual action. This perspective does not place one level above another but considers individual and organisational behaviour as embedded in institutions, whilst institutions are socially constructed and therefore constituted by individual and organisational behaviour. This multi-dimensional examination approach provides the optimal entry point for understanding social life, even if subsequent exploration moves down to micro-foundations or up to emerging macro-structural phenomena (Jessop, 2001).

Therefore, to address this key issue of institutional neglect in EEG and GPN frameworks, this study attempts to introduce a third analytical dimension: the institutional approach. This institutional perspective provides an appropriate framework connecting the contrasting analytical orientations of these two approaches. EEG adopts an "inside-out" perspective, emphasising the regional development processes, such as path dependence, local learning, and embedded relationships, how those issues shape economic development trajectories from within regions outward to broader scales (Boschma and Martin, 2010). Conversely, GPN

employs an "outside-in" analytical orientation, focusing on how exogenous forces, which particularly multinational corporations and global production networks, influence regional development through strategic coupling and network integration processes (Coe and Yeung, 2015).

These analytical orientations create complementary perspectives on regional economic development. Whilst EEG often overlooks external influences and multi-scalar relationships. Conversely, whilst GPN tends to underemphasise indigenous development capabilities and path-dependent processes (Yeung, 2024). The institutional approach bridges this analytical gap by providing a framework that can simultaneously accommodate both endogenous institutional evolution and exogenous institutional influences, thereby enabling a more comprehensive understanding of how regional economic development emerges from the interaction between internal capabilities and external pressures within specific institutional contexts. Through the continuity of institutional change, different actors can be seamlessly connected to observe how they jointly constitute a complete regional economic system. It should be emphasised that the purpose of introducing institutional theory is to supplement the institutional contexts neglected in EEG and GPN. Here, I follow the important point proposed by Boschma and Frenken (2011), not using institutions as deterministic factors but still adhering to actor-centred approaches at various scales in economic geography, integrating institutions as contextual conditions into the synthetic research framework to better understand actors' economic behavioural logic.

2.4 Institutional Approach

Institution constitutes a core concept in social sciences, yet its definition has been characterised by diversity and controversy. Different disciplines and theoretical schools have offered varying definitions and interpretations of institutions from their respective perspectives. Whether from sociological, economic, political, or geographical viewpoints, various disciplines have engaged in considerable discussion of institution from multiple angles. To some extent, this concept has become quite ambiguous and broad. Therefore, rather than discussing the core concepts and theoretical deficiencies of institutional research in the same detail as EEG and GPN, this discussion focuses on the definition of institutions

within the research framework of this thesis, which include its importance, and how institutional research can better facilitate this synthesised research framework.

2.4.1 Definition of Institutions

Before introducing institutions, it is necessary to establish definition understanding for this concept. There are a few studies have provided precise definitions of institutions themselves; instead, most literature focuses on how to understand institutions or provides clear definitions of phenomena related to institutions. For example, institutional plasticity describes the flexibility and dynamism within institutions (Notteboom et al., 2013); institutional environment refers to regulations and social discourse about organisational roles, functions, and futures (Boschma and Frenken, 2006); institutional arrangements are specific guidelines (Williamson, 1996) and so forth.

Despite this conceptual diversity, there is considerable convergence around foundational definitions of institutions themselves. The most widely accepted conceptualisation amongst institutional scholars builds upon North's (1990) pioneering definition of institutions as "rules of the game"(p. 3) Subsequently, North (1993) further supplemented this concept, forming a more comprehensive institutional framework:

"Institutions are the rules of the game of a society or more formally are the humanly devised constraints that structure human interaction. They are composed of formal rules (statute law, common law, regulations), informal constraints (conventions, norms of behaviour, and self-imposed codes of conduct), and the enforcement characteristics of both" (pp. 5-6).

Building on this foundation, some scholars define institutions as non-material entities, such as "formal and informal rules that guide actors' perceptions and activities" (Strambach, 2010, p. 408), or as building-blocks of social order. They represent socially sanctioned, that is, collectively enforced expectations with respect to the behaviour of specific categories of actors or to the performance of certain activities' (Streeck, 2005). Alternatively, from an individual actor perspective, institutions are defined as collective action that controls, liberates, and extends individual behaviour (Commons, 1931). Simultaneously, scholar also

describe institutions as organisational forms, believing that "institutional arrangements refer to particular organisational forms (firms, state bureaucracies, cooperative networks, or, more generally: governance systems) whose constitution and operations are governed by the institutional environment" (Martin, 2017, p. 80).

This thesis does not consider these two definitions to be in conflict, as the definition of institutions as material organisational forms can actually be understood as implementers or regulators of "social rules". Therefore, to avoid narrow institutional definitions, this thesis combines these two institutional definitional modes by defining institutions as follows:

Institutions are the structured frameworks, both formal and informal, that shape social and economic interactions within a society. They encompass legally constituted entities (such as courts, unions, and government bodies), formal constraints (such as written rules, policies, and standards), as well as informal constraints (such as social norms, customs, and shared beliefs). In economic geography, institutions act as crucial mediators of economic behaviour and outcomes across various spatial scales, influencing regional development trajectories and the organisation of economic activities.

By adopting this definition, this thesis aims to provide a comprehensive institutional perspective through which to examine the role of institutions in shaping economic geography, particularly in the context of network relationships and industrial evolutionary pathways.

2.4.2 The Role of Institutions in Economic Development

After defining institutions within this research scope, a question remains: what is the role of institutions in the economy? A single section is insufficient to explain such a concept with rich meaning and vast scope. Therefore, this discussion focuses primarily on explaining why institutional research is important for this type of network and evolutionary research. As described earlier, in EEG and GPN approaches, although scholars have attempted to connect them and apply them to exploring regional economic development, few researchers have combined network-based and evolution-based research (Lee, 2024). One fundamental reason

might be the neglect of institutions. Thus, the institutional concept can contribute at two levels within this thesis: providing contextual examination for the economic behaviour of network actors and offering more detailed understanding of evolutionary pathways, thereby promoting connections between EEG and GPN literature.

First, introducing institutional examination can provide sufficient contextual support for understanding the economic behaviour of network actors within regions. As traditional institutional theory describes Barley and Tolbert (1997) state:

"[...] that organizations, and the individuals who populate them, are suspended in a web of values, norms, rules, beliefs, and taken-for-granted assumptions, that are at least partially of their own making" (p. 93).

Simultaneously, Amin (2004) emphasises that whilst mainstream economics assumes the economy is rationally driven, in actual social operations, continuous stabilisation through social rules and norms is still needed. Therefore, it can be understood that the entire economic development process is jointly driven by institutional frameworks combined with mainstream economics. Although in the economic geography realm, scholars acknowledge this dual-driven regional economic development model of institutions and economics. They have drawn two main insights from institutional economics: economic behaviour is influenced by both social contexts and path dependence. Regarding the first point, institutions are important because they connect the "economic" and "social" through a set of habits, practices, and conventions (Hesse and Rodrigue, 2004). Nevertheless, how this driving occurs and how institutional environments interact with other factors during evolutionary processes, such as actor behaviours, seems not been explored in detail. Institutional dynamics themselves are shaped and constrained by specific norms and habits embedded in culture, normative values, cognitive beliefs, or worldviews, all of which influence individual choices. Therefore, what is needed is a deeper understanding of change in which institutional development responds to both endogenous political and economic dynamics and exogenous shocks (Jessop, 2001). As mentioned in early sections, these inside-out and outside-in perspectives are precisely what EEG and GPN can provide. Therefore, introducing institutional examination seems enables better combination of network research and

evolutionary research in EEG and GPN literature. In addition, through institutional examination, better examination of the contexts in which regional actors operate can be achieved, understanding the behavioural logic of different actors in economic networks.

Secondly, introducing institutional approaches can also provide more detailed examination of institutional evolutionary trajectories through the evolution of these economic behaviours. This detailed examination stems from two fundamental properties of institutions: first, institutions do not exist once and for all but undergo continuous modification to adapt to changing environments (Mahoney & Thelen, 2010; Maskell & Malmberg, 2007); second, institutional influence on economic behaviour is not unidirectional but mutually influential.

The core debate regarding institutional evolution concerns appear to whether institutional evolution is continuous. Here this study does not provide a definitive conclusion on this viewpoint but treats this discussion as an open issue. From one perspective, some scholars consider that institutional evolution is gradual. James Mahoney, as an advocate of gradual institutional change, argues that institutions once established will change in subtle and gradual ways over time. Although these slow and piecemeal changes are not as striking as sudden and large-scale transformations. They are equally important for patterns of human behaviour and forming substantial political outcomes (see Mahoney, 2010; Mahoney and Thelen, 2009). Similarly, scholars such as Djelic and Quack (2003) and Capoccia (2016) advocate this gradual change perspective.

Conversely, some scholars believe institutional evolution is discontinuous. For example, Strambach (2010) analyses the development of Germany's software customisation industry from an institutional evolutionary perspective. Through industrial research, she found that institutional evolutionary pathways are not continuous but emerge through combination with external factors to adjust original internal institutions and recombine them. Martin (2010) argues that institutional evolution is a process where each new "layer" constitutes only a small change to the institution as a whole, but this process can accumulate to set institutional evolution on track, leading to mutations or even transformations of institutional fundamental nature" (p. 14).

To sidestep this debate about continuity, Streeck and Thelen (2005) categorise institutional evolution into four different types: Displacement, Layering, Drift, and Conversion, attempting to conceptualise institutional evolution from a more comprehensive perspective. Layering refers to the process of adding new formal rules to old ones to change their effects (Schickler, 2001); conversion refers to reinterpreting existing rules to serve new purposes (Thelen, 2004); drift refers to situations where old rules are deliberately not adapted to changing social conditions to gradually change their impact (Hacker, 2004); "exhaustion" is a process through which institutions "wither" through over-extension that weakens their originally invented capabilities (Streeck, 2009, p. 125).

A more comprehensive and agreeable perspective comes from William Easterly. From an institutional economics perspective, he believes whether institutions change continuously depends on the source of change. He evaluates these two evolutionary modes as different "worldviews", where continuous change stems from "bottom-up" forces spontaneously emerging from social norms, customs, traditions, beliefs, and individual values in society, because current institutions are severely constrained by previous institutions. Sudden change stems from "top-down" forces determined by laws made by political leaders, because political leadership can start from scratch, tearing up old laws and making new ones at any time (Easterly, 2008, p. 95). Sudden change (top-down) is rarely mentioned, fundamentally because this viewpoint is implicit, as advocates of this change mode believe institutions are created by central governments to enable market economy operation. Simultaneously, the most extreme bottom-up view is also untenable; otherwise, formal states and laws would not be needed, yet they are ubiquitous (Easterly, 2008, p. 96).

His viewpoint could resonate with previously discussed economic geography literature at two levels. First, this top-down change mode may not be entirely controlled by central governments. Compared to institutional economics, geography breaks down the binary between qualitative behavioural geography and quantitative spatial science. Adopting a more middle-range approach focusing on the role of specific formal organisations in producing geographical patterns, thereby triggering institutional transformation. For example, institutions are viewed as sites for strategic codification and mediation of power

relationships, attempting to impose more general strategic lines at "street level" or "grassroots" politics (Jessop, 2001). Therefore, when migrating this concept to geography, it emphasises the concept of "space." When focusing research on specific regional areas (whether within companies or sub-national regions), this top-down sudden change mode can be described as changes caused by power holders exercising their power. Second, as Easterly (2008) mentions: "Yet the apparent effectiveness of top-down formal institutions in rich societies may still depend on these institutions having evolved from the bottom up. If so, then attempting to introduce formal institutions into poor societies where bottom-up factors are lacking will not replicate the institutional successes of rich countries" (p. 96). This institutional change perspective also response to a classic question in economic geography: "why can some places achieve certain outcomes whilst others cannot?" According to his proposed viewpoint, the answer indicates that economic development models under different regional institutional contexts require separate discussion.

Institutional change is both a deliberate design process and a long-term evolutionary process (Buitelaar et al., 2007). Regardless of perspectives, institutions undeniably require examination through a dynamic viewpoint, consistent with this study's advocacy for dynamic research frameworks for overall regional economic development.

Regarding the mutual influence between institutions and actors. Scholars in previous sections on GPN and EEG literature have provided considerable elaboration on institutional shaping and influence on economies. Although not explicitly directed, this "unidirectional" influence has been confirmed and emphasised by many EEG and GPN scholars. Conversely, institutionalists emphasise bidirectional influence, believing institutions not only shape economies but that economic actors are not passive recipients of institutional rules. They are active participants capable of interpreting, negotiating, and even changing these rules. Institutions are not predetermined but designed by actors to achieve mutual benefits through cooperation (Weingast, 2002). From Hamilton's (1932) early description: "Institutions and human actions, complements and antitheses, are forever remaking each other in the endless drama of the social process" (p. 89); to acknowledging that institutions both generate and constrain agency behaviour (Barley and Tolbert, 1997; Peters, 2005); to describing the relationship between institutions and individual behaviour as a complex recursive relationship

(Martin, 2017), and continuous, gradual mutual influence (Hodgson, 2007). As Bitektine & Haack (2015) state, actors are institutional superheroes with purposeful "abilities to create, change, and destroy institutions" (p. 50).

Therefore, an appropriate approach would be to combine institutional and economic-level analysis. A vivid description comes from Gunnar Myrdal, who believes the customary method of independently analysing economic and institutional factors can be likened to "throw(ing) the yeast into the oven after the bread has been baked" (Myrdal, 1970, p. 32). This explains the limitations that may arise from separately analysing institutions and economics. This analytical approach may seriously underestimate the role of individuals and organisational institutions in shaping and reshaping institutional environments (Bathelt and Glückler, 2014).

Furthermore, viewing institutions from a policy-making perspective could also demonstrate this mutual influence. As mentioned earlier, policies can be viewed as manifestations of formal institutions. For policy stakeholders, there is the distinction between including "policy (rule) makers" and "policy recipients". In analysing regional economic development, scholars frequently view policies as pre-established, fixed conditions. Although undeniably, institutions are often shaped and redesigned by political actors, institutions (including policies) are constantly changing and may simultaneously constrain both "rule makers" and "rule recipients" (Capoccia, 2016). As Streeck and Thelen (2005) argue, due to cognitive limitations of "rule makers" and their limited capacity to control rule implementation, as well as rule inconsistencies. "Rule recipients" behaviour and unforeseen changes in external conditions, or "rule recipients" open contestation can drive political debates about specific institutional forms, functions, and prominence. In this process, gaps between what rules say and how they are applied allow incremental processes of rule deviation and reinterpretation, leading to long-term gradual but transformative institutional change (see Streeck & Thelen, 2005, p. 19; also, Mahoney & Thelen, 2010, p. 10). This demonstrates that institutions (policies) are not unchanging but continuously change in response to stakeholder behavioural changes.

This series of evidence shares a common theme: institutions are critically important, and in-depth institutional research is necessary. Moreover, institutions are changeable, and researchers need to seriously consider how institutions shape economic behaviour and outcomes whilst institutions themselves are influenced by economic, political, and ideological factors (Rutherford, 2001). One of the main concerns of institutional analysis is the risk of determinism (Sayer, 1995). Whilst emphasising institutional constraints, attention should equally focus on human agency and potential for institutional change. In other words, institutions are both rigid structures governing economic behaviour and plastic frameworks susceptible to human behavioural influence.

2.4.3 Individual Actors and Role-Based Analysis

Introducing institutional concepts can make additional contributions to the overall research framework beyond addressing deficiencies in institutional research in the previous two research frameworks. One important contribution lies in emphasising individual actors and how to incorporate individual actors into analytical frameworks. Although this has not been explicitly emphasised previously, a noteworthy point is the difference in analytical subjects between institutional research and the EEG and GPN. In institutional research analysis, analytical subjects are constantly changing and can include various form of actors, which could represent relatively macro dimensions as well as more micro individual analytical dimensions. This change in analytical dimensions has been a contentious point in institutional research, namely, how to handle the relationship between organisations and individuals in institutional research.

First, institutional analysis separates individuals from organisations because organisational institutional logic differs from individual institutional logic and requires separate examination. As Abdelnour et al. (2017) describe, there is difficult to address agency and institutional issues without ultimately confronting how individuals connect with and work within organisations. Although institutional research often emphasises individual influence on institutions, this emphasis on individuals in economic research is often placed within organisational frameworks. For example, Martin (2017) mentions that early research was criticised because institutional approaches neglected human agency, making methods unable to capture the full range of creative actions by individuals and organisations within their

institutional contexts. This represents one of the most common pitfalls of institutional approaches: researchers always want to "read" individual behaviour from national (or local) institutional structures (Gertler, 2010). This approach may lead to overlooking potential for institutional innovation and change at these scales, missing key aspects of regional economic evolution and resilience by overlooking bottom-up institutional change potential (Pike et al., 2009).

This analytical perspective ambiguity stems from assumptions that institutional domains are direct aggregations of organisations, organisations are aggregations of individuals, and individuals are aggregations of inherent preferences and intentions (Abdelnour et al., 2017). Although individual arbitrary actors are themselves institutions that have strengthened effectiveness over nearly two centuries (Boli et al., 1985), for individual actors, due to lack of effective analytical means to reasonably place them in economic environments. This individual behaviour is overlooked or viewed as part of organisations, leading to analytical subject ambiguity.

Second, however, this ambiguity may be resolved through Sennett's (1977) perspective of "roles" that individuals assume in organisations. Sennett (1977) argues that individuals can simultaneously be members of multiple groups or collectives, clearly indicating they join groups and organisations not as existence units we call "individuals" or "selves" but as unique action modules called "roles." Through this perspective, although "individuals" are independent "entities," when placed in different environments, they are assigned different "roles." Based on Sennett's (1977) viewpoint, this study argues institutional examination should be studied according to these "roles" rather than "individuals" per se. This perspective is also confirmed by Abdelnour et al. (2017), who believe examining individual actor influence on institutional environments through role perspectives is effective.

For example, Bitektine and Haack (2015) propose a multi-level model believing individual-level cognitive judgements can induce organisational and field-level changes. A more accurate description should be that this individual cognition is cognition manifested by the "role" individuals play in their current environment. From this "role" perspective, reasonable

explanations for behaviour and motivations become possible. This institutional analytical method of assigning different roles to individuals has also been applied in research, such as Grillitsch and Sotarauta (2020) in institutional evolution research, separately emphasising different individual roles, including how innovation entrepreneurs, institutional entrepreneurs, and place-based leaders drive regional economic change.

Moreover, this actor-specific role-based examination approach is particularly important in evolutionary research, especially for individual-dimension examination. Whether institutional evolution is gradual or sudden through continuous accumulation, during evolutionary transformation processes, due to macroeconomic environmental changes, actors' identities may change. However, institutional legacies left by individual actors in original "roles" or transformation process ambiguities may cause overall analytical logic confusion. This analytical method of defining specific "roles" that actors assume resolves this problem to some extent, especially in examining societal embeddedness during industrial evolution processes (detailed in Section 5.6.1) and lorry driver research (detailed in Section 5.6.2).

Therefore, introducing institutional methods first adds individual actor dimensions, enriching the analytical dimensions of the overall research framework and enabling more comprehensive inclusion of actors in regional economic development. Second, on this foundation, it clarifies that an effective analytical method for adding individual dimensions is identifying individual actors' different or specific roles in regional economies, such as identifying different types of specific organisations (e.g., NGOs, companies, governments). Through this "role" perspective, it could better identification of individual actor subjective initiative's influence on economics and institutions.

2.4.4 Formal and Informal Institutions

Another key point of introducing institutional methods is emphasising attention to informality. In previous discussions, a frequently overlooked point is discussion of informality. Although informality is involved in EEG embeddedness discussions (e.g., Hess, 2004; Billington et al., 2017; TerWal and Boschma, 2011) and GPN strategic coupling/global production network "dark side" discussions, especially labour research (e.g., Gertler, 2004;

Gutelius, 2016; Sowers, 2017). Especially in GPN labour research, informality is considered as an important discussion factor affecting bottom-tier actor living environments. Although these behaviours are crucial for institutional evolution, they often operate under traditional analytical method radars. Therefore, researchers seem do not place institutional informality at the same important level as formality.

This macro bias may limit researchers' ability to understand how institutions evolve and adapt to economic actors' daily practices and innovations, leading to incomplete or misleading conclusions about regional economic dynamics. As Coe and Yeung (2015) point out, discussion of informal organisations often remains superficial, failing to deeply explore their formation patterns and differences from formal organisations regarding economic development (see also Hesse and Rodrigue, 2004). Therefore, introducing institutional methods partially addresses research neglect of informality.

Before formally introducing informal institutions, it is necessary to clarify what informal institutions contain. Helmke and Levitsky (2012) define informal institutions as: "[...] socially shared rules, usually unwritten, that are created, communicated, and enforced outside of officially sanctioned channels" (p. 727). However, institutions include not only informal rules but also some formalised entities. For example, in the logistics industry, the fleet model in logistics networks is a typical example. This model consists of social connections forming large, medium, and small fleets of various sizes, mostly without legally recognised entities, thus belonging to informal organisational modes. This informal organisational mode can actually be viewed as a manifestation of informal institutionalised entities. To avoid excessive conceptual definitions disrupting overall article structure, this study does not intend to provide a new definition for informal institutions. Therefore, based on Helmke and Levitsky's (2012) definition, informal institutions should also include "some unregistered legal entity organisations or labour forms."

Regarding informality emergence, this process directly relates to the mutual influence between actors and institutions mentioned in Section 2.4.2. As North (1990) points out, some institutional arrangements persist despite lacking efficiency because they continue to serve

the interests of those in power (see also Hodgson, 1993). This demonstrates that whilst formal institutions define behavioural norm boundaries, they cannot cover all contingencies.

Therefore, actors create informal institutions because formal institutions are incomplete (Helmke and Levitsky, 2012). Alternatively, for actors who prefer but cannot achieve formal institutional solutions, informal institutions may be "suboptimal" strategies (Helmke and Levitsky, 2012). This evidence indicates that social rule implementation is never perfect; gaps always exist between ideal rule patterns and actual life patterns under rules. Those controlling social institutions, whoever they may be in specific situations, may not completely control how their creations operate (Streeck, 2005). Rule recipients not only implement rules made for them but also modify rules during implementation using their inherent openness and ambiguity.

Moreover, informal structures outside formal organisations are equally important for business operations (Krackhardt and Hanson, 2006). In fact, governments may sometimes tolerate or even promote informal activities to control social conflict (Briassoulis, 1999). For example, illegal employment may provide economies with flexibility that would otherwise be too strictly regulated to function well (Streeck, 2005). Through empirical research, Storper (2018) emphasises mutually reinforcing mechanisms between formal and informal institutions and local industries. He argues that many leading regions' success, such as Silicon Valley and London, may be attributed to industrial agglomeration and endogenous co-evolution of local formal (laws, government structures, rules, organisations, etc.) and informal institutions (practices, norms, beliefs, networks, etc.) specific to particular industries and places. Similarly, Haugen (2018) reveals the key role of credit relationships in informal trade networks through the concept of petty commodity chains. This special global value chain consists of unregistered small enterprises maintained through personalised relationships and informal infrastructure. In these networks, credit relationships permeate entire chains, not only strengthening commodity chain integration but also continuously reinforcing through repeated and expanded transactions. These examples demonstrate that informal institutions are not merely secondary supplements to formal frameworks but constitute essential components of economic systems. The co-evolutionary relationship between formal and informal institutions suggests that understanding regional economic development requires examining both dimensions simultaneously. For logistics networks specifically, informal mechanisms remain important. For example, the trust-based relationships and unregistered

organisational forms, such as transportation fleets, which often facilitate the coordination, and governance functions that formal institutions cannot adequately address.

Furthermore, within the Chinese sociocultural context, another informal institution merits discussion: *guanxi* (关系). *Guanxi* can be broadly translated as "particular ties" or "personal networks" (Gold et al., 2002). At its core, the concept emphasises how trust-based and reciprocal interpersonal relationships operate beyond the boundaries of formal institutional frameworks (Luo, 2000). Employing Lubman's (1998, pp. 3–43) metaphor regarding contracts in Chinese business practices, if a contract can be likened to a cage, then appropriate *guanxi* serves as the key to unlock it (Gold et al., 2002). In other words, *guanxi* can, to a certain extent, be utilised to circumvent official approvals and cumbersome bureaucratic procedures whilst securing greater protection (Xin and Pearce, 1996). Consequently, *guanxi* has sometimes been connected with negative practices. For example, it is often directly associated with corruption, bribery, malfeasance, and other forms of unfair competition (Wank, 1999). As Guthrie (1998) argues, *guanxi* practices conflict with the emergence of rational-legal systems at the national level. Even from a broader perspective, governmental actors attempt to discourage discussions surrounding *guanxi* (Dickson, 1992).

However, as Lee Kuan Yew, the founding father of the Republic of Singapore, observed, Chinese people utilise *guanxi* "to make up for the lack of the rule of law and transparency in rules and regulations" (Yeung and Tung, 1996, p. 56). Regarding *guanxi* itself, this concept is not inherently linked to negative connotations; rather, it constitutes a relatively neutral term. Scholars have offered more market-oriented interpretations of *guanxi*. For instance, Yang (2016) contends that *guanxi* is not synonymous with corruption but instead emphasises long-term obligations and relational bonds. Similarly, Smart (1993) suggests that *guanxi* serves to establish trust, thereby reducing uncertainty and risk during cooperative processes. As Chang (2011) notes, uncertainty regarding resources and information profoundly influences actors' economic activities and social behaviours. In China, enterprises typically rely on social connections to mitigate risks and uncertainties, pool necessary resources, and gather information to minimise the impacts of such uncertainties on business operations (Larson, 1992). These social connections, within the Chinese context, are precisely what *guanxi* represents. However, as this body of literature demonstrates, although scholars have provided relatively substantive explanations for *guanxi* across different usage scenarios, a unified

definition for *guanxi* in specific contexts remains elusive. Notably, when *guanxi* is situated within particular industries or regions, descriptions of its specific roles and functions appear somewhat ambiguous. As Smart and Hsu (2017) observe, the establishment of *guanxi* is predominantly based on informal or even illegal means, which may explain the limited coverage of such content in the literature. As Chang (2011) concludes, whilst scholars generally acknowledge that *guanxi* represents social obligations and the solicitation of special favours, consensus regarding the role *guanxi* plays amid China's continued economic development has yet to be reached.

Moreover, the boundaries between formal and informal institutions are inherently blurred and fluid. As Schindler (2017) argues, specific economic activities have nothing inherently "informal" about them; boundaries between the two are determined by a series of artificial regulations, court decisions, enforcement practices, and efforts to circumvent regulations (p. 250). His perspective aligns with the view that institutions are shaped by actors' various economic behaviours, suggesting a "non-binary" approach that challenges rigid formal-informal distinctions. While acknowledging the validity of this perspective, this study maintains that exploring informality remains valuable for generating a deeper understanding of economic behaviour. Therefore, this research adopts a "binary" analytical framework, treating formality and informality as equally important but distinct dimensions for exploration. This approach enables systematic examination of how formal rules interact with informal practices in shaping economic networks.

Nevertheless, research on the co-evolutionary pathways between actors and institutions, encompassing both formal and informal dimensions, remains an underexplored area requiring more detailed investigation to explain evolutionary processes. This institutional complexity necessitates an analytical framework that can capture both the network relationships emphasised by GPN theory and the evolutionary dynamics highlighted by EEG research, whilst remaining sensitive to the institutional contexts that shape both. The following section presents such a framework, synthesising these three theoretical approaches into a coherent analytical structure.

2.5 Synthesised Framework and Research Questions

The preceding analysis of GPN, EEG, and institutional approaches reveals both the individual strengths and inherent limitations of each theoretical framework. These complementary strengths and mutual limitations necessitate an integrative approach that leverages each approach's analytical capabilities whilst systematically addressing their individual constraints. GPN contributes essential network perspectives for examining power relationships and embeddedness within regional economies. EEG provides the temporal dynamism necessary for understanding how regional economic development trajectories unfold over time. The introduction of institutional concepts fundamentally addresses the contextual neglect evident in both GPN and EEG, providing robust analytical foundations for understanding how formal and informal institutions shape economic behaviour and network formation. Moreover, institutional approaches enable more detailed analysis of individual and organisational actor dimensions within the synthesised framework, advocating for a more nuanced and comprehensive analytical approach to actors across different scales. Finally, the explicit incorporation of informality analysis provides a more complete understanding of regional economic development pathways.

This theoretical synthesis establishes a comprehensive analytical framework emphasising four core elements: network relationships, evolutionary dynamics, multi-dimensional actors, and institutional contexts (both formal and informal). To operationalise this integrated approach for investigating regional economic development, the analysis proceeds through three interconnected and sequential analytical perspectives. These perspectives represent a progressive analytical strategy designed to capture the multifaceted nature of regional economic evolution: from macro-institutional patterns through intermediary actor dynamics to micro-network governance mechanisms.

The first perspective examines how various forms of *embeddedness* influence industrial evolution, establishing the broad developmental context within which networks emerge and transform. The second perspective focuses on how specific *intermediaries* shape network power structures and spatial configurations, identifying the key actors who operationalise

embedded relationships within evolving institutional contexts. The third perspective investigates how top-down institutional logics and bottom-up actor strategies interact to generate stable *network dynamics*, revealing the governance mechanisms that sustain network functionality across temporal and spatial scales. Together, these three analytical lenses provide a comprehensive framework for understanding how logistics networks co-evolve with institutional environments, addressing the research aim of this thesis through systematic examination of embeddedness patterns, intermediary functions, and governance dynamics.

2.5.1 Embeddedness and Industrial Evolution

The evolution of logistics networks involves interconnected processes of network formation, actor participation, and governance development. Capturing these dynamics requires an analytical approach that connects broad institutional transformations with specific network interactions. Establishing the overall industrial evolutionary pathway serves as the foundational analytical step, providing essential context for understanding how network relationships emerge, develop, and transform over time. This macro-level analysis enables identification of critical junctures, institutional shifts, and structural transformations that shape subsequent network configurations and actor behaviours. Consequently, industrial evolution constitutes the first research perspective within this synthetic framework. Within this evolutionary analysis, this study employs the concept of embeddedness as the core analytical lens for understanding developmental pathways. The rationale for selecting embeddedness is twofold.

First, the three different embeddedness modes demonstrate high compatibility with this study's research positioning. Regarding territorial embeddedness, unlike manufacturing industries that possess substantial fixed assets in specific locations, the logistics industry is essentially a continuously mobile industry. For industry actors, most of their fixed assets (transport vehicles) are constantly changing in terms of physical location. Therefore, this mobility challenges the fundamental concept of territorial embeddedness in traditional research frameworks. It proves necessary to conduct additional examination of the distinctive territorial embeddedness nature of the logistics industry to enrich theoretical frameworks.

Concerning network embeddedness, this study's timeframe spans from the end of China's planned economy era to the current market economy pattern. Although this macroeconomic pattern change may lead to completely different market economic operational logics, as emphasised in institutional research, past decisions shape actors' expectations for the future (North, 1990). The extent to which institutional legacies left by original institutional frameworks influence current economic patterns remains unclear. Therefore, exploring how changes in network embeddedness, which include the relationships between different actors, as well as the transformations alongside macroeconomic institutional changes, become key to resolving this issue.

Regarding societal embeddedness, it represents the "genetic code" carried by actors themselves (Hess, 2004). This study does not involve cross-cultural "genetic code" exchange in transnational research. However, under the macroeconomic institutional transformation context, several questions become crucial. First, how does the transformation from internal logistics to outsourcing structures affect social relationships between different actors? Second, how do actors' "genetic codes" from original roles shape their current societal embeddedness relationship networks? Third, how do individual actors' "role" transformations during evolution processes and their impact on societal embeddedness regarding economic behaviour? As Bathelt and Glückler (2014) emphasise, relational perspectives are essential for understanding economic decision-making in research, production, and transaction processes. This is particularly in emerging economies and transition contexts, where formal structures may be less developed or trusted (Meyer and Peng, 2016). Understanding how societal embeddedness facilitates trust-based systems operating alongside formal institutions is therefore crucial. This requires a more detailed examination of societal embeddedness relationships' impact on regional economic development.

Second, embeddedness provides a powerful analytical lens for examining the evolutionary pathways of the logistics industry, whilst this research offers an ideal empirical context for developing a more dynamic understanding of embeddedness evolution. As a core concept in both EEG and GPN frameworks, embeddedness provides theoretical tools for understanding the logic of social institutional formation and transformation within market exchange contexts (Ghezzi and Mingione, 2007). This capacity to capture institutional-economic

interactions proves particularly valuable when examining how logistics networks evolved alongside broader economic reforms, especially given that formal and informal institutional changes fundamentally reshaped actor relationships and spatial configurations.

Furthermore, although numerous economic geographers have examined embeddedness and acknowledged its temporal variability (e.g., Hess, 2004; Chang, 2011), most applications treat embeddedness patterns as relatively stable rather than examining their dynamic evolution. As Bian and Landau (2022) identify, a persistent limitation exists: embeddedness research remains insufficiently temporalised. In this thesis, China's logistics transformation provides an ideal empirical context for developing a more dynamic understanding of embeddedness evolution, where rapid institutional transitions continuously reshape network relationships within regional industries. Within this context, it could examine how embeddedness analysis captures the complexity of network-institution co-evolution. Consequently, by examining how embeddedness patterns evolve alongside regional industrial transformation, this study both addresses a key theoretical gap and advances embeddedness research towards more temporally sensitive applications.

This leads to the first research question: **RQ1: How do various forms of embeddedness influence the formation and development of logistics networks?** This question addresses a key gap in embeddedness research by examining how territorial, network, and societal embeddedness co-evolve with industrial transformation, particularly in the context of logistics industries where traditional embeddedness concepts require further discussion.

2.5.2 Intermediaries and Institutions

Although many studies have discussed the dynamism and diversity of intermediaries in GPN research (e.g., Phelps et al., 2018), these studies demonstrate insufficient discussion of specific change mechanisms of intermediary functions and the institutional logic changes behind them. As Gertler (2010) states, regional studies have long recognised the importance of institutions and public policy in explaining regional development, but "theoretical blind spots" persist, which lack of the linkage between actors' micro-behaviours with institutional evolution and change (Maskell and Malmberg, 2007; Sotarauta and Pulkkinen, 2011).

Therefore, having established how embeddedness patterns shape overall network formation, this thesis turns to examining the specific actors who operationalise these embedded relationships within logistics networks. Identifying and understanding key intermediaries are crucial for connecting macro-level embeddedness patterns with micro-level network dynamics, as these intermediaries serve as the primary conduits through which embedded relationships are activated and transformed. Focusing on intermediaries provides analytical leverage for understanding how networks actually function, since intermediaries actively create, maintain, and reconfigure the connections between other actors. This intermediary-focused approach thus bridges the gap between understanding network formation patterns (RQ1) and examining how these patterns translate into concrete governance mechanisms and power relations (RQ3).

There are two reasons why this thesis emphasis on the concept of intermediary. First, intermediary research and actor research are not contradictory concepts. For the logistics industry, precise logistics intermediary concepts did not exist in original internal logistics system, with logistics being contained within shipper or consignee systems. As Moss et al. (2009) state, whether an organisation is an intermediary depends on that organisation's specific work relationship with other actors. When the overall logistics industry shifted towards outsourcing mechanism, all emerging actors responsible for material flow between shippers and consignees can be defined as logistics intermediaries. These actors jointly complete the full-process work of logistics transport business. Intermediary concepts include almost all actors in logistics processes, such as 3PL companies, lorry drivers, fleets, and recently emerging digital freight platforms. Therefore, using intermediary concepts in this manner proves reasonable.

Second, this study's emphasis on the "intermediary" concept aims to highlight that intermediaries' primary function involves serving as important media connecting different actors. In addition, based on assigning actors fixed roles (see Section 2.4.3), using intermediary concepts can better emphasise this study's network research dimension. In anthropological and political research, James (2011) provides an insightful perspective on intermediary definitions. He believes intermediaries embody different attributes and can

flexibly switch amongst these "repositories." More importantly, he emphasises that intermediaries do not always simply negotiate between fixed identities and actors but make these identities real through different transformations. According to Coe and Yeung's (2015) perspective, intermediaries should be conceptualised based on their functions in GPNs than necessarily binding to specific actor forms. Thus, intermediaries can simultaneously play different roles in production networks, such as "serving as lead firms in one network whilst acting as specialised suppliers in another" (Coe and Yeung, 2015, p. 42). Therefore, each actor cannot be studied in isolation but must be considered in connection with other actors and all system aspects (Bateson, 2000). Therefore, adopting an intermediary-focused approach seems to be a more suitable lens for examining logistics network evolution in China, as it captures both the functional flexibility of actors and the relational dynamics that constitute network governance.

Moreover, the emergence of digital logistics platforms represents a fundamentally new category of intermediary that challenges traditional network governance patterns. Unlike conventional logistics intermediaries that evolved from existing industrial structures, digital platforms create entirely new forms of network coordination and value creation mechanisms. As digital infrastructure, computational systems assign value to goods by gathering entities in virtual spaces and reconstructing relationships between them through algorithmic ranking and statistical analysis (Callon and Muniesa, 2005). These systems enable goods to achieve socially distant exchange (Berndt and Boeckler, 2009), fundamentally altering the spatial dynamics of economic coordination. However, for physical industries, such as logistics, this technologically mediated exchange still requires material implementation through transportation and handling. Digital platforms therefore occupy a unique position as hybrid intermediaries that simultaneously operate in virtual coordination spaces and physical operational networks. These platforms function not merely as spaces for socio-technical interactions but increasingly participate directly in value activities of GPNs as autonomous economic actors (Grabher and van Tuijl, 2020; Dolata and Schrape, 2022; Ibert et al., 2022). Crucially, they operate as both matchmakers between users and multilateral market makers through the digital infrastructure they provide and the participation conditions and rules they establish (Grabher and van Tuijl, 2020; Hardaker, 2022).

This dual functionality creates new forms of power relations and governance mechanisms that existing intermediary typologies struggle to capture. Digital platforms can simultaneously facilitate network connections whilst exercising algorithmic control over information flows and market access, fundamentally altering traditional concepts of intermediary neutrality (Langley and Leyshon, 2017). Yet despite their growing significance in reshaping logistics networks globally, existing research demonstrates a critical gap in understanding the development pathways and institutional implications of such born-digital intermediaries within the logistics industry. Overall, these intermediaries not only connect various actors in GPNs but also influence entire network structures and functions through their own dynamic adjustments. Exploring intermediary function change mechanisms and how they operate under different geographical, economic, and institutional contexts helps better understand GPNs complexity and dynamism, providing new perspectives for economic geography theory development.

It is worth noting that institutional approaches permeate the entire research, whether in overall industrial evolution processes or in subsequent network dynamics. However, the institutions investigation is particular emphasis here, as it aims to conduct detailed deconstruction of unique institutional contexts behind each type of key actors to understand their unique behavioural logics. Through this approach, the research can explore how institutional contexts gradually change alongside actor emergence. As well, for institutional research itself, these social contexts are shaped by regional or actor behaviours. Nevertheless, what remains missing is the mutual influence relationship between institutional evolution and actors in networks. Although scholars recognise that these actors shape institutional changes in a simultaneously evolving and mutually shaping process (see Section 2.4.2), as mentioned in EEG and institutional research, both explore how institutional changes affect actor changes in regions. From network theory perspectives, these actors are interconnected and mutually influential. However, to what extent actor changes/formations are influenced by institutional changes, and to what extent actor interactions (power) influence evolutionary trajectories remain unresolved questions. As emphasised in EEG research by Hassink et al. (2019), more research is needed to reveal the extent to which expectations and visions between "old path actors" and "new path actors" influence economic patterns during evolutionary processes, thereby affecting new path development (p. 162). Analysing regional industrial evolution

through these newly emerged intermediaries represents an effective perspective for understanding overall logistics industry changes and further answering this question.

This leads to the second research question: **RQ2: How do intermediaries (such as logistics companies, transportation fleets, and digital platforms) shape the power structure and spatial configuration of logistics networks?** This question addresses the understudied relationship between intermediary evolution and institutional change by examining how different types of intermediaries both respond to and reshape institutional contexts, with particular attention to digital platforms as emerging intermediaries that challenge traditional network governance patterns.

2.5.3 Network Dynamics

Regarding network dynamics definition, Teece et al. (1997) define corporate dynamic capabilities as the ability to "integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (p. 516). Since this study explores broader regional industrial dynamics including various organisational forms (corporate, non-corporate actors, and government) and individual actors, when incorporating these main regional industrial actors into dynamic analysis, this definition requires appropriate expansion. Based on this, this study defines network dynamics as follows:

Network dynamics refer to dynamic processes through which diversified actors within networks (including enterprises, non-corporate organisations, and individuals) continuously adjust relationships, reconfigure roles, and innovate collaborative patterns to integrate, construct, and reconstruct network resources and capabilities in adaptation to institutional environmental changes and market demands.

Having examined how embeddedness shapes network formation (RQ1) and how intermediaries emerge within and reshape these embedded contexts (RQ2), the analysis now turns to a crucial but underexplored question: how do these processes culminate in stable network governance patterns? Whilst the previous two perspectives establish the foundations

of network formation and the roles of key actors, a critical gap remains in understanding how embedded relationships and intermediary functions translate into functioning governance systems. This synthesis becomes particularly important when considering the *temporal* dimension of network evolution. Networks do not simply form and remain static; they must develop mechanisms for maintaining stability whilst adapting to changing conditions. In research contexts where formal institutional frameworks undergo rapid transformation, understanding how networks achieve governance stability becomes especially complex.

Regarding how industrial dynamics form, this question directly relates to discussions of institutional gradual change (bottom-up) versus sudden transformation (top-down) (see Section 2.4.2). For industrial dynamics formation, as Easterly (2008) states: "[...] these two worldviews as opposing extremes, which is a caricature—most views lie somewhere in between" (p. 96). Economic development models and institutional formation may not occur from purely top-down or bottom-up perspectives but represent complex, dynamic processes. In economic geography, numerous scholars have proposed the importance of simultaneously focusing on both "top-down" and "bottom-up" forces in shaping industrial dynamics (see Bathelt and Glückler, 2011). For example, Hodgson (2000) mentions that institutional evolution typically includes upward and downward causality, with individuals creating and changing institutions, as institutions shape and constrain individuals. Institutionalism is not necessarily limited to "top-down" cultural determinism and institutional determinism with which it is sometimes associated. Similarly, as Streeck (2005) mentions that in regional economic development's multi-tier institutional structures, lower-tier institutions subject to top-down regulation are not determined once and for all by the latter. For example, the general rule adopters, those controlling state institutions inevitably have some flexibility to adjust supranational rules applicable to them, and they can also attempt to change these rules by pressuring rule makers or rule enforcers. Although this discussion about institutional formation pathways has been widely accepted, more specific case studies are still needed regarding how these two forces mutually influence and simultaneously operate in regional economic evolution processes, forming unique economic dynamics.

Furthermore, two points merit consideration. First, since this study's research background spans China's macro institutional transition stage, China adopted a more gradual, progressive

approach in transitioning from communism to capitalism during this stage (Easterly, 2008, P96). Thus, the significant internal (regional) heterogeneity clearly displayed by China's case challenges capitalist theoretical models that narrowly focus only on national-scale institutional coordination. Theoretical frameworks derived from empirical analyses of European and North American capitalism should not be imposed on Chinese models (Zhang and Peck, 2016). Under this background, there may be strong institutional thickness conflicts and reconciliation with existing market economy models. This deeply rooted research case in local cultural environments and institutional contexts requires more detailed identification of how existing network dynamic patterns are formed and sustained under China's institutional background, requiring more careful examination within specific spatial regional areas.

Second, with digital logistics platforms emerging as new intermediary forms, they introduce more complex network dynamics and governance challenges. As Grabher and van Tuijl (2020) emphasise, digital platform emergence introduces new intermediary and coordination forms in logistics networks, requiring reconsideration of traditional governance models. These platforms not only facilitate transactions but also reshape logistics network institutional landscapes. It is creating new power dynamics in industries including logistics through controlling access to key data and network effects (Kenney and Zysman, 2016). For example, in logistics contexts, Hofmann and Osterwalder (2017) demonstrate how digital platforms blur boundaries between different types of logistics service providers, leading to new competitive and cooperative forms. These developments emphasise the need for a more nuanced understanding of how digital technologies reshape governance mechanisms managing logistics network dynamics and power relationships within them.

This leads to the third research question: **RQ3: In the evolution of logistics networks, how do top-down institutional logics and bottom-up actor strategies interact to form network dynamics?** This question addresses a fundamental gap in understanding how network governance emerges and stabilises by examining the recursive interactions between formal institutional frameworks and informal actor practices, particularly relevant in China's gradual transition context where multiple institutional logics coexist.

These three research questions form a coherent analytical plan that captures the multi-dimensional complexity of logistics network evolution. By examining how embeddedness patterns shape network formation (RQ1), how intermediaries operationalise and transform these embedded relationships (RQ2), and how particular forms of network dynamics emerge from the interplay between institutional frameworks and actor strategies (RQ3), this synthesised framework provides a comprehensive approach to understanding regional economic development. This enables examination of both the macro-structural forces and micro-level practices that jointly constitute network evolution, whilst remaining sensitive to the institutional contexts that mediate these processes.

2.6 Conclusion

This chapter first reviewed two core research approaches in economic geography: EEG and GPN. Through critical examination, whilst these two approaches can be effectively integrated and compensate for research deficiencies inherent in each, the combination of these theories still proves insufficient to fully address this study's research objectives. Therefore, building upon this foundation, this study has introduced broader institutional approaches, attempting to supplement existing research frameworks. This framework does not propose new theoretical concepts but rather combines complementary advantages of existing methodologies, providing more comprehensive analytical perspectives for understanding logistics network evolution.

Based on synthesising conceptual insights from GPN, EEG and institutional approaches, this study has proposed three interrelated and progressive research questions that explore industrial evolutionary pathways. These questions are interconnected and build on one another: understanding embeddedness patterns (RQ1) is necessary for identifying key intermediaries (RQ2), which in turn enables analysis of how network governance emerges from institutional-network interactions (RQ3). Through these questions, employing a "general-specific-general" structure, the study examines overall industrial evolutionary pathways, identifies specific actors, and returns to overall network dynamics research. Through this comprehensive approach, this research framework attempts to construct analytical scope within sub-national regions whilst expanding these analytical frameworks

that emphasise "global" as important factors, as well as provides more sufficient explanations for regional economic development from detailed perspectives, which demonstrating development possibilities for theoretical synthesis.

The theoretical contribution of this integrated framework lies in its ability to address two important gaps in existing economic geography literature. First, it remedies the *institutional neglect* in both GPN and EEG approaches by systematically incorporating formal and informal institutional analysis. Second, it bridges the *temporal divide* between GPN's static tendencies and EEG's evolutionary focus through dynamic institutional analysis that captures both continuity and change.

Furthermore, this synthesised framework demonstrates particular relevance for research contexts, where multiple institutional logics coexist and compete. The framework's emphasis on embeddedness evolution, intermediary transformation, and network dynamics provides analytical tools specifically suited to understanding economic development in contexts characterised by rapid institutional change and structural transformation. The multi-dimensional analytical approach—examining macro-level embeddedness patterns, meso-level intermediary functions, and micro-level network governance—enables comprehensive analysis of how regional economies evolve within changing institutional environments.

Based on the theoretical framework and research questions established above, the next chapter provides a detailed explanation of the research design, case selection, and data collection methods employed in this investigation.

Chapter 3: Methodology

This study's research questions fundamentally shaped the selection of methodological approaches. The core concern is about understanding processes of industrial transformation—specifically how steel logistics networks evolve, how new participants emerge within these networks, and how relationships form between different actors. These process-oriented questions, combined with the need to examine informal institutional dynamics within specific Chinese regional contexts, require methodological approaches capable of capturing complex, contextual phenomena that often resist quantification. Consequently, this study employs a case study approach within a qualitative research framework, utilising semi-structured interviews, participant observation, and secondary data analysis.

Qualitative research is recognised as particularly suited to addressing process-oriented questions in human geography research (Hay, 2010). The study's focus on understanding how industries evolve within contexts of macroeconomic transformation presents additional methodological requirements for which qualitative methods possess distinct advantages. As Schoenberger (1991) argues, under conditions of significant economic and social transformation, many analytical categories and theoretical frameworks underlying quantitative research may face new challenges in capturing emergent phenomena. Qualitative research, by contrast, aims to understand phenomena's specificity and developmental processes through detailed contextual analysis. For research that has historical dimension, such as this thesis, qualitative methods can effectively illuminate path creation and industrial emergence by revealing the "social and institutional processes that shape and operate within mechanisms of path creation" (Dawley, 2014, p. 108), thereby deepening comprehension of how industrial transformations unfold over time.

The research content's inherent characteristics provide additional justification for qualitative approaches. This study extensively examines concepts that are difficult to quantify numerically, including institutions, informality, and relational networks. The exploration of informal practices' operational mechanisms within logistics networks is particularly challenging for quantitative methods, as these practices are often concealed and highly context dependent. Their identification and analysis require qualitative methods—such as in-

depth interviews and participant observation—that can access tacit knowledge and uncover hidden dynamics (Clark et al., 2018). Furthermore, understanding why particular informal practices emerge and persist requires examination of actors' motivations, cultural contexts, and institutional constraints that are best captured through qualitative inquiry. Consequently, qualitative case study methods provide appropriate analytical frameworks for investigating the complex interactions between formal and informal relationships during industrial evolution, whilst offering the flexibility to pursue unexpected findings that emerge during fieldwork.

It must be acknowledged that fieldwork did not proceed entirely according to predetermined plans. Whilst these challenges created difficulties, they also facilitated learning about social science research methods and compelled methodological reconsideration. Rather than describing the entire research process as plan-execution focused, it is more accurate to characterise it as learning-by-doing. Consequently, the entire research process resembled an exploratory journey: beginning with fragmented cognitive pieces, gradually mapping complete industrial evolution landscapes through continuous data collection, comparison, and assembly, thereby understanding "why phenomena occur," "how they unfold," and "how they transform" through internal logic. Such qualitative and grounded research approaches offer rich opportunities for theoretical development through iterative cycles between empirical findings and theoretical understanding (Cresswell, 2009).

This chapter unfolds in the following sequence. Section 3.1 introduces the research methodology and case selection rationale. Section 3.2 provides a comprehensive review of the fieldwork process, which is divided into four chronological phases. Secondary data collection and data verification methods are presented in Section 3.3. Ethical considerations and data handling procedures are discussed in Section 3.4, followed by researcher reflexivity and positionality in Section 3.5. Finally, Section 3.6 concludes the whole chapter.

3.1 Case Study Approach and Case Selection

This study selects case study as the primary research method, comprising two hierarchical levels. Firstly, I designate the Sichuan-Chongqing region's steel logistics industry as the

overall research location for this thesis. Secondly, I focus on a specific steel plant within Sichuan Province as the concrete research case for Chapter 4's analysis of steel plant logistics department evolutionary pathways.

As one of social science's core research methods, case study's fundamental purpose involves elucidating cases' unique characteristics (Bryman and Bell, 2011). Particularly when primary research questions attempt to explain contemporary phenomena, specifically in this research, how steel logistics networks evolved into existing configurations and why such complex intermediary structures emerged. As Yin (2009) suggests, when case study represents the preferred method compared to other approaches when research questions focus on "how" or "why" certain social phenomena operate.

One of the major misconceptions regarding case study concerns the limitations of results presented through case study analysis, such as inability to generalise from case study analysis (Flyvbjerg, 2006) and biased case selection (Goertz and Mahoney, 2009). However, for specific industry evolution research, I argue that case study can better highlight its value. The reason lies in case study's capacity for in-depth understanding of key events' industrial impacts through "close dialogue" with key regional actors, economic entities, and organisations (Clark, 1998), rather than searching for materials across broader ranges. Especially for multi-participant research such as this thesis, involving different actors and multiple institutional interactions (Taylor, 2013), and exploring evolutionary processes. Case study can more deeply explore research subjects, themes, and multi-scalar levels whilst "capturing agency and context" through "deep contextualisation" of "socio-spatial relations, mechanisms, and processes" (Pike et al., 2016, p. 139).

Therefore, selecting representative cases for case study is not about overgeneralisation but should serve as recognition that "force of example is underestimated" (Flyvbjerg, 2006). Through developing new analytical concepts or making subtle improvements to existing concepts, or through extending and modifying existing analytical methods (for example, by adding explanatory elements), case study promotes theoretical development whilst obtaining "behind closed doors" knowledge to identify hidden realities (Flyvbjerg, 2006, p. 228). Thus,

by providing in-depth and contextually relevant knowledge, case study can simultaneously make valuable contributions to theoretical and social scientific development (Yin, 2009).

This research focuses on the Sichuan-Chongqing region, aiming to explore Chinese steel logistics network evolution through this region as a typical case. The Sichuan-Chongqing region, located in southwestern China (see **Figure 3.1**), comprises Sichuan Province and Chongqing Municipality. Prior to 1997, Chongqing Municipality belonged to Sichuan Province. In 1997, the Fifth Session of the Eighth National People's Congress passed the proposal to establish Chongqing Municipality as a direct-administered municipality with 88% approval (Xinhua News Agency, 2009), making Chongqing China's fourth direct-administered municipality (the other three being Beijing, Shanghai, and Tianjin) and the most recent municipality established to date. Despite administrative separation between Chongqing and Sichuan, their shared Southwestern Mandarin dialect and profound historical-cultural connections. Therefore, they are commonly referred to collectively as the "Sichuan-Chongqing Region" in daily discourse and regional research.

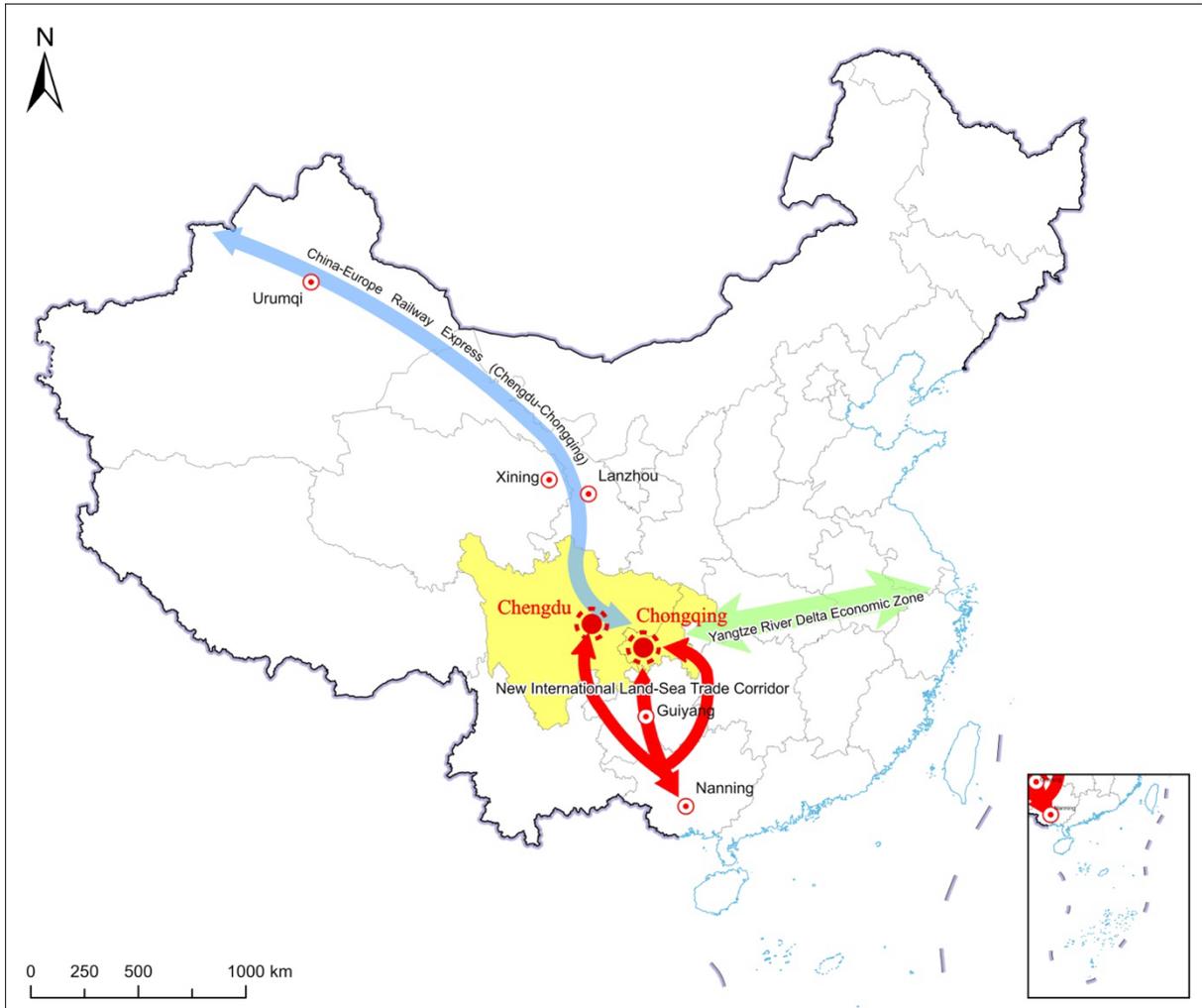


Figure 3.1: Geographical and Strategic Position of the Sichuan–Chongqing Region

Source: Made by author

The selection of the steel industry in the Sichuan-Chongqing region as the case study stems from dual considerations of its inherent significance of logistics within this region and my personal background experience.

The Sichuan-Chongqing region acts as a vital inland logistics hub within China's national logistics system. As the economic centre of western China, the Sichuan-Chongqing region accounts for over 30% of total Gross Domestic Product (GDP) in western China (Chongqing Daily, 2025). As illustrated in **Figure 3.1**, according to the Master Planning of the New International Land-Sea Trade Corridor issued by the National Development and Reform Commission (NDRC) in 2019, this region is simultaneously positioned at the intersection of

three major trade corridors: the Belt and Road Initiative (BRI), the Yangtze River Economic Belt, and the New International Land-Sea Trade Corridor (NDRC, 2019). Consequently, the Sichuan-Chongqing region has been established as the core inland logistics hub in western China, connecting westward to Europe, southward to ASEAN markets, and eastward to the Yangtze River Delta Economic Zone.

Specifically, the Sichuan-Chongqing region has established connectivity with both the Eurasian continent and Southeast Asian maritime routes through two major trade corridors: the China-Europe Railway Express (Chengdu-Chongqing), which constitutes a principal route of the BRI, and the New International Land-Sea Trade Corridor. The Chinese government provides substantial support for the construction and operation of key logistics corridors and hub platforms in this region through capital investment and policy coordination (Chongqing Daily, 2026). In 2024, for instance, annual train departures on the China-Europe Railway Express (Chengdu-Chongqing) route ranked first nationally among all China-Europe Railway Express routes, accounting for one-third of the total (CCTV News, 2025). Concurrently, the New International Land-Sea Trade Corridor has successfully connected 579 ports across 127 countries, serving as a crucial link between western China and overseas markets (Chongqing Daily, 2025). Additionally, the Sichuan-Chongqing region is located in the upper reaches of the Yangtze River Economic Belt. This provides the Sichuan-Chongqing region with low-cost, reliable waterway connectivity, which strengthens economic integration with the middle and lower Yangtze regions. Given its significance as an inland logistics hub, this region provides a compelling focal area for research into the logistics industry.

Within the regional context, this study focuses specifically on the steel logistics industry. It derives from both the importance of the steel industry in the Sichuan-Chongqing region and its developmental trajectory, which aligns closely with industrial evolution.

As one of China's old industrial areas, during the War of Resistance against Japanese Aggression, the Sichuan-Chongqing region emerged as a major rear base for the Chinese Communist Party, responsible for military material supply and equipment production. Subsequently, during the early period of reform and opening-up, from the Third Five-Year

Plan to the Fifth Five-Year Plan (1965–1980), the Sichuan–Chongqing region accounted for more than 20% of the nation’s total capital construction investment allocated to the Third Front regions—including the inland and central–western areas of Sichuan–Chongqing region, Guizhou, Yunnan, Shaanxi, Gansu, Ningxia, Qinghai, Shanxi, Henan, Hubei, and Hunan. This share exceeded that of Hubei Province, which ranked second, by approximately RMB 10 billion (Wang and Zhong, 2021). During this period, large steel enterprises located in the Sichuan–Chongqing region, such as Panzhihua Iron and Steel (Group) Company (攀枝花钢铁厂), Chongqing Iron and Steel Plant (重庆钢铁厂), Chongqing Special Steel Plant (重庆特钢厂) and so forth, made significant contributions to regional and national industrial development (Wang and Zhong, 2021; Wang, 2020).

After the late twentieth century, with the deepening of the reform and opening-up process and China’s broader economic transformation, steel producers in the Sichuan–Chongqing region gradually shifted toward differentiated and high-quality development strategies. Leveraging abundant hydropower resources, the region increasingly adopted more environmentally friendly electric arc furnace (EAF) steelmaking technologies. Until now, EAF steel accounts for approximately 40% of total steel output in the Sichuan–Chongqing region, significantly higher than the national average of around 10% (National Business Daily, 2025). Moreover, as a representative category of steel products widely used in aerospace, defence, and high-end manufacturing, vanadium–titanium steel relies on vanadium pentoxide as a core material. The Sichuan–Chongqing region accounts for more than 60% of China’s total output of vanadium pentoxide (Asian Metal, 2025).

At present, the Sichuan–Chongqing region remains one of the most important steel production areas in western China. As shown in **Table 3.1**, according to the classification standards of the National Bureau of Statistics of China, western China consists of 6 provinces, 1 municipality, and 5 autonomous regions. In 2024, Sichuan and Chongqing accounted for 45 and 10 steel enterprises, respectively, out of a total of 153 steel firms in the region. This indicates a markedly large industrial scale for the Sichuan–Chongqing region. Moreover, in 2024, steel output in Sichuan Province reached 39.07 million tons, while Chongqing Municipality produced 18.55 million tons. Together, the Sichuan–Chongqing

region accounted for over 25 percent of total steel output in western China (National Bureau of Statistics of China, n.a.; Military Industry Resource Network, 2025).

Region	Steel Output (10,000 tons)	Share in Western China (%)	Number of Steel Enterprises	Share in Western China (%)
Guangxi Zhuang Autonomous Region	5,590.86	24.83	18	11.76
Sichuan Province	3,906.89	17.35	45	29.41
Inner Mongolia Autonomous Region	3,442.39	15.29	28	18.30
Yunnan Province	2,276.06	10.11	12	7.84
Chongqing Municipality	1,854.57	8.24	10	6.54
Shaanxi Province	1,514.32	6.73	4	2.61
Xinjiang Uygur Autonomous Region	1,428.69	6.35	29	18.95
Gansu Province	1,236.77	5.49	3	1.96
Guizhou Province	587.24	2.61	1	0.65
Ningxia Hui Autonomous Region	541.77	2.41	2	1.31
Qinghai Province	136.41	0.61	1	0.65
Tibet Autonomous Region	0.00	0.00	0	0.00
Total (Western China)	22,515.97	100.00	153	100.00

(Note: Regions are ranked in descending order by steel production in 2024)

Table 3.1 Steel Output and Enterprise Distribution across Western China by Region (2024)

Source: Compiled by the author based on *National Bureau of Statistics of China* (n.a.) and *Military Industry Resource Network* (2025).

However, driven by industrial restructuring and substantial local infrastructure demand, the steel industry in the Sichuan–Chongqing region has gradually shifted from a production-oriented base to a consumption-oriented market. During the Fourteenth Five-Year Plan period (2021–2025), Sichuan implemented more than 1,600 provincially designated key projects, with total investment approaching RMB 8.8 trillion, generating significant demand for steel products (Sichuan Daily, 2026). In addition, the Sichuan–Chongqing region has become China’s third-largest automobile manufacturing base. On average, one out of every nine vehicles produced nationwide can be labelled as “Made in Sichuan–Chongqing” (Chongqing Daily, 2025). This has further contributed to strong downstream demand for steel. From the perspective of resource circulation, steel flows within the region are largely intra-regional, with particularly intensive exchanges between Sichuan Province and Chongqing. In addition, a relatively small share of steel resources originating from Sichuan is distributed to external markets, primarily Shanxi Province and northern Yunnan Province (Jiru, 2024). As a result, the region has experienced a situation in which steel demand exceeds local supply. It thus functions as a net steel-importing region, with external supplies mainly sourced from Shanxi, Shaanxi, Gansu, Yunnan, Guizhou, and Xinjiang (Mysteel, 2025). This pattern of high steel consumption and net inflows has increased demand for intra-regional distribution and long-distance interprovincial transport. As a result, it has created market opportunities for logistics providers.

According to the evaluation system of the China Federation of Logistics and Purchasing (中国物流与采购联合会)—one of the largest logistics organizations in China—logistics firms are assessed based on their scale and service capacity. Firms that meet specific criteria are certified as A-level logistics enterprises. As of 2024, Sichuan Province had more than 350 A-level logistics enterprises, ranking first in western China (People’s Daily Online, 2024). Chongqing Municipality also hosted over 100 A-level logistics enterprises (Chongqing Daily, 2025). In addition, employment in the logistics sector in Chongqing exceeded 150,000

workers in 2024 (Chongqing Daily, 2025). Building on this logistics industry foundation, the Sichuan–Chongqing region has developed a comprehensive steel logistics service system. For example, data from the Sichuan Department of Commerce show that Sichuan hosts more than 4,000 steel distribution enterprises. These firms provide professional third-party logistics support for regional steel circulation (China Metallurgical News, 2024). Moreover, the Sichuan–Chongqing region hosts a large number of major logistics enterprises and trading hubs. For instance, Sichuan Shudao Logistics Group Co., Ltd. (四川蜀道物流集团有限公司), a Fortune Global 500 enterprise, is headquartered in Chengdu, while the Southwest regional headquarters of China Logistics Group Co., Ltd. (中国物流集团有限公司) is located in Chongqing. The region also includes major steel transportation and trading facilities, such as the Chongqing Road Logistics Base (重庆公路物流基地), the *Guoyuan* Port Steel Market (果园港钢材市场), and *Liangli* Steel City (量力钢材城), which is one of the largest steel distribution centres in western China. Together, these factors indicate a high level of institutional and infrastructural maturity in steel logistics across the Sichuan–Chongqing region.

Therefore, the steel industry in the Sichuan–Chongqing region provides an ideal case context for examining the evolution path of the logistics industry. First, from a structural perspective, the region has experienced a transition from a production-oriented system to a consumption-oriented one. Correspondingly, steel logistics has shifted from an internalised model dominated by large state-owned enterprises to an externalised system relying on third-party logistics providers and specialised distribution hubs. This transformation created market demand for professional logistics services and offers empirical evidence for examining the internalisation–externalisation mechanism. Second, from a temporal and institutional perspective, the multi-stage historical development of the region’s steel industry provides substantial time depth for tracing logistics evolution. From self-built logistics systems in the late twentieth century, through the gradual emergence of third-party logistics during economic reforms, to the formation of specialised logistics networks today, this long-term trajectory offers rich historical material for identifying the institutional drivers of logistics externalisation.

Regarding my personal background experience and research feasibility. My formative experiences connect intimately with this region. I grew up in a local town centred around a steel plant (T Steel Plant) as its pillar industry. In my memory, lorries loaded with ore or various steel materials flowed continuously along highways; workers wearing uniform overalls moved throughout the town, forming daily life's backdrop. Terms related to steel transportation, such as "Golden Camel Company" (pseudonym), "drivers," "private vehicle owners," "commercial companies," alongside stereotypes like "private vehicle owners are wealthy," "steel material transportation requires overloading," and "lorry drivers represent high-risk occupations," became deeply imprinted in my early memories. Later, after moving away from the town with my parents, I only returned during Lunar New Year periods. Gradually, I discovered that frequently mentioned terms from memory were rarely discussed, replaced by new concepts such as "logistics companies" and "digital freight platforms." Simultaneously, certain fixed cognitive frameworks regarding steel transportation, such as "widespread overloading" and "ordinary workers cannot afford vehicles," also seemed to be changing. This significant transformation, which from micro-entity nomenclature to macro-industry cognition. It was spanning the crucial period when China's steel logistics industry experienced dramatic transformation (including capacity integration, stricter overloading controls, and digital platform penetration) directly constitutes the most direct observational foundation and continuous driving force for this thesis main research objective: ***how logistics networks evolve from internalised structures to multi-tiered outsourcing arrangements?***

Therefore, when I became a doctoral student, my research starting point derives from personal observation and curiosity, aiming to systematically present and analyse this industrial evolution's complex processes and internal mechanisms through more academic analysis, combined with multiple participant perspectives. This not only answers my personal questions but also aims to provide solid empirical foundations for understanding industrial transformation's dynamics within specific Chinese regional contexts.

My personal background experience also provides invaluable feasibility advantages for regional fieldwork:

1. Social Network Access: I can relatively conveniently contact willing key informants through existing personal relationships (such as veteran workers, transformed private vehicle owners, steel plant employees, logistics company participants, etc.).

2. Deep Participation Opportunities: I obtained valuable pathways for entering steel logistics-related subsidiaries for internships and conducting a one-month participant observation (specific details see section 3.2).

3. Critical Advantages of Language and Cultural Understanding: I am able to speak the Southwestern Mandarin (Sichuan dialect) with local residents. Although Mandarin has been promoted nationwide since the 1950s (Deng, 1999), the Sichuan dialect remains dominant in informal settings and industry contexts within the Sichuan-Chongqing region. Proficient dialect mastery not only rapidly reduces psychological distance and enables more relaxed, candid communication in participants' mother tongue environments. More importantly, it also enables precise capture of subtle dynamics, emotional tendencies, and informal rules within participant discourse, thereby deeply interpreting local knowledge, informal institutional logic, and cultural embeddedness contained within steel logistics network evolution. This proves crucial for revealing authentic industry practices beyond formal statistical data or official discourse, significantly enhancing qualitative data depth, richness, and explanatory power.

Additionally, this study selected T Steel (pseudonym) as the case study subject for Chapter 4's analysis of overall steel logistics network evolutionary pathways. Beyond personal experience and data accessibility, as one of the top five large-scale steel plants in the Sichuan-Chongqing region by production volume. Through privatisation restructuring, T Steel Plant transitioned from a state-owned enterprise to a private steel company, experiencing complete institutional transformation stages. Its logistics department also gradually transitioned from original internalised logistics states to current multi-participant outsourcing structures, conforming to research characteristics. Through an in-depth case study of T Steel Plant, this thesis examines complete industrial evolution contexts during institutional transformation periods and analyses mutual influence processes between multiple participants and

institutions, such as diversified investment decisions, planning and strategic forces, influences, and processes (Pike et al., 2016). More information about case selection details and the T Steel Plant is presented in Chapter 4.

Therefore, integrating unique awareness granted by personal experience, deep sensitivity to regional industrial transformation, and solid basis of research feasibility (social networks, participation opportunities, dialect interpretation capabilities), the Sichuan-Chongqing region was chosen as research site of this thesis.

3.2 Data Collection Methods and Research Process

To ensure analytical rigour, robustness, and validity whilst maximising understanding of the research questions (Punch, 2013), this study employs a mixed-methods approach comprising interviews, participant observation, and secondary data collection. Through this complementary data collection strategy, the research transcends the limitations of singular methodological approaches, thereby enhancing data quality and strengthening analytical arguments (Yeung, 2003). Conversation serves as the primary medium for social interaction, information sharing, and knowledge generation. The core data collection method of this thesis comprises semi-structured interviews, which enable researchers to identify potential narratives and sequences of events that facilitate deeper understanding of how socio-economic phenomena emerge and unfold (Dunn, 2010). As Schoenberger (1991, p. 181) argues, evidence generated through enterprise interviews represents "testimony from participants in complex, ongoing processes" alongside the fundamental rationale for their activities.

Rather than presenting these three specific data collection methods from distinct methodological perspectives, this section adopts a chronological approach to demonstrate the integrated research process. The fieldwork timeline extended from September 2022 to November 2023, encompassing four distinct phases that reflect the evolving nature of qualitative inquiry.

3.2.1 Phase One: September 2022 - March 2023

During this initial phase, I conducted eleven interviews. However, the COVID-19 pandemic significantly impeded research progress. Particularly during the early stages, pandemic control policies resulted in extended periods of home confinement, severely limiting mobility. Consequently, until the conclusion of the Lunar New Year holiday in 2023, the majority of interviews were conducted via telephone. Similarly, minimal face-to-face contact with participants meant that recruitment relied predominantly on existing social networks. Although I attempted online recruitment through online platforms such as LinkedIn, *Maimai* (脉脉), *Douyin* (抖音), and *Xiaohongshu* (小红书), these efforts proved unsuccessful, yielding no participants. The fundamental barrier appeared to be my limited engagement with these social media platforms, resulting in low follower counts that caused potential participants to suspect fraudulent activity. Consequently, I abandoned this recruitment strategy in subsequent phases.

Recruitment through established relationships afforded significant trial-and-error opportunities in this initial phase. I could verify the authenticity of secondary data findings with participants whilst inquiring about underlying causal factors, thereby developing clearer comprehension of overall logistics network structures and dynamics. Notably, given my reliance on social networks for recruitment, I sought dialogue with various types of participants across different logistics divisions who were willing to participate, extending beyond the steel industry. This approach broadened understanding beyond steel logistics to encompass the broader logistics sector. Consequently, interviews included small-scale manufacturers, state-owned enterprise logistics investment groups, third-party logistics companies, mineral producers and so forth. Through examining their logistics perspectives, operational approaches, and logistics company collaborations, I constructed broader logistics industry understanding. These conversations enabled precise identification of genuine practitioner concerns, as well as facilitating the interview quality with subsequent deeper fieldwork with logistics participants.

In accordance with Durham University ethical review standards (detailed in Section 3.4), I initially followed three pre-interview steps rigidly: detailed research purpose explanation,

reading the informed consent form, and requesting permission for audio recording. However, I discovered that these preliminary procedures compromised data collection quality in certain degrees. Reading informed consent forms often triggered defensive responses, as extensive text created impressions of participating in "highly confidential" or "responsibility-bearing" conversations. Given many participants' unfamiliarity with academic research, informed consent reading generated anxiety rather than comfort. Recognising this phenomenon, I adopted alternative approaches. Following participant agreement, I would send informed consent documentation 30-60 minutes before interviews, accompanied by brief research explanations. This timing prevented early refusal whilst ensuring informed participation. At interview commencement, I confirmed document receipt and emphasised key participant rights: complete confidentiality, interview termination rights, and question refusal permissions. This approach emphasised participant agency whilst maintaining ethical compliance and enhancing conversational effectiveness.

Regarding audio recording requests, initial attempts to inform participants of recording intentions proved counterproductive. Recorded participants exhibited pronounced discomfort and diminished conversations, fearing potential consequences from recorded statements despite I provided explicit assurances of anonymity and confidential usage of data. After several attempts, I abandoned recording requests, instead employing notetaking during interviews and post-interview reconstruction using memory and notes. Whilst this approach potentially captured fewer detailed descriptions compared to audio recording, non-recording methods enabled more comfortable participant environments and richer content sharing. I did, however, use audio recording in a few instances during later research phases, but only with participants who had explicitly consented and with whom I had cultivated strong social relationships over many years prior to the research. In these cases, I was confident that recording would not negatively affect the quality of our conversations.

3.2.2 Phase Two: March 2023 - September 2023

This phase encompassed twenty interviews. Following the Lunar New Year holiday, extensive offline recruitment opportunities emerged, significantly expanding research channels. Like the previous phase, this stage included broader logistics industry participants such as railway employees and international freight forwarders, though primary focus shifted

toward steel logistics industry participants, particularly lorry drivers. Most interviews adopted offline formats. Beyond existing personal network recruitment, I visited majority freight yards surrounding Chongqing, including Chongqing Road Logistics Base (重庆公路物流基地), *Guoyuan Port* (果园港), *Cuntan Port* (寸滩港), International Trade and Logistics Park (国际商贸物流园), International logistics hub park (国际物流枢纽园区) and parking areas near Chongqing Steel Plant (重庆钢铁厂), which is the largest steel plant in Chongqing. The physical locations of those places are shows in **Figure 3.2**.

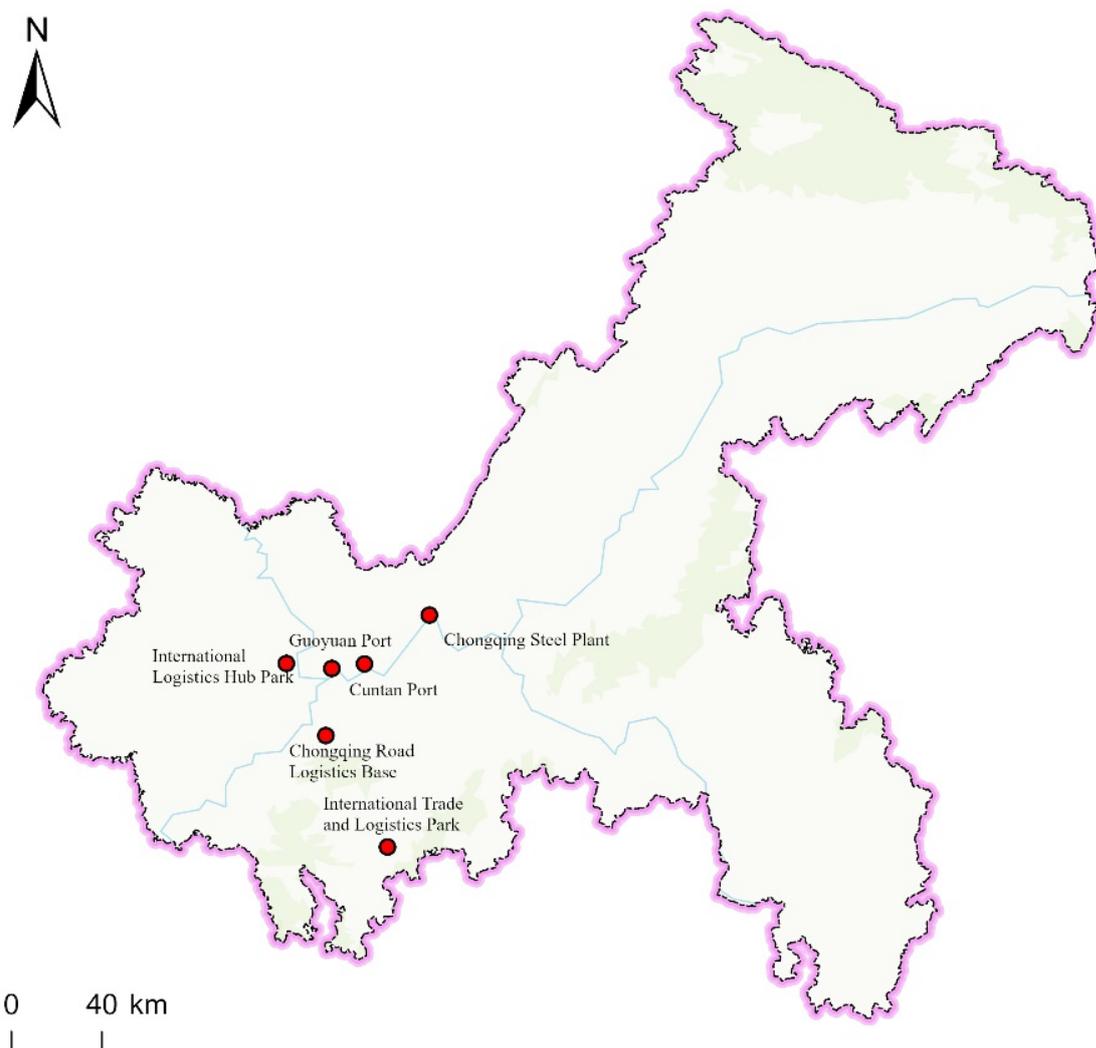


Figure 3.2: Locations of interview sites in Chongqing

Source: Made by author

Lorry driver interviews merit particular attention. Whilst I visited all Chongqing-area logistics parks, interviews occurred primarily in two locations: Chongqing Road Logistics Base and parking areas near Chongqing Steel Plant. These locations possessed two significant characteristics: abundant parking space for drivers waiting for cargos, resulting in relatively idle drivers; and accessibility for non-driver personnel, allowing unrestricted internal access to lorry driver communities. Optimal interview timing occurred during late in the afternoon hours when numerous drivers had completed daily work and were queuing for cargos, providing available time for interviews. I approached drivers whose vehicles were loaded with steel materials and whose lorries matched steel transportation specifications, which is predominantly six-axle flatbed vehicles. I also carried small gifts for participants to establish reciprocal relationships, typically cigarette packets, given widespread smoking habits among lorry drivers. I became a listening ear for these drivers, many of whom hoped that sharing their struggles with me might amplify their voices and potentially improve their circumstances through whatever channels I could access.

For in-person interviews, I obtained no signed informed consent forms, nor did I require subsequent participant signatures. All my fieldwork processed involved oral notification of potential data access and ethical issues, coupled with printed informed consent form reading and participant agreement before proceeding. Several factors motivated this approach. Firstly, participants remained reluctant to provide signatures to unknown individuals, particularly overseas institutional researchers. Secondly, signature requests would compromise interview atmosphere and impede effective data collection. Consequently, oral notification combined with printed informed consent form reading became my primary ethical compliance method during this phase. A crucial research design consideration involved establishing trust and rapport whilst maintaining strict ethical standards, particularly with initially sceptical participants, such as lorry drivers, who typically possessed limited formal education and might exhibit wariness toward academic researcher. The process above helped these participants overcome initial reservations, thereby obtaining more authentic, higher-quality interview data.

Regarding appropriate questioning approaches for different participants. Whilst scholars favour using pre-structured open-ended questions as conversation starters for semi-structured

interviews (e.g., Bryman, 2016) to effectively obtain expertise, information, and perspectives from each participant (Warren, 2002). This research reveals that unlike elite interviews, lorry driver interviews did not benefit from open-ended questions followed by closed inquiries (Harvey, 2010). Effective opening questions required participant appeal whilst demonstrating industry knowledge and concern awareness to successfully attract attention and encourage communication. Consequently, lorry driver interviews benefited from more specific questions. They are more comfortable with "why" questions, such as "Why do you maintain stable cooperative relationships with fixed suppliers?" These "why" questions directly related to daily operations rather than deep reflection. Gradual guidance seemed more effective for extracting desired behavioural logic answers. As Yin (2009, p. 89) describes interviews as "guided conversations". In this industry-specific events, through this "why" questions interview method, I successfully resonated with participants to attract interest and encourage specific event commentary. Through this approach, I could capture specific behaviours from their descriptions, request detailed elaboration, and finally inquire about underlying attitudes and logic, thereby deeply exploring behavioural rationales.

In addition, through the fieldwork, it approves that strict adherence to research question frameworks proved unnecessary and potentially counterproductive, sometimes affecting participant event detail descriptions and creating less harmonious interview atmospheres. It is more important to maintain overall thematic consistency—industry evolution and participant relationships within this research—whilst following participant thinking patterns. For example, during lorry driver interviews, participants frequently provided responses that deviated from questions, or providing non-answers. Initially, I attempted to redirect discussions toward my concern issues after participant response. However, after several attempts, I recognised this is an ineffective interviewing strategy. More importantly, it seems that following their response trajectories sometimes yielded unexpected insights. Moreover, given core thematic establishment, collected data rarely deviated significantly and eventually returned to my primary concerns.

Beyond lorry driver interviews, this phase also included broader steel industry participants, deepening overall understanding of steel logistics industry. However, a key limitation involved during this phase is dispersed interview participants and limited interview time,

resulting in fragmented materials lacking continuity. It caused numerous unresolved questions remained during interviews and data organisation, making the subsequent internship (participant observation) phase crucial for addressing these gaps and resolving outstanding issues.

3.2.3 Phase Three: August 2023 - September 2023

In late August, I undertook a month-long internship at T Steel Plant, conducting participant observation. This participant observation served two initial purposes. Firstly, joining this specific community facilitated accessibility to relevant practitioners, enabling broader professional network development and extended research opportunities. This interview-focused rather than observation-focused approach enabled researchers to identify particularly relevant participant issues that might remain unidentifiable through observation or written record analysis (Dunn, 2010). Secondly, through perspectives of participants who experienced steel plant logistics department evolution, I could more precisely understand T Steel Plant's complete evolutionary trajectory. During this period, I conducted twenty-two interviews, including in-depth discussions with T Steel Plant employees across various hierarchical levels and non-T Steel Plant steel logistics industry participants encountered during this period. This internship opportunity provided me the viewpoint from participant perspectives to explore their operational approaches, attempting to immerse myself within the industry to understand different behavioural motivations.

During this internship, as this opportunity was direct arrangement by the Board of Directors, which provided certain authority. Thus, I could easily access employees across all hierarchical levels within the steel logistics subsidiary, from leadership to staff, with high willingness to communicate. From top to bottom, I conducted in-depth interviews lasting at least thirty minutes with dozens of employees, approximately half of the interview exceeded one hour. However, this top-down arrangement showed one major disadvantage, as participants knew about my arranged presence and research purposes. Sometimes, they hesitated to describe authentic situations. Nevertheless, this situation also provided some advantages for this research. When questions involved sensitive topics, they could provide reasonable explanations and motivations for informal practices from their perspectives. Through these interviews, I connected previously fragmented information whilst resolving

some remain issues in the former phase and completing material collection for Chapter 5 on logistics intermediaries.

A crucial emphasis during internship involved private relationship establishment and informal conversations. Beyond formal interviews, important data collection process included informal dialogues during work breaks and private dinner invitations resulting from established relationships. These non-interview chatting are vital when they referred to how informal industry behaviours influenced the sector. As immediate questioning would interrupt speakers and trigger wariness. For informal information gathered during those process, I would inquire if I can use them into research in the following day. I would contact participants via WeChat or telephone the following day, requesting permission to include specific previous discussion topics as research content. Typically, participants would not directly refuse, as direct refusal represents impoliteness within Chinese cultural contexts. Consequently, when participants exhibited obvious hesitation or contemplation, I would then abandon that content as interview data. These informal conversations provided not merely industry understanding but insights into cultural backgrounds, socio-economic factors, implementation methods, and multiple perspectives. These significantly aided thesis development, particularly Chapter 6 discussions on network dynamics.

3.2.4 Phase Four: September 2023 - November 2023

After completing the internship, I conducted follow-up interviews with additional recruitment through private networks to address remaining research issues, particularly regarding T Steel Plant logistics department evolutionary trajectories. During this period, I conducted five interviews.

Primary interview targets included former steel plant participants who had departed the company. These individuals included former internal lorry drivers, steel department managers, employees, former steel plant leadership, and participants who experienced different steel plant logistics department transformation phases. To protect participants' information, I did not explicitly label their dual identities. This phase interviews focused primarily on historical event descriptions and their operational approaches and behavioural

motivations. However, given historical description subjectivity and potential retrospective interview inaccuracies regarding past events (Dex, 1995; Fetterman, 2019), triangulation became essential. Therefore, to ensure data authenticity, I cross-referenced collected information through various secondary data sources, including T Steel Plant official websites, government websites, and various industry and regional yearbooks. This process completed empirical material collection for Chapter 4 on T Steel Plant evolutionary trajectories.

Two aspects are worth to reflection regarding the overall interview process. Firstly, regarding online versus in-person interview differences. There were no significant distinctions in my research. Whilst telephone interviews occurred partly due to pandemic restrictions during early phases and geographical limitations later, most telephone interview participants were recruited based on existing trust relationships. Given established excellent social relationships with participants before interviews, differences between telephone and in-person interviews proved minimal differences in this research. While the major distinctions emerged from participant willingness to participate in the research.

Secondly, regarding different recruitment channels' impacts on research information collection. Elites are viewed as individuals occupying influential positions within social, economic, and political spaces who control "human, capital, decision-making, and knowledge resources" (Desmond, 2004, p. 264), thereby the elite interviews providing valuable macro perspectives. However, elite-focused interviews alone cannot fully capture other participants' perspectives on policies and upper-tier participant behaviours. Such elite-limited interviews may produce regional cognitive biases due to occasional power dynamic imbalances between other participants and elite interviewees (Harvey, 2010). Consequently, this research encompassed both elite and grassroots interview categories. From research outcomes, elite interview information was significantly influenced by different contact channels, whilst lorry driver interviews showed minimal variation regardless of acquaintance introductions or field recruitment approaches. The fundamental reason appears to be elite interview participants' greater concerns about potential consequences of their statements on their lives and positions. Despite this research strict adherences to Durham University ethical review standards and confidentiality assurances, such guarantees could not completely dispel their concerns.

Therefore, I found that elite interviews demonstrated distinctive differences depending on recruitment channels, especially regarding sensitive questions. For elites recruited through top-down channels, even when they were reluctant to answer certain questions due to concerns about potential consequences, they would still attempt to provide reasonable explanations owing to top-down pressure. However, these responses usually contained limited valuable insights. When both introducer-researcher and introducer-participant relationships were well established, more effective information emerged, as interviews resembled "unpaid" assistance to friends. In other circumstances, such as through bottom-up recruitment channels, relatively weak interview effects resulted, with participants refusing extensive information disclosure and seeking rapid interview conclusion, often treating the interview as "task completion." Nevertheless, grassroots interviews, such as those with lorry drivers, showed minimal content variation across different recruitment channels. The fundamental reason appears to be their reduced concerns. Willing lorry driver participants typically viewed interviewers as "confidants," hoping that dialogue would enable more people, particularly upper-tier policymakers, to hear their voices. Consequently, this participant category demonstrated high interview enthusiasm.

During fieldwork, I obtained fifty-nine valid interview datasets. As showed in **Table 3.2**, to avoid overly complex participant coding whilst protecting participant information, I categorised participants into five groups: non-steel industry logistics participants (A), steel logistics third-party logistics companies (B), steel plants (C), steel logistics subsidiaries (D), and lorry drivers (E). Specific participant details are mentioned during citation as needed.

Code	Role/Company type	Interview Date
A1	Small-scale manufacturer	11.11.2022
A2	Small-scale manufacturer	20.11.2022
A3	Logistics company	21.11.2022
A4	State-owned enterprise logistics investment group	26.11.2022
B1	Steel logistics third-party logistics company	26.11.2022
B2	Steel logistics third-party logistics company	26.11.2022
B3	Steel logistics third-party logistics company	27.11.2022
A5	Manufacturing logistics subsidiary	30.12.2022
E1	Lorry driver	30.12.2022
A6	Mineral producer	30.12.2022

B4	Steel logistics third-party logistics company	01.01.2023
A7	Logistics company	20.03.2023
B5	Steel logistics third-party logistics company	21.03.2023
D1	Steel logistics subsidiary	28.03.2023
E2	Fleet manager/lorry driver	05.04.2023
A8	National Railway Administration	20.04.2023
D2	Steel logistics subsidiary	27.04.2023
A9	International freight forwarder	09.05.2023
A10	National Railway bureau	20.07.2023
B6	Steel logistics third-party logistics company	20.07.2023
E3	Lorry driver	24.07.2023
E4	Lorry driver	24.07.2023
E5	Lorry driver	24.07.2023
E6	Lorry driver	24.07.2023
E7	Lorry driver	24.07.2023
E8	Lorry driver	24.07.2023
E9	Lorry driver	24.07.2023
E10	Lorry driver	24.07.2023
E11	Lorry driver	24.07.2023
A11	University professor (logistics specialization)	30.07.2023
A12	University professor (logistics specialization)	30.07.2023
D3	Steel logistics subsidiary	04.09.2023
D4	Steel logistics subsidiary	04.09.2023
D5	Steel logistics subsidiary	04.09.2023
D6	Steel logistics subsidiary	04.09.2023
D7	Steel logistics subsidiary	04.09.2023
D8	Steel logistics subsidiary	04.09.2023
D9	Steel logistics subsidiary	05.09.2023
D10	Steel logistics subsidiary	05.09.2023
D11	Steel logistics subsidiary	05.09.2023
D12	Steel logistics subsidiary	06.09.2023
A13	National Railway bureau	06.09.2023
C1	Steel plant	07.09.2023
A14	Manufacturing industry	07.09.2023
D13	Steel logistics subsidiary	07.09.2023
C2	Steel plant	07.09.2023
D14	Steel logistics subsidiary	12.09.2023
C3	Steel plant	12.09.2023
D15	Steel logistics subsidiary	12.09.2023
D16	Steel logistics subsidiary	12.09.2023
D17	Steel logistics subsidiary	13.09.2023
C4	Steel plant	19.09.2023
C5	Steel plant	20.09.2023

A15	Steel network freight platform	21.09.2023
B7	Steel logistics third-party logistics company	23.09.2023
E12	Fleet manager	25.09.2023
A16	Former T Steel Plant employee	13.10.2023
B8	Former T Steel Plant employee	15.10.2023
A17	Former T Steel Plant employee	17.10.2023

Table 3.2: List of interview participants

3.3 Secondary Data Collection and Verification

Secondary data comprised of several types: official data, including China Federation of Logistics and Purchasing and Chinese official data from websites ending in ".org" or ".cn", policy documents, and various yearbooks including regional and industry yearbooks; materials from media, daily newspapers, journals, and commercial publishers; steel company websites and annual reports from steel-related logistics companies; research and analysis from academic institutions and commercial consulting companies; and China logistics industry-related forums, such as Truck Home (卡车之家), Freight Vehicle Home (货车之家). Through this secondary data collection—from preliminary research preparation and interview information verification during fieldwork to final secondary data supplementation of ambiguous policy information from interviews. So that, I completed what Crang (2005) describes as iterative data collection processes "from materials to ideas and back to materials".

Secondary data possessed two main limitations: highly dispersed information and varying source emphases. For example, official website information tended toward policy orientation and widespread reporting on current issues, presenting "content they want people to know" rather than "content people want to know". Forum content, whilst representing participant subjective consciousness, lacked authenticity verification. Consequently, seeking information through secondary channels could easily become overwhelming, as researchers could not precisely capture important information relevant to my research.

To ensure data validity and compensate for potential limitations in both primary and secondary sources, this study employed triangulation as a core analytical strategy. Yin (2009) describes triangulation as "establishing converging lines of evidence" (p. 12), while Jones and Murthy (2010) characterize it as a rigorous epistemological and methodological strategy for representing and analysing economic process complexity. Through triangulation, multiple data sources and different analytical perspectives can maximize understanding of research questions whilst enhancing data authenticity and accuracy (Denzin, 2017; Yin, 2009).

This study implemented triangulation through two primary dimensions: multiple data sources (interviews, participant observation, and secondary literature) and multiple actor perspectives (elite and grassroots interviews). The secondary data proved particularly valuable in compensating for the regional industry background knowledge deficits, whilst the combination of primary qualitative investigation with secondary sources enabled comprehensive cross-comparisons that provided multiple perspectives for exploring complex phenomena. Data triangulation focused primarily on three main comparison groups.

Firstly, cross-comparison between official and unofficial data. During data collection, I consulted numerous official formal data sources, including formal document analysis of Chinese and English academic literature, government reports, policy documents, and official news reports. I also strategically combined informal information channels, particularly logistics industry-related online forums. These platforms, operating under relatively less government regulation, often contained valuable insights regarding industry practices that might not appear in official channels, such as lorry driver or related practitioner complaints and dissatisfaction with specific policies. These forums could provide important insights into the "dark sides" (Werner, 2016) of logistics industry, particularly regarding imbalanced policies.

Whilst acknowledging the limitation of individual viewpoints regarding lower verifiability, these forum discussions represented authentic stakeholder perspectives, revealing operational realities typically obscured in formal documentation. Consequently, combining these official and unofficial information channels can provide more comprehensive industry understanding,

particularly regarding formal regulation and informal practice interactions. Since logistics industry participants' interactions often combined formal and informal institutions, and industry participants prioritised immediate income over formal industry regulations. Thus, the authenticity of this secondary data, whether official or unofficial, required verification regarding whether these phenomena truly represented widespread industry occurrences. This study combined cross-comparison verification between personally collected primary data and secondary data, which enhance the reliability of the data I collected.

Secondly, cross-comparison between interview-collected data and secondary data. During interviews, I would present valuable secondary data questions or key events to participants, inquiring about their experiences and causal explanations or management approaches. Through their evaluations and responses to specific events and phenomena, I could verify the authenticity of the collected information. This approach could re-verify information accuracy whilst demonstrating my familiarity with the industry and professionalism to participants, particularly during lorry driver interviews, thereby reducing psychological distance between researcher and participants. However, individually sourced information could not guarantee complete authenticity, it is necessary for additional verification of important and filtered information.

Finally, cross-inquiry among different participants is also necessary. For example, I would ask logistics company participants about lorry driver survival difficulties or lorry driver groups about logistics company implementation strategies. Given these participants' different institutional tiers within the same spatial industry, different goals and interests may produce different behavioural logics. Consequently, different participant descriptions of identical events showed variation. This variation became one of the most valuable research viewpoints, which refers to why such variation occur? Such comparative variation appears predominantly in Chapter 5 discussions on intermediaries. Through those three correlative processes, I completed research data triangulation and strengthened primary and secondary data collaboration (Bryman, 2012).

Additionally, during fieldwork, I attended three Chinese logistics industry conferences. They are all annual industry conferences, separately hosted by three of the largest logistics-related institutions, which are China Federation of Logistics and Purchasing (中国物流与采购联合会), Tuc Media (运联) and China Communications and Transportation Association (中国交通运输协会). These conferences focused primarily on latest industry dynamics and technological advances' problem-solving capabilities. These events did not expand my interviewee networks significantly. Although several participants verbally agreed to interviews, they declined for various reasons after further communication. Nevertheless, these industry conferences provided important insights into broader logistics industry and strengthened my understanding of the sector.

As initially described, the entire research process resembled puzzle assembly. When I recognised data closure, which indicates participants no longer provided new knowledge for my research topic and achieved data saturation, I finished my fieldwork.

3.4 Research Ethics and Data Handling

This research adheres to Durham University research ethics guidelines and receives approval from the University Research Ethics Committee prior to fieldwork commencement. To ensure ethical research practices, interviews were conducted with participants' free and informed consent. The doctoral thesis interview purposes were explicitly stated, with audio recording only undertaken with participant agreement. As previously mentioned, my interviews rarely involved recording, with audio requests made only under limited circumstances where well social relationships had been pre-established.

Furthermore, to comply with strict ethical standards, I ensured that participants understood exactly what they were agreeing to participate in before research commencement, whether for interviews or internships, whilst providing each participant with opportunities to decline participation (Dowling, 2010). Additionally, I provided participants with confidentiality assurances and information outlining my academic background, thesis research objectives, and interview topics (Dowling, 2005). Maintaining confidentiality proved crucial, as elite

individuals could be easily identified within industry and participant networks and might discussed sensitive commercial information or controversial political viewpoints during interviews (Odendahl & Shaw, 2001). Consequently, I applied anonymisation to participant identities and subsequent T Steel Plant descriptions (see Chapter 4). Furthermore, this research follows accuracy ethics, ensuring that obtained qualitative data were not fabricated in any manner (Christians, 2008).

Regarding data management, during interview data processing phases, I stored original interview documents and translated versions in systematic file folders to avoid "drowning in data" (Berg, 2012, p. 53). To avoid data leakage, I copied interview materials to personal portable hard drives and uploaded them to private cloud storage as multiple data security measures. These measures included ensuring high-quality accessibility to extensive qualitative data whilst preserving and protecting qualitative data for any data analysis conducted during and after the doctoral project (Berg, 2012). Importantly, interview records and transcription data were stored in secure locations, such as my own laptop and the mobile hard disk, to prevent unnecessary access to sensitive information.

For interviews where participants preferred not to be recorded, I would use voice recorders immediately after interview completion for quickly note down my own recollection, including identified emotional and word usage details, followed by prompt organisation upon returning home to prevent detail loss over extended periods. For interviews with voice recordings and subsequent data analysis phases, I did not employ any machine transcription tools or text analysis software such as NVivo. This approach was motivated by several factors. Firstly, since majority of my interviews were conducted in Sichuan dialect, this regional language differs from Mandarin in pronunciation and vocabulary usage, and currently there is no available software can provide accurate transcription. Secondly, machine transcription cannot capture participants' emotional and tonal variations or subtle word usage differences, potentially causing me to overlook important details. Therefore, rather than choosing any transcription or text analysis tools, I manually transcribed all recorded interview audio into Mandarin and subsequently translated them into English to more precisely capture detailed interview content. Within any translation limitations required, I endeavoured to ensure that participants' original statements or words-maintained meaning in

English corresponding to participants' original intentions. Throughout this process, I am deeply grateful to my supervisors, Prof. Karen Lai and Prof. Michael Crang, for their guidance regarding cross-cultural linguistic translation.

3.5 Researcher Reflexivity and Positionality

During the research process, my personal identity was multifaceted. As a doctoral researcher based abroad and as a Chinese citizen. I functioned both as a "fellow townsman" sharing common language and cultural backgrounds with participants and as an observer separated from industry participants. As previously described, during internship, I operated both as a participant and observer, whilst potentially being viewed by colleagues as a scholar due to top-down arrangements. This multidimensional identity—whether from my personal perspective or others' perceptions—was undeniably complex throughout the research process. Such a multifaceted identity could facilitate research through flexible transitions whilst potentially creating research obstacles.

As described in the participant observation section, my internship entry resulted from top-down arrangements within the company. Consequently, employees often maintained certain wariness toward me, hesitating to describe authentic situations. This phenomenon proved more prevalent among middle-tier employees. Lower-tier employees, such as workers, showed less concern about my origins, recognising me as formerly belonging to this town. Provided they found me personable and conversable, they willingly engaged in dialogue. Upper-tier leadership possessed clearer understanding of my background, knowing my internship purposes and arrangement channels. Therefore, they demonstrated considerable mastery of conversational boundaries when communicating with me. When sensitive topics arose, they could skilfully avoid them whilst redirecting discussions toward preferred topics. However, middle-tier employees maintained more suspicious attitudes toward my identity. Despite clearly informing them of my dialogue purposes and internship objectives beforehand, they retained certain suspicions about my truthfulness. Consequently, during research with this participant category, my multidimensional complex identity created the certain obstacles, affecting data collection in some degrees.

Beyond internship multidimensional identity impacts, throughout remaining research periods, multifaceted identity transitions played different roles when engaging different participants, thereby facilitating research. For example, with familiar individuals, I might function as a junior listening to familiar elders' recount history; during industry conferences, I participated as a foreign doctoral student exploring discussions; with lorry drivers, I adopted listening to perspectives, hearing their complaints about unfair treatment they endured. Rather than formal research, these interactions resembled chance encounters with strangers over cigarettes, describing recent circumstances whilst standing roadside. For company interview subjects, I generally employed top-down policies, positioning myself as a scholar engaging in industry exploration discussions. This flexible multifaceted identity transition enabled smooth and orderly completion of my research process.

The multidimensional nature of my positionality proved both advantageous and challenging throughout the research process. My position as an insider, which could share the same dialect, cultural understanding, and establish hometown connections. Those things provide unprecedented access to informal networks and authentic narratives that might remain inaccessible to external researchers. Conversely, my simultaneous position as an outsider, as a foreign university-affiliated researcher. It occasionally created barriers, particularly with middle-management participants who remained uncertain about my intentions and loyalties.

This complex positionality required constant negotiation and reflexive awareness throughout fieldwork. I recognised that my identity was not fixed but fluid, requiring adaptation to different contexts and participant expectations. Such flexibility, whilst methodologically valuable, demanded careful ethical consideration to ensure that identity adaptations never compromised research integrity or participant trust. The ability to move between insider and outsider positions, which Dwyer and Buckle (2009) term the "space between", ultimately enriched data collection whilst highlighting the socially constructed nature of researcher identity within qualitative inquiry.

Furthermore, my personal interest in the research topic, stemming from childhood memories of industrial transformation, required ongoing reflexive examination to distinguish

between nostalgic memory and analytical observation. This personal connection, whilst providing unique insights and access, necessitated constant vigilance against allowing emotional attachment to cloud analytical judgement. Throughout the research process, I maintained awareness that my interpretation of participant narratives was inevitably filtered through my own experiential lens, requiring triangulation with multiple sources and perspectives to ensure analytical rigour.

3.6 Conclusion

This methodology chapter has described my research experiences in China and reflections on the choices made, and advantages and limitations associated with various data sources and methods used. The entire research process mirrors one of this thesis's core themes: how do informal institutions emerge and persist within formal institutional frameworks? Combining Chinese cultural and institutional contexts, I made corresponding modifications to numerous research procedures whilst still adhering to ethical review frameworks, enabling more efficient data acquisition through formal and informal method combinations.

The research limitations include limited access to government officials and digital platform participants, though these were partially addressed through cross-verification among different participants and policy document analysis. Despite these limitations, the methodology successfully captured complex industrial transformation processes whilst maintaining ethical standards and analytical rigour. The combination of insider access with outsider analytical perspective proved particularly valuable for understanding informal institutional dynamics.

As initially described, the entire research process resembled puzzle assembly. Research conclusion occurred when I recognised data closure, when participants no longer provided new knowledge for my thesis, which achieving data saturation. My empirical analysis unfolds through three interconnected and progressive chapters. Chapter 4 examines T Steel Plant's overall evolutionary pathway as the primary research case, demonstrating embeddedness impacts on overall evolutionary trajectories. Chapter 5 examines logistics intermediaries within steel logistics networks, illustrating interactions between logistics intermediary emergence and institutional contexts. Finally, Chapter 6 analyses overall logistics network

dynamics. Specifically, how logistics networks maintain stable operations under current multi-tier outsourcing structures. This approach completes comprehensive steel logistics network evolution research. More details regarding Chinese cultural contexts are presented throughout subsequent chapters, providing deeper contextual understanding of the institutional and cultural factors shaping steel logistics network evolution.

Chapter 4: The Temporal Dynamics of Embeddedness: Exploring Logistics Network Evolution in China's Steel Industry

Since Polanyi's (1944) pioneering work and subsequent elaborations by Granovetter (1985) and others, the concept of embeddedness—how economic activity is situated within social, institutional, and spatial contexts—has become one of the cornerstones in economic geography. Whilst scholars have extensively documented how embeddedness manifests across different scales, from the local to the global, the temporal dimension of embeddedness remains insufficiently explored. How does embeddedness evolve over time as industries develop? This question becomes particularly salient in this research context, where rapidly changing institutional frameworks may fundamentally alter the basis of embedded relationships.

China's transition from a planned to a market economy provides a compelling context for studying the temporal dynamics of embeddedness. During this transition, deeply embedded networks formed under state socialism encountered market forces that challenged established organisational structures and relational patterns. These tensions manifested differently across industries and regions, offering a natural laboratory for investigating the evolution of embeddedness under institutional change.

This chapter focuses on logistics networks as a strategic site for investigating embeddedness dynamics for several reasons. First, logistics networks physically connect economic activities across space, making the territorial aspects of embeddedness particularly evident. Second, logistics involves multiple actors at different organisational scales, from individual lorry drivers to large corporate entities, allowing for examination of embeddedness at different tiers. Third, logistics networks are sensitive to infrastructure developments, providing opportunities to observe how material changes affect embeddedness patterns. Through a longitudinal case study of T Steel Plant (pseudonym) in Sichuan-Chongqing region, this chapter traces the transformation of logistics networks from internally managed systems

under planned economy to multi-tiered outsourced structures under market conditions. By focusing on a single location over nearly three decades, the research identifies specific mechanisms through which different forms of embeddedness—societal, territorial, and network—influenced logistics operations at successive developmental stages. By examining the evolutionary path of this steel factory's logistics network, this study addresses the first research question: *How do various forms of embeddedness influence the formation and development of logistics networks?* Beyond addressing this deficiency in embeddedness concept through a temporally dynamic perspective, this research also aims to establish the foundation for subsequent analytical chapters through the T Steel Plant logistics network case study, providing a concrete context to better position these broader industry trends.

This chapter examines how different types of embeddedness interact and evolve in response to external shocks during China's transition from planned to market economy, and changes in the strategic value of embeddedness advantages across successive stages of industrial evolution. In doing so, this chapter aims to foster a more dynamic understanding of embeddedness that accounts for temporal change and institutional context. Furthermore, by distinguishing between individual and organisational dimensions of embeddedness, this chapter provides a more nuanced analytical framework for understanding how embedded relationships operate at different scales.

Before turning to the empirical case study, the following sections first develop this analytical framework by addressing conceptual ambiguities in existing embeddedness concept. The analysis proceeds chronologically, examining key transition periods in T Steel's logistics network evolution and identifying the changing role of embeddedness from the early 20th century to present period.

4.1 Refining the Embeddedness Approach

As a dynamic concept, embeddedness emphasis on how economic activities is embedded across different scales within social, institutional, and spatial contexts. From Polanyi's (1944, p. 57) early observation that "instead of economy being embedded in social relations, social relations are embedded in the economic system," to Uzzi's (1996, 1997) conceptualisation of

embeddedness as an exchange logic, and subsequently to Hess's (2004) refinement of the embeddedness concept within economic geography, which drawing upon the plant rhizome metaphor from actor-network theory (Deleuze and Guattari, 1988) to conceptualise embeddedness as analogous to plant root systems. Or more recent research that views embeddedness as a resource-based compensatory mechanism through which firms utilise dependencies to offset existing capability limitations (Salder, 2023).

Scholars have provided considerable detail regarding embeddedness's role and function across different industrial stages, whilst these studies also reveal embeddedness's inherent complexity. As Wigren-Kristoferson et al. (2022) describe, understanding embeddedness processes requires comprehensive research combining historical events, current processes, and future projections. Even when reaching relatively unified conclusions that embeddedness constitutes a bilateral exchange mechanism and embedding processes are continuous and long-term, while conceptual challenges persist. Although scholars have conducted extensive research on embeddedness, when employing embeddedness to explore enterprise development pathways and analyse more deeply what forms of embeddedness produce particular outcomes, the limitations of the embeddedness analytical framework become increasingly apparent. These limitations generate numerous difficult-to-explain phenomena when utilising embeddedness concepts for enterprise evolutionary pathway analyses. As Wigren-Kristoferson et al. (2022) observed, embeddedness's complexity remains rarely considered. Therefore, I contend that embeddedness remains an ambiguous concept, with this ambiguity stemming from two interrelated aspects: conceptual imprecision and blurred boundaries between different forms of embeddedness.

4.1.1 Conceptual Ambiguities in Embeddedness

Regarding conceptual imprecision, a persistent question in embeddedness research has been "Who is embedded in what?" (Pike et al., 2000). In his foundational contribution to economic geography, Hess (2004) incorporated spatial dimensions into embeddedness, distinguishing between societal, network, and territorial embeddedness. Societal embeddedness refers to actors' social and cultural backgrounds, network embeddedness to the stability and durability of interpersonal and inter-organisational relationships, and territorial embeddedness to actors' anchoring in specific places through localised networks and resources.

While this tripartite framework has been broadly validated, it addresses only half of the fundamental question, the "what" but not the "who". Even in Hess's formulation, there remains a tendency toward firm-centrism and state-centrism, and therefore neglecting non-firm and non-state actors, such as labour, formal & informal institutions. Whether considering the "genetic code" of societal embeddedness or the business network structures of network embeddedness. This approach insufficiently considers the specific roles of individual participants within the overall embeddedness framework and the interactions between individual actors (regional agents) and organisations (lead firms) (see also Boschma, 2022). In other words, embeddedness research has often been excessively firm-centric, examining embeddedness from the perspective of firms whilst neglecting how individual participants' embeddedness shapes the broader economic environment and the reciprocal influences between these levels. This analytical approach not only leads to the inefficient elucidate network dynamics but also has the risk of conceptual ambiguity. Although organisations may be viewed as aggregates of individuals, organisational embeddedness cannot simply be regarded as the sum of individual embeddedness.

Some scholars have considered the embeddedness of individual participants in shaping the overall economy. For instance, Nowak and Raffaelli (2022) developed an analytical framework encompassing the interaction between organisational and individual-level embeddedness. Moving beyond firm-centrism, Dawley (2014) focused on the role of institutional agents, particularly state governments. Some scholars have explored embeddedness from entrepreneurship perspectives, examining how firms better embed themselves into domestic and international business networks (e.g., Wigren-Kristofersen et al., 2019; Leppäaho et al., 2018). However, these contributions often build upon the existing firm-centric foundation, continuing to attribute economic development successes and failures to an overall embeddedness concept centred on firms, without clarifying from conceptual roots the different levels of embeddedness involvement.

This ambiguous actor specification leads to a second form of ambiguity: blurred boundaries between different types of embeddedness. As Hess (2004) acknowledged, the boundaries between societal, network, and territorial embeddedness are indistinct. The embeddedness

literature has not adequately explained this inherent ambiguity. I contend that this conceptual blurring stems from analytical subject ambiguity. In predominantly firm-centric research, scholars have not sufficiently distinguished between individual and organisational participants, leading to this second type of ambiguity. Undeniable, overlap and mutual influence exist among the three embeddedness concepts. However, distinguishing between individual and organisational actors enable to create a clearer understanding of these interactions in certain degrees.

Having identified these ambiguities in embeddedness concepts, I propose a more precise analytical framework that distinguishes between individual embeddedness and organisational embeddedness as separate yet interrelated dimensions. This distinction is not merely analytical but reflects fundamental differences between individuals and organisations in economic, social, and territorial contexts. Organisations are not simply aggregates of individual participants but emergent entities with distinct interests, capabilities, and institutional characteristics.

As Granovetter (1985) observed, economic behaviour is embedded in ongoing systems of social relations. However, these relations operate differently at individual and organisational levels. For example, when managers make decisions based on personal relationships (individual societal embeddedness), these may align with or diverge from the company's strategic network position (organisational network embeddedness). Moreover, social theory has long recognised tensions between individual and organisational interests. Durkheim (1984, p. 152) observed that "every harmony of interests conceals a latent conflict, or one that is simply deferred". Additionally, organisational studies have documented how individual career aspirations and personal networks may align with organisational objectives during stable periods but diverge during institutional transitions or economic restructuring (Grabher and Stark, 1997; Nee, 1989). The case of Chinese enterprises during market transition clearly illustrates this dynamic. As SOE underwent reform in the 1990s, managers utilised personal relationships to fill institutional voids while simultaneously reconstructing organisational networks. These personal and organisational networks sometimes reinforced each other but often generated tensions when personal loyalties conflicted with new market imperatives

(Boisot and Child, 1996). Thus, for embeddedness analysis, the analytical subject should be dual rather than a singular organisational dimension.

4.1.2 Disentangling Embeddedness Types

Based on the identified conceptual ambiguities and building upon Hess's (2004) embeddedness framework, I propose a refined analytical approach that distinguishes between individual and organisational dimensions of embeddedness. By differentiating these analytical subjects, this framework establishes a clearer conceptual system that avoids viewing networks as undifferentiated social structures without distinguishing between interpersonal and inter-organisational relationships. The framework recognises how different types of embeddedness operate at different scales whilst remaining mutually constitutive. On this foundation, it calls for future research to move beyond firm-centric thinking and pay more attention to the roles of multi-dimensional actors in regional economic development.

First, Hess (2004) metaphorically described societal embeddedness as a "genetic code", noting that both individuals and collectives possess histories. From an organisational perspective, societal embeddedness primarily refers to the heritage of local, domestic, and international cultural, institutional, and economic environments embodied in a company (Tacconelli and Wrigley, 2009), as well as its accumulated experiences (Burt et al., 2016). Participants' "genetic code", whether individual or organisational, are shaped through path dependency. Extending this theory, I suggest that understanding societal embeddedness should follow this logic: individuals are embedded in society, with the "genetic code" origins residing in the individuals constituting organisations rather than the organisations themselves. Individuals collectively form organisations, causing organisations to possess this genetic code.

As in Hess (2004)'s Silicon Valley case, he described how transnational corporations transfer their "genetic code" to new regions when they enter, with this code originating from the company's "local culture" in Silicon Valley. I contend that this local culture influences individual participants in the company, which including executives making strategic decisions. These decision-makers' collective genetic code shapes the company's strategic

direction and genetic code. The key logic behind corporate embeddedness is the personal sunk costs (financial and emotional) of key decision-makers (Salder and Bryson, 2019). Thus, for societal embeddedness, I argue that greater attention should focus on individual participants and the personal groups constituting the organisational framework rather than the enterprise itself.

Network embeddedness, by contrast, presents a different configuration. Unlike societal embeddedness, the entity participating in economic network construction is often the company (organisation) rather than the individual, as economic activities majority occur between companies. Even when individual participants exist, such as independently operated freight vehicles, they must register as operators, possessing company attributes. Therefore, network embeddedness directly related to transactions is associated with organisations, including inter-company business networks. The fundamental reason for considering network embeddedness at the company level is that business practices and development strategies are adjusted around the company's basic values (Hueso et al., 2020). Additionally, company interests and individual interests are fundamentally distinct; they may align or mutually exclude each other.

Thus, network embeddedness represents company behaviour, whether economic or non-economic; formal and informal; intra-organisational and inter-organisational relationships. From a single enterprise perspective, network embeddedness typically involves factors such as durability and stability of business operations (Hess, 2004). I contend that network embeddedness is most directly related to economic activities and also the most "fragile" embeddedness. This fragility indicates that when external influences occur, network embeddedness may be the quickest to disengage. For network embeddedness itself, both the time dimension required for formation and the cost of disembedding are relatively low. Unlike societal embeddedness, it is not constrained by physical space but can occur in a vacuum. When two different organisations transact, network embeddedness emerges; when the transaction disappears, network embeddedness similarly disappears. Its establishment and cancellation require relative less additional costs. However, network embeddedness is directly influenced by the other two embeddedness types; high-intensity societal embeddedness leads to denser information networks and social factors like trust between

members, directly promoting network embeddedness formation. Territorial embeddedness similarly promotes network embeddedness formation, as geographical clustering facilitates business relationships.

Network embeddedness also concerns organisations' relationships with broader participants, such as government non-governmental organisations, and local non-economic participants. This form of embeddedness is directly linked to societal embeddedness. As Yeung (1998) noted, trust established between different network participants is key to business success. This trust, whilst part of network embeddedness, is also influenced by societal embeddedness represented by *guanxi* (personal relationship 关系) between the individual participants comprising these entities in China business context. (further discussion of *guanxi* and network dynamics is covered in Chapter 6).

Territorial embeddedness aligns more closely with Hess's (2004) discussion—when either individuals or organisations are fixed in specific physical spaces, territorial embeddedness emerges. In this concept model of individuals combining into organisations, organisational embeddedness and individual embeddedness show relatively small differences. Both originate from embeddedness's spatial logic (Hess, 2004). Both individuals and organisations embedded in fixed spaces generate territorial embeddedness through formal and informal interactions with the physical space and participants within it. For example, Samsung and Tesco's joint venture in Korea emphasised "strategic localisation," stressing product, procurement, staffing, and decision-making localisation to enhance territorial embeddedness in cross-regional investment (Coe and Lee, 2013).

Territorial embeddedness primarily emphasises relationships between participants and physical locations rather than between participants. Terms like territorialisation and deterritorialization directly express participants' changing embedded connections with physical spaces (Thrift, 2002). As described earlier regarding network embeddedness, companies establish connections with other participants and with local institutions. These connections with local institutions represent a key concrete manifestation of a company's territorial embeddedness, as does fixed asset investment within defined physical spaces. For

individuals, territorial embeddedness entails entanglement between the person and the local geographical environment. As Ghezzi and Mingione (2007) described, individual social behaviour is influenced by family, ethnicity, and local religion. This entanglement involves personal property in the locality or family members working or studying in the same physical location. Even participants' social relationships (societal embeddedness) within this physical space can also be viewed as their local territorial embeddedness. Once participants, whether individuals or organisations, choose to leave specific physical environments, they lose these spatial connections to some degree and incur exit costs, which positively correlate with embeddedness degree.

Evidently, the boundaries between embeddedness concepts are indeed blurred and mutually influential. Such as the personal social relationships are included by both societal and territorial embeddedness, and companies' broader operation networks establishing creating both network and territorial embeddedness. As Storper (1997) described, territorialisation typically connects with specific interdependencies in economic life, further confirming this mutual dependence between territorial and network embeddedness, or the entanglement between company network embeddedness and individual societal embeddedness. For instance, through research on small and medium-size enterprise (SMEs) embeddedness, Salder and Bryson (2019) found that in the process SMEs establishment, lifestyle and business choices are difficult to separate.

However, this refined of embeddedness concept in this thesis provides more detailed explanations. Compared to the original concept, this more detailed participant classification can provide clearer understanding, particularly for societal and network embeddedness concepts. Under the original framework, Haag and Sandberg (2020), from a company perspective, tended to describe company network embeddedness as experience brought by company genetic code, influenced by institutional environments and culture (Tacconelli and Wrigley 2009). Similarly, societal embeddedness under the original framework was described as how company experience shapes present and future behaviour (Frasquet et al. 2018; Lowe and Wrigley 2010). However, the above contains blurred forms of embeddedness, with participants' societal embeddedness highly overlapping with network embeddedness. As mentioned earlier in the societal embeddedness section, company decisions are made by

company leaders and key decision-makers. When analysis focuses on more detail analytical subject, this company-dimension societal embeddedness is shaped by individual-dimension societal embeddedness, which further influences company network embeddedness. By adopting a non-firm-centric embeddedness concept in this thesis, there is greater clarity in delineating different embeddedness roles in economic and social environments, which enables more effective identification and analysis of their interactions and operational logics.

Therefore, regarding the initial key question, who is embedded in what? (Pike et al., 2000). I consider that individuals are embedded in social environments; organisations exist as aggregates of these individuals, embedded in economic networks; finally, individuals and organisations are simultaneously embedded in territories. Then, these organisations and individuals are influenced by different environmental and policy levels, forming the overall socio-economic environment. For economic development, these three embeddedness types need to maintain relative independence while internally maintaining certain associated states.

Based on this refined embeddedness concept, which distinguishes between individual and organisational dimensions, this thesis examines how these theoretical insights illuminate processes of industry evolution. By applying this concept to a steel logistics network in China's Sichuan-Chongqing region over a 30-year period, this study demonstrates the analytical value of this refined embeddedness concept in understanding the complex interplay between social relationships, economic networks, and territorial contexts during institutional transitions. Moving beyond firm-centrism to examine the multi-scalar nature of embeddedness, it provides a clearer insight into how economic geographies are produced, reproduced, and transformed through the actions of individual and organisational actors embedded in specific historical and spatial contexts.

4.2 T Steel Plant: From State Ownership to Market Transition (Prior to 1997)

T Steel's antecedent facility was initially established in the early 20th century. During China's resistance against Japanese aggression in the 1940s, the facility served military purposes as a

weapons production base. Following the establishment of the People's Republic of China, it was gradually transformed into a steel plant under SOE structure, assuming the nascent form of current steel factory. This plant is situated in a mountainous region characterised by deep hilly terrain, benefiting from the area's rich mineral resources, including coal, aluminium, and particularly some of China's lowest-sulphur white cast iron deposits. This geographical advantage had established the region as a centre for steel production since the Western Han Dynasty, with indigenous inhabitants producing agricultural implements through the smelting of shallow iron ore deposits.

During this initial period, the plant's internal transport department served a dual function, managing both inter-workshop transfers and the external transportation of raw materials and finished products. Under China's "Reform and Opening-up" (改革开放) policy initiated in 1978, which marked the transition from a planned economy to a "socialist market economy". This steel plant operated as an SOE with a centralised management structure for logistics operations. Despite increasing production volumes, the overall scale of operations remained relatively limited. In the 1980s, it witnessed significant increases in production output. As a representative of heavy industry under the SOE structure, the factory maintained a comprehensive internal logistics system until 1997. Under the planned economy regime, this structure provided stability and operational continuity (resource from the official website of T Steel)

In "Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness" (Uzzi, 1997). It introduced the concept of over-embeddedness, which occurs when actors or organisations become excessively dependent on existing economic structure. This over-reliance limits their ability to access new information, adapt to environmental changes, and innovate. In this scenario, economic behaviour becomes deeply embedded in social networks, influenced not only by purely economic factors but also by social relationships, trust, and cultural norms. Building on this insight, this chapter reveals a more nuanced form of over-embeddedness, which I term "multi-dimensional over-embeddedness". It refers to a condition where actors are simultaneously and deeply integrated across societal, network, and territorial dimensions, with these forms of embeddedness mutually reinforcing each other. This creates a highly stable institutional system where change becomes contingent on shifts in multiple

embedding mechanisms simultaneously. While this configuration can provide stability and predictability in certain contexts, it may impede adaptation when environmental conditions demand organisational transformation.

During this period, T Steel's logistics department, or even, the steel plant's overall operational model exhibited characteristics of high institutionalisation, defined as the closure of organisational boundary and internal relationship stability. These characteristics reflected the profound fusion of societal, territorial, and network embeddedness. These highly institutionalised features can be regarded as the pervasive influence of regulative, normative, and cultural-cognitive elements that provide stability and meaning to social life within organisations (Scott, 2013). In this context, "high" institutionalisation refers to the degree to which these elements have become entrenched and taken for granted, resulting in a rigid, self-contained operational system (Greenwood et al., 2008). This manifested in high vertical integration, limited external interaction, standardised procedures, strong internal hierarchies, and resistance to external market influences. This multi-dimensional over-embeddedness created a system characterised by closed organisational boundaries and high internal stability.

Although China's broader market-oriented reforms began in 1978, large-scale market-oriented reforms were concentrated in the mid-to-late 1990s, when Chinese enterprises began implementing "reduce staff to increase efficiency" (减员增效) reforms. Large numbers of SOE employees had their employment contracts forcibly terminated. According to data from the China Entrepreneur Investment Club, the number of SOE in China decreased from 118,000 to 34,100 between 1995 and 2003. During this period, the SOE workforce declined from 112.6 million to 68.8 million, a reduction of nearly 44 million workers (Chen et al., 2017). The primary reason for this transformation was that large-scale implementation of property rights reforms within China's SOE system began with the "*Zhua da Fang xiao*" (grasping the large and releasing the small, 抓大放小).

It was promulgated on November 14, 1993. In the Third Plenum of the 14th Communist Party of China (CPC) Central Committee adopted the "Decision on Several Issues

Concerning the Establishment of a Socialist Market Economic System" (中共中央关于完善社会主义市场经济体制若干问题的决定). Under which the "grasping the large and releasing the small" policy framework was implemented. Specifically, the Chinese government mandated that most loss-making large and medium-sized SOE resolve their difficulties within three years. Forming enterprise groups became a core pathway to achieving this objective. " *Zhua da* " (Grasping the large, 抓大) entailed concentrating resources to support large SOE crucial to national security and economic lifelines (such as energy, military industry, and heavy industry), forming internationally competitive enterprises through mergers and restructuring to ensure state control over core industries (Hsieh and Song, 2015). For instance, during this period, PetroChina and Sinopec quadrupled their asset scale through the merger of provincially scattered refineries, joining the ranks of the Global 500, in 2024 ranking No.5 (China Petrochemical News, 2024). Meanwhile, " *Fang xiao* " (releasing the small, 放小) involved liberalising reforms for small and medium-sized SOE (such as local textile plants and food factories), permitting share cooperation, contracting and leasing, or even bankruptcy sales, resolving efficiency problems through market mechanisms (Hsieh and Song, 2015). Between 1998 and 2001, 66,000 small and medium-sized SOE nationwide underwent restructuring, with approximately 80% exiting state ownership (Hu, 2016).

Prior to this, SOE reforms were concentrated in the pilot reform stage, including the 1978-1984 " *Fang quan rang li* " (power delegation and profit sharing , 放权让利) phase. For example, in October 1978, the Sichuan Provincial Government selected six SOE, including Chongqing Iron and Steel and Chengdu Seamless Steel Pipe Factory, to pilot reforms expanding SOE operational autonomy. It allowed them to retain portions of their profits and provide appropriate bonuses to workers if annual production targets were met (Western Times, 2009). This was followed by the 1985-1992 phase of separating ownership and management rights of SOE, centered on the "Decision of the CPC Central Committee on Economic System Reform" (中共中央关于经济体制改革的决定) (Central Committee of the Communist Party of China, 1984). This reform sought to create a clearer distinction between the state's role as owner and enterprises' role as autonomous operators, granting SOE managers greater decision-making authority over production, pricing, and personnel while

maintaining state ownership of productive assets (Xiao, 2018). Although the first two rounds of SOE reforms achieved certain results, serious information asymmetries persisted between the state and enterprises, and market-supporting institutions were lacking to promote genuine separation of ownership and management rights, leading to problems, such as unclear property rights and absent ownership in SOE.

The essence of this strategy was "strategic trade-offs"—under limited resources, the state contracted its management radius, focused on key industry, while simultaneously releasing the market vitality of small and medium-sized enterprises to achieve overall economic recover of SOE. Based on these, the corporate restructuring was comprehensively promoted, and China economics entered a more concentrated phase of SOEs privatization reform (see also People's Daily Overseas Edition, 2018). In the case of T Steel, privatization restructuring was not initiated until 1997 due to it severed financial difficulties. Therefore, within this research, I apply its privatization transformation as the milestone in its transition from a planned economy to a market economy, rather than the official 1978 reform date. This approach more accurately captures the institutional changes that occurred before and after the enterprise's own transformation.

During this phase, as a typical *Danwei* (单位, work unit), T steel encompassed comprehensive services ranging from production facilities to the daily needs of employees. This town, built around the steel plant, included not only steel-related industries but also hospitals, schools, and almost all industries necessary for the daily lives of employees and their families under the entire steel plant. To understand the formation of this multi-dimensional over-embeddedness, it has to analyse the distinctive Chinese *Danwei* system as an entry point.

China's *Danwei* system originated in the mid-20th century as part of the macro-emergency institutional adjustments implemented by the Chinese government to adapt to the economic crisis caused by the "Great Leap Forward" (*Da yue jin*, 大跃进) (Naughton, 2018). Lv (2015) argues that the boundary closure and internal self-cycling system under this *Danwei* system

stemmed from historical factors, with origins traceable to the military supply system that began in the late 1930s and extended through the pre-and post-Reform and Opening-up period. Even before 1949, the *Danwei* assumed significant economic and welfare functions. In subsequent stages, it evolved into a political mechanism for controlling overall social stability. Lv (2015) characterises it as a "minor public economy" (p. 36). He also acknowledges that while this *Danwei* system constructed a stable social structure, it simultaneously harboured certain deficiencies. Rather than discussing the origins of this *Danwei* system or examining more macro-governmental control levels. This thesis focuses on the industry itself reveals that Lv (2015)'s observations are substantiated at the sub-national regional level. This *Danwei* system formed a closed, self-sufficient, and relatively externally resistant unique space within a defined physical area. Within this space, participants developed high levels of embeddedness—societal, network, and territorial with each other.

From territorial embeddedness perspective, the *Danwei* system restricted individual participants' activity range. All aspects of daily life—including food, clothing, shelter, transportation, and complementary facilities such as medical care and education—received comprehensive coverage within the physical space of the *Danwei* system. Participants within the *Danwei* space could fulfil all their needs within this space. This fixed physical region created a unique sense of regional belonging among the people within the area. As Perry (2015) describes, before the *Danwei* system, when Chinese people met, they typically asked, "Where are you from?" The answer to this question usually referenced a city or province, such as Sichuan, Shanghai, or Guangdong. During the *Danwei* system period, the answer to the same question shifted from geographical location to work unit. For example, "I'm from Bank of China" or "I'm from the Seventeenth Department Store" (p. 42). Although this phenomenon has considerably weakened today, it indeed represented a unique temporal imprint during the *Danwei* system period. Additionally, the *Hukou Zhengce*(户口政策, household registration policy) implemented from the 1950s onwards similarly restricted population mobility between regions to some extent (ibid). From another perspective, these policies also enhanced the territorial embeddedness between participants and regions. Furthermore, the unique *Danwei* housing supply system, wherein the unit provides employees with significant concessions to "allocate" housing (Bian et al., 2015), further strengthened territorial embeddedness. These residences were typically owned by the *Danwei* and distributed to employees as an employment benefit (Logan and Bian, 1993).

Consequently, while these unit employees had their work lives anchored to a fixed location, their residences were often uniformly allocated by the unit and relatively concentrated. This closed organisational boundary anchored these participants' embeddedness with the local physical space to this specific location, creating extremely strong territorial embeddedness for those within the *Danwei*.

Regarding societal embeddedness, Yeh (2015) describes the *Danwei* system as a "lifetime social welfare system virtually from cradle to grave" (p. 60). Within such a *Danwei* system, work, family, neighbours, and social relationships concentrated within this fixed geographical space. A mature *Danwei* system manifested in limited or non-existent labour market mobility. Employees within the unit were permanent members, enjoying lifetime employment (Naughton, 2018). Generally, these unit employees would arrive at their designated *Danwei* after high school or university graduation, with this arrangement continuing for life (Yeh, 2015). When all *Danwei* personnel were anchored in this fixed physical space for both work and life, repeated daily interactions formed high-intensity social networks among actors. Combined with the closure of territorial boundaries, a relatively closed social network formed within the unit. This "all-encompassing" *Danwei* model strengthened internal connections while limiting interactions with the external world. For instance, the case of the T steel, the plant entirely comprised by local personnel, as the town itself depended on the steel plant, with all public service institutions, such as schools and hospitals subordinate to the steel plant. According to surveys, over 80% of households in the steel plant town had at least one family member employed by the steel plant at the time (A17, 17.11.2023). Consequently, complex societal embeddedness networks existed among steel plant employees, forming an extreme state of over-embeddedness in society perspective, which at the expense of external market participation.

Furthermore, network embeddedness which directly related to industrial operations exhibited highly internalised characteristic as well. In logistics and transportation, the steel plant adopted a highly vertically integrated strategy. As one steel plant logistics department employee from that period described:

"At that time, our steel plant belonged to the state-owned system. We produced ourselves, then bought vehicles ourselves, recruited drivers ourselves, established repair shops ourselves, and maintained and serviced the vehicles ourselves. [...] Everything was self-operated and self-transported. So, at that time, it was only the steel plant's own transportation department doing the work; we are the only one." (B8, 15.10.2023)

From vehicle procurement, driver recruitment to repair services and supporting facilities, everything operated internally, forming a self-sufficient, closed system. This "self-digesting" model aligned with the macroeconomic environment of the time: on one hand, the steel plant's production capacity remained relatively limited; on the other, domestic steel consumption had not yet exhibited significant growth. A former steel plant employee described the situation at the time as "monopolistic operation" (A6, 30.12.2022). Another former employee of T steel explains to me in detail:

"Because we were the internal transportation enterprise of the group company, it had a certain monopolistic nature. Monopoly meant that our own materials were basically entrusted to us, arranged by ourselves, and at that time, our work basically did not engage in social transportation. If there were no materials, we would just run empty. Basically, it was completely our own transportation... It was like, these are all your jobs, and no one else can take them away. For example, if others wanted to participate, they couldn't [...] At the very least, as long as we didn't release our logistics resources, others had no right to transport. That was the situation. We also didn't need to seek external resources for transportation operations... And from an economic perspective, our primary indicator at that time wasn't economic efficiency and cost but ensuring the smooth production of the steel plant. For us, cost was merely a calculation index. Although the leadership's intention was to require us to continuously reduce costs, in reality, for our transportation costs, there was no [...] measurement standard. For instance, [...] the leadership would only subjectively tell us to reduce it by 2% or 3% [...] but] these were all virtual values. And even if these indicators were used to assess us, they ultimately wouldn't have much impact on us. So, under that special system and situation at the time, that's how it was." (A17, 17.10.2023)

As he described, under the institutional framework of that time, the transportation system was almost isolated from the external world. It neither engaged in external logistics activities nor concerned about its own logistics costs. As long as production was ensured, everything else was secondary. This formed a completely closed internal logistics system, both for the logistics industry itself and for vertical industrial integration. Under this system, the network embeddedness of T Steel's logistics network existed in a state of complete internal circulation.

During this period, cost accounting was not a significant issue. Most transportation, including the delivery of finished products and the reception of raw materials, typically involved empty backhauls. Although this inefficiency of logistic sector was not a major issue at the time, it later became a key consideration for logistics operations. Concepts of backhaul (utilising the backhaul journey for transportation) or even deadhead (the strategic planning of trips without cargo from the point of origin) had not yet been prioritised but eventually became important factors in optimising logistics efficiency and cost management. However, in the context of T Steel's multi-dimension over-embeddedness at the time, the more pressing issue of maintaining production and supply chain continuity overshadowed these operational inefficiencies.

The analysis reveals that the interaction between societal, network, and territorial dimensions created a particularly rigid organisational structure, and these forms of embeddedness continuously reinforced each other within this fixed space, forming this multi-dimensional over-embedded structure and highly stable internal space. Specifically, societal embeddedness manifested in the strong interpersonal relationships and shared cultural norms within the steel plant, fostering a cohesive but potentially isolated workforce network. Network embeddedness was evident in the tightly connected internal supply chains and information flows within the industry itself, while effective for internal operations, limited external collaboration. Territorial embeddedness reflected the steel plant's deep rootedness in the local geography location and the spatial fixity of individual participants, both in terms of physical infrastructure and its role in the regional economy.

In turn, the high stability of this internal system further supported the further closure of organisational boundaries. While it provided short-term stability and predictability for the enterprise. It also limited the enterprise's capacity for innovation and market adaptability. As a result, personal relationships (societal embeddedness), departmental boundaries (network embeddedness), and local economic dependencies (territorial embeddedness) became so intertwined that they collectively hindered the organisation's ability to adapt to changing market conditions. The intricate interplay between these three dimensions of embeddedness, and their tight interconnection, led to a system where personal relationships, departmental

boundaries, and local economic dependencies were deeply entangled. Societal relationships influenced career decisions, organisational structures reflected and reinforced social hierarchies. The factory's territorial rootedness further consolidated these interconnections, forming a pattern of recurring internal circulation. Thus, this multi-layered embeddedness created an organisational ecosystem. This state not only epitomised the early stages of China's socialist market economy but also provided an important theoretical perspective for understanding the subsequent motivations and challenges of state-owned enterprise reforms.

Therefore, prior to 1997, T Steel exhibited typical multi-dimensional over-embeddedness characteristics. This state primarily manifested in the high closure of organisational boundaries, extreme stability of internal relationships, and extreme distrust of external markets. This over-embeddedness was a product of the specific historical environment, reflecting the unique organisational forms in China's planned economy period. Undeniably, this multi-dimensional over-embeddedness was sufficient to support the operation of the entire industry and even society in this completely internalised, closed environment. Moreover, in the absence of external forces, it seemed to achieve a delicate balance that could continue operating sustainably. However, as the market economy gradually advanced and the steel plant shed its *Danwei* system, moving toward privatisation. The disadvantages of this multi-dimensional embeddedness gradually emerged. During the subsequent reform process, breaking this state of multi-dimensional over-embeddedness, achieving moderate openness of organisational boundaries, flexible adjustment of internal relationships, and effective interaction with external markets became key tasks for the transformation of the steel plant.

4.3 First Reform Phase: Confronting Over-embeddedness (1997-2004)

In 1997, the enterprise confronted severe financial difficulties, characterised by wage arrears and substantial debt. According to data from the T Steel's official website, despite employing over 12,000 staff, the plant's annual steel production remained below 200,000 tonnes, indicating profound operational inefficiency. Against the backdrop of the Asian economic crisis (1997-1998), which exposed the vulnerabilities of the Asian economic model (Naughton, 2018), Chinese SOE accelerated their market-oriented reforms. This reform

model was deemed crucial for maintaining economic stability and competitiveness (Garnaut et al., 2006). It encompassed measures to enhance SOE efficiency, reduce state subsidies, and, in some cases, privatise SOE (Lin and Zhu, 2007). Aligned with this context, T Steel similarly undertook a restructuring plan, ultimately transforming from a SOE into a private entity.

Following the "*Zhua da fang xiao*" (grasp the large, let go of the small) strategy proposed at the 15th National Congress in 1997. As well as the Chinese government encouraged SOE to form "*qiye jituan*" (enterprise groups, 企业集团), during this period (Keister, 2009). T Steel transformed from a state-owned steel plant into the T Group (pseudonym). Although the enterprise officially became T Group after privatisation, I continue to use "T Steel" throughout the thesis for consistency and clarity. In 1997, this steel plant initiated its privatisation process. Privatisation led to rapid expansion and increased production capacity, straining existing transportation infrastructure. In response, the steel group launched its first logistics reform. This reform involved attracting non-internal transport vehicles to supplement its transportation capacity and establishing an external logistics department. This new entity operated alongside the original transport department, though management authority remained with the steel plant. However, under the original institutional structure, within this multi-dimensional over-embeddedness. It became a significant obstacle to the logistics industry's transition from internalisation to marketisation. This rigidity exemplified what Uzzi (1997) termed the "paradox of embeddedness," where relationships that provide benefits during stable periods may become burdensome when facing external shocks or requiring radical transformation. The complex interplay between these three dimensions of embeddedness resulted in a system which personal relationships, departmental boundaries, and local economic dependencies were deeply entangled. This multi-dimensional internal over-embeddedness explains why attempts to change any aspect of the organisation often faced resistance from multiple fronts, making transformation particularly challenging.

4.3.1 Tensions Between Production Expansion and Logistics Department Growth

During this period, the transport department underwent passive expansion driven by the steel plant's development and the introduction of market mechanisms. However, logistics was not viewed as a primary contributor to the steel plant's economic development and did not undergo active expansion. Instead, it developed passively as an auxiliary industry. As Löhr and Mattes (2022) noted, during industrial transitions, companies may narrow their portfolios or relocate their activities, potentially for financial reasons. From the steel plant's perspective, logistics did not generate direct economic benefits. Its primary function was to serve the core industry. Consequently, it was not prioritised as a primary objective in the enterprise transformation process, causing the original "price-indifferent" transportation model to gradually lag behind the steel plant's own development, becoming an important constraint in development process.

In the late 1990s and early 21st century, overall production capacity gradually expanded due to macroeconomic development and the privatisation of the steel plant. This expansion, along with increasingly diversified sales methods, largely responded to China's ongoing transition from a planned economy to a market economy system (Naughton, 2018). This macroeconomic background and policy support provided new opportunities for the steel plant to explore diversified sales channels, rapidly expanding its sales volume. An interviewee's statement clearly illustrates this changing situation:

"At that time, you actually needed a certain *guanxi* (*personal* relationships) to sell steel. But the most important thing was to sell it; you needed some funds to turnover. Because the regulations weren't so strict at that time, as long as you had connections, you could sell steel. When the factory couldn't sell, of course, the more people who came to sell, the better." (A16, 13.10.2023)

This statement emphasises how regulatory relaxation permitted more diversified sales methods. It also highlights the continued importance of *guanxi* (personal relationship, 关系) in business operations (detailed discussion of *guanxi* in Chapter 6). The interviewee's emphasis on relationships and capital turnover reflects the steel industry's increasingly

market-oriented nature, where sales ability and cash flow management became crucial. Additionally, the plant's positive attitude toward multiple sales channels ("the more people who came to sell, the better") indicates strategic adaptation to new market realities. This aligns with Keister's (2009) observations on how Chinese enterprises adapted to market transitions by leveraging formal and informal networks. Thus, expanding sales channels represented not merely a response to increased production but a strategic reconfiguration of the factory's market approach to accommodate the broader economic reforms underway in China during this period.

The introduction of market mechanisms caused steel product prices to fluctuate, consequently affecting transportation prices (as steel sales typically included delivery to designated locations). However, this created complex dynamics between sales and transportation systems. While steel market prices fluctuated, underlying transportation costs remained relatively stable. The discrepancy between volatile steel prices and more rigid transportation costs created friction between these two departments. As one interviewee described:

"Because previously, under our steel plant's unified management of transportation, steel transported outwards basically meant vehicles backhauling empty. At that time, calculations were based on relatively high costs, and our fixed transportation prices were quite high, leading to disagreements between the sales system and the transportation system. The sales system had significant objections because they believed steel couldn't be sold due to high transportation costs. For example, if our internal transportation cost to Chongqing was 300 yuan per tonne, they might find transportation vehicles willing to transport for 250, 230, or even 220 yuan in the market. In this situation, conflicts arose between the two departments. [...] combined with the fact that our own transportation system's capacity was gradually becoming unable to meet the steel plant's production volume, this contradiction became increasingly severe." (A17, 17.10.2023)

Evidently, due to the logistics department's lack of prioritisation, logistics sector could not process market-oriented transformation simultaneously with the steel plant's main industry. Consequently, the logistics operational mode under the original system failed to satisfy the steel sales model in the market economy environment. Therefore, when steel sales faced challenges due to market downturns, the transportation department often became the target of criticism. This occurred because the rigidity of transportation costs made it difficult for the entire steel sales package (product plus transportation) to remain competitive without

squeezing transportation profits. As a result, the steel plant began attempting open up its logistics operations, trying to incorporate external logistics vehicles to alleviate its logistics pressure while resolving conflicts between sales and logistics departments.

4.3.2 Interactions Between Different Forms of Embeddedness

During the initial logistics department expansion, the constraints of multi-dimensional over-embeddedness became apparent. Individual societal embeddedness, in particular, continued to interfere with the organisation's attempts to expand its network embeddedness. Although this initial expansion provided some relief from immediate logistical pressures, it did not fundamentally resolve the developmental constraints imposed by the over-embedded institutional structure. Limited by the macroeconomic conditions of this period, the overall regional logistics capacity level was relatively low. Despite the rapid development of manufacturing industries, including the steel industry examined in this research. Sichuan Province's overall transport market was characterised by relatively low ownership of transport vehicles. This gap inevitably created tensions in the logistics industry, making expansion difficult. As a logistics company manager recalled in an interview:

"At that time, transportation capacity was very tight because almost no one could afford to buy transport vehicles. In the early 21st century, a steel transport truck cost 400,000 to 500,000 RMB. Even now, buying a truck costs about the same. And at that time, our salaries were only a few hundred yuan, maybe just over a thousand yuan. For an ordinary worker, buying a vehicle was simply impossible." (B1, 26.11.2022)

This interview provides valuable insights into the economic constraints hindering logistics industry growth during this period. The high cost of vehicles relative to average incomes presented a significant barrier to entry for potential logistics participants. In this context, the initial introduction of external vehicles relied almost on some existing steel sellers who had more sufficient capital to purchase transport vehicles compared to other employees. Additionally, with the aforementioned separation of sales and transportation departments, sales personnel distrusted the steel plant's transportation capacity. Consequently, they began purchasing their own vehicles, combining personal trading and transportation businesses. This circumvented the steel plant's transportation department, opting for self-managed logistics, engaging in steel sales and transportation in a personal capacity. The proliferation of

private steel sales channels led to increasing numbers of individuals purchasing vehicles for steel sales and transportation, causing overall transport processes to become chaotic.

However, this process was considerably more nuanced than simply expanding external partnerships. Rather than merely introducing external logistics vehicles, it involved adding transport vehicles based on existing internal networks. Since these sales personnel who purchased vehicles owned "external" transport vehicles in their personal names while also being internal company employees, defining whether these transport vehicles belonged to company internal assets became difficult. This added complexity to the already complex over-embedded foundation. A former logistics department manager offered insightful observations on this situation:

"As private steel sales became increasingly common, more and more people purchased vehicles for steel sales and transportation. They only wanted to transport steel they sold themselves, and even arranged for personnel familiar with the steel plant's internal transportation department to handle transportation. This led to chaos in the entire sales and transportation system. To unify management, the group company established an external logistics company. At that time, any vehicle not belonging to the group's internal transportation department, whether purchased by internal employees or social vehicles, had to join the external transportation department if it wanted to transport steel produced or sold by the group company. So, the situation at that time was that all steel transportation not through the group company's official sales channels was handled by the external transportation company." (A16, 13.10.2023)

This statement suggests that the steel plant's approach was driven not through a desire to expand its network, but through the eagerness to regain control over a chaotic system. It required all non-enterprise transportation companies to join a steel plant-led external transportation company for unified management. It effectively maintained the current status of network embeddedness. From the steel plant's perspective, this process did not significantly expand its production network participants or alter its network embeddedness. Nevertheless, this approach of absorbing external transport companies under unified steel plant management, while partially alleviating transportation pressure, failed to address the development dilemmas brought by logistics over-embeddedness. As, this complex network embeddedness was simultaneously embedded within the foundation of existing societal embeddedness. From the perspective of individual participants. This internal expansion

expanded the organisation's network embeddedness based on existing personal sociality, leading to a lack of independence between these two forms of embeddedness. Individual participants, relying on their societal embeddedness networks, could already influence the organisation's network embeddedness, meaning personal decisions influenced the overall organisation's economic decisions.

This over-embeddedness created two problems: First, internal logistics costs became increasingly high compared to socialised logistics costs because the logistics department's core function was ensuring production and sales, not profit-driven operations. In addition, this external logistics network driven by sales department employees, in a market-competitive environment, gradually widened the cost gap with internal logistics, marginalising the internal logistics network. This phenomenon created a second problem: complex embedded relationships made standardised process management difficult. In the external transportation company, individuals as part of the sales system preferred transporting their own sold goods while refusing to transport others' goods. This friction between individual interests and steel plant interests reflected that the logistics expansion behaviour of sales department employees stemmed more from their own sales needs rather than considerations for resolving the steel plant's transportation dilemmas. This differed from the initial expansion intentions of steel plant logistics department.

To address this issue, the steel plant implemented a queuing policy for internal and external logistics vehicles. They hoped to break the existing predicament by having transport vehicles accept cargo orders in sequence. However, this approach failed to adequately consider the influence of personal societal embeddedness. As previously described under the original *Danwei* system, employees within the entire steel plant exhibited high intensity societal embeddedness, which also existed between sales and transportation departments. Although steel transportation demand information was simultaneously released through the steel plant's official channels, it also spread through informal networks formed by the overlapping embeddedness within and between sales and logistics departments. Typically, these informal channels primarily focused on societal relationships, such as communication between kinship, family relationships, and friendship networks, with simplified processes transmitting information faster than official routes.

This network structure significantly influenced information flow within the organisation. Informal information channels, characterised by close connections, often transmitted information faster than official channels. Consequently, those non-enterprise transportation capabilities, who relied on the formal informational channel experienced delays in receiving information, particularly regarding transportation orders. This disparity in information dissemination attributed to the closure effect of strong relationships, where information tends to spread rapidly within closely connected groups but struggles to bridge different network clusters (Granovetter, 1973). Thus, participants excluded from these unofficial information channels frequently received lower-quality transportation orders, which were more complex transportation routes, or orders with higher costs and risks for the same distance. This further exacerbated information asymmetry.

However, due to the logistics industry's expansion rate relatively lagging to the steel plant's economic growth rate, this disadvantageous competition did not significantly impact overall logistics development at this stage. Moreover, despite the establishment of informal, strong relationship-embedded networks between logistics and sales departments, the continuous growth in freight volume prevented new logistics participants from being completely isolated from the T steel logistics network. As a former external logistics company manager commented:

"At that time, queue-jumping and exchanging transportation rights were common occurrences; we often turned a blind eye. The steel plant's enormous freight volume meant that, even if they only chose to transport their own goods, there would continually be external transport vehicles flowing in, hoping to join our system. As long as they could enter, there would be goods to transport and money to be made. So, we didn't mind too much. After all, we all came from the same town and met frequently. As long as it didn't affect the steel group's overall transportation, we were happy to provide some convenience." (A16, 13.10.2023)

This indicates that although the managers of T steel were well aware of these informal practices and tolerated their occurrence. Under generally favourable conditions, these informal methods did not adversely affect the overall operation. Moreover, considering the

complex network of relationships in the small town, these irregular operations were acknowledged and even considered the correct operational mode.

Nevertheless, this over-embedded state and the mixture of formal and informal relationships ultimately proved more detrimental than beneficial to the overall development of the steel plant's logistics operations. Excessive reliance on personal relationships and informal networks hindered the implementation of standardised procedures and professional management practices. It also created entry barriers for external logistics providers who might have brought new efficiencies and innovations to the system. Furthermore, the lack of clear boundaries between personal relationships and professional operations made it difficult to implement performance-based evaluations and rewards. At this stage, the disadvantages brought by this multi-dimensional embeddedness were temporarily obscured by the steel plant's rapid growth and the relatively limited transportation resources, causing the steel plant itself to choose further expansion rather than addressing these issues. However, in the long term, it led to declining overall efficiency and competitiveness. As the industry developed and competition intensified, the demand for more efficient, cost-effective logistics operations became increasingly apparent. The informal system that had developed, while solving short-term problems, could not address the complexities of the modern fast develop steel industry. The complex network of social relationships, established practices, and shared understandings formed during the planned economy background continued to influence organisational behaviour and decision-making processes, illustrating the persistence of embedded institutional arrangements in transitional contexts.

The first reform phase (1997-2004) reveals the inherent tensions that were caused when a multi-dimensionally over-embedded organization confronts market pressures. During this period, T Steel's attempts to expand its logistics network were constrained by pre-existing patterns of individual societal embeddedness that interfered with organizational network embeddedness. This phase demonstrates how the boundaries between individual and organizational embeddedness become particularly blurred during initial market transitions, as personal relationships continued to influence resource allocation despite formal organizational changes. The limitations of this approach need a more fundamental reconfiguration of embeddedness, which emerged in the second reform phase.

4.4 Second Reform Phase: Strategic Reconfiguration Towards Optimal Embeddedness (2004-2008)

By 2004, as T Steel's overall steel production continued to grow, and with the rapid expansion of Sichuan's steel industry more broadly, the steel plant initiated its second phase logistics reform. This reform unfolded in two stages. The first stage involved transforming the original logistics department into a logistics "*shiye bu*" (business division, 事业部) and the second stage was creating the "Golden Camel" (pseudonym) logistics company under the regulation of its logistics business division.

The transformation into a logistics business division represented an intermediate stage between the logistics department's reform and the establishment of a 3PL company. This structure allowed it to operate as a semi-autonomous unit within the existing steel plant organisation while maintaining strategic alignment with the parent company (Child, 1996). This business division formation provided the parent company better control compared to creating a subsidiary, whilst offering greater operational flexibility than a department. Consequently, it was often viewed as an experimental ground during Chinese SOE transformation process (Keister, 2004), allowing companies to test new management approaches before broader implementation. Though still controlled by the parent company, the division enjoyed complete operational autonomy, independent management, and independent accounting system. Through establishing this logistics business division, the logistics department gained greater autonomy, thereby avoiding friction between the original sales and logistics departments. This restructuring transformed cooperation between two internal departments (sale and logistic) within the steel plant into cooperation between a department and a semi-autonomous external structure within the parent company framework. By having the sales department consolidate orders and uniformly sending them to the "external" logistics business division, this effectively resolved the previous irrational transportation order allocation mechanism issue between internal sales and transportation departments caused by over-embeddedness.

Simultaneously, under the logistics business division's management, an external "Golden Camel" logistics company was established. The company encouraged internal employees to resign from their original positions in T steel and join Golden Camel by investing in vehicles. Individuals could purchase vehicles belonging to Golden Camel, or several participants could jointly invest in vehicles and join Golden Camel, which managed them uniformly by Golden Carmel. Importantly, if participants withdrew their investments, they could return to their original positions at the steel plant. This approach effectively created a boundary-spanning entity existing at the intersection of the steel plant's formal boundaries and its extended network.

4.4.1 Blurred Corporate Boundaries

The creation of logistics business division and Golden Carmel alleviated the over-embeddedness problem mentioned earlier. Although the logistics company itself was still established by the steel plant and only process the steel plant's business, it represented the first logistics company purely assembled with external funding. From the embeddedness perspective, since its internal personnel configuration remained unchanged, societal embeddedness essentially remained constant, but this internal organisational splitting model meant that individuals' societal embeddedness has less influence on organisational network embeddedness. Embeddedness within logistics sector became less complex than the previous external logistics company model, thereby resolving the problem of network embeddedness entanglement with societal embeddedness. At this stage, with the logistics department itself externalised, societal embeddedness between logistics participants could not further interfere with logistics resource allocation within the steel plant's logistics network. This ensured that with the same time maintain original personnel structure and societal embeddedness, the boundaries between various forms of embeddedness became clearer.

Golden Camel's primary responsibility was to manage overflow transport business from the steel plant's logistics departments. For Golden Camel itself, it had a clear division with the steel company, including formal contractual separation between Golden Camel participants and the steel plant. It is fully responsible for accepting and completing transportation tasks, freed from the previous entanglement of complex formal and informal relationships. This

configuration achieved optimal embeddedness (Uzzi, 1997), balancing the benefits of network connections with the flexibility required for efficient operations.

The concept of "corporate boundaries" refers to the demarcation between activities, resources, and relationships considered internal to an organisation versus those considered external. These boundaries are not merely legal or formal distinctions but complex, socially constructed interfaces that determine which is under a company's direct control versus what operates through market or network relationships (Santos and Eisenhardt, 2005; Håkansson and Snehota, 2006). As Blois (2006) pointed out, in modern economic organisation, particularly in transitional economies, these boundaries are increasingly fluid and permeable. While traditional views equated corporate boundaries with legal ownership, contemporary scholars recognise that organisational boundaries can extend beyond legal entities, encompassing supply chain partnerships, strategic alliances, and embedded network relationships where control and influence operate without formal ownership (see Pfeffer and Salancik, 2015).

In the context of T Steel, this approach of restructuring internal corporate embeddedness on the existing structure by splitting and reorganising created blurred corporate boundaries. As formally independent entities, such as Golden Camel still maintain deep societal, territorial, and network embeddedness with the T steel. From a formal legal perspective, Golden Camel Company existed outside the enterprise's boundaries. However, when considering embeddedness within the broader institutional context of T Steel's social system, it retained common objectives and strong social connections with the plant. In this situation, as described by Coe et al. (2008), corporate boundaries appear blurred as they both adhere to core enterprise's formal organisation, rules, and profit objectives within the same institutional context. Despite these boundaries constantly changing and reconfiguring, diffusing into various inter-enterprise collaborations, I contend that at this stage, these companies still sit within enterprise boundaries because of the following two reasons.

First, the Golden Carmel participants still maintained strong social connections with T steel participants. As mentioned in the previous stage, within the entire town, majority of the

families had members who worked at the steel plant. This extended to their strong territorial embeddedness locally, which was difficult to eliminate. The continued existence of these connections indicates that certain forms of embeddedness remain resilient even organisations attempt to reconfigure their network structures. Second, from Golden Camel perspective, it still possessed inherently strong and intertwined network embeddedness with steel plant structures. In addition, while legally Golden Camel were external participants to the steel plant, internally its participants maintained close interactions with the participants in steel plant. Cognitively, they did not perceive themselves as excluded from the steel plant. This cognitive aspect of embeddedness highlights the importance of perception and identification in shaping organisational boundaries and relationships. As a former employee who participated in the Golden Camel project recalled:

"At that time, I happened to have some spare money, and the news quickly spread throughout the factory. Everyone knew that the logistics department's orders exceeded supply, and investing in Golden Camel would definitely be profitable. So, I left my original position and joined Golden Camel. [...] Although I no longer worked there, I still frequently visited my original unit to chat with them or inquired about operational conditions from Golden Camel staff. [...] Either way, I never felt like I had left the steel plant. I always thought I was still part of the factory, just temporarily away, making some money, doing some investments. Afterwards, due to the steel plant forcibly repurchasing Golden Camel's vehicles, I received my deserved dividends and principal, and returned to work at my original position, without changes." (B3, 27.11.2022)

Thus, under the same employee configuration structure, this departmental spin-off maintained stability in the original societal and territorial embeddedness, ensuring organisational cohesion while more clearly disentangling the intertwining between different forms of embeddedness. Furthermore, through this logistics reform, the steel plant successfully verified the feasibility of operating the steel logistics industry with a light-asset structure—that is, satisfying its logistics needs through external funding purchasing vehicles while maintaining control rights. This laid the groundwork for further reform. Similar to the logistics department's transformation into a logistics business division, Golden Camel was internally referred to as an "experimental field" or "product of the times" (A17, 17.10.2023), which attempted to extricate the steel plant from its over-embedded state. This initiative lasted approximately one year, effectively separating network embeddedness in an environment characterised by profound societal and territorial embeddedness. Through Uzzi's

(1997) concept of optimal embeddedness, the Golden Camel experiment can be interpreted as a strategic attempt to recalibrate the balance between arm's length and embedded relationships. The experiment not only alleviated transportation pressure but also verified the method's feasibility in achieving a more optimal embedded state.

4.4.2 Third Logistics Reform and Divestment

Building upon the success of the second logistics reform, the steel plant undertook a third logistics reform. This phase of reform emphasises divesting the logistics department's heavy assets, transitioning towards a light-asset operational model. This shift represented a move towards market-based relationships while still maintaining the benefits of societal embeddedness, such as trust and effective information transmission. Since the third reform involved the steel logistics industry's transition from heavy to light assets, and unbalanced logistics regulation led to the emergence of external 3PL companies, these contents are the analytical focus of Chapter 5. Therefore, these contents are not elaborated upon here, here focuses more on the impact of this light-asset transfer and the emergence of external logistics companies on the overall industry embeddedness. The reform process primarily comprised two steps: the packaging and sale of transport resources, and the reorganisation of external 3PL companies.

First, regarding the integration of transportation resources, the steel plant repurchased vehicles while dissolving Golden Camel. It then packaged for sale the heavy assets of transport capacity, including vehicles from its original internal logistics company, the repurchased Golden Camel fleet, and other transport assets. Original owners or drivers of these transport vehicles were given priority purchasing rights, and when selling these vehicles, the matching transportation resources were also bundled together. This method of packaging transport vehicles with transportation cargo rights for sale ensured that vehicle purchasers would have guaranteed cargo sources after purchase. As a logistics company manager at that time described:

"Because the steel plant's freight rates were relatively high and profits were good at that time, everyone wanted to buy. But in fact, the vehicle sales value completely exceeded the value of the car itself. For example, a car that might only sell for 50,000 yuan could

possibly sell for 100,000 or even 150,000, because buying the car would guarantee cargo sources." (B8, 15.10.2023)

Through this method of preferential sales to original owners, the steel plant could ensure consistency in the original societal embeddedness structure while outsourcing its logistics sector. These employees' shared history and societal relationships preserved trust and cooperation elements present in the previous structure. As mentioned earlier, employees in the steel plant town had complex social relationships which beyond their work roles. Despite organisational changes, these pre-existing relationships persisted. At the same time, to avoid the entanglement between different forms of embeddedness during the over-embeddedness period, the steel plant also required these buyers relinquished their original positions in steel plant, which the logistics sector became a completely independent external entities in legal terms. As the logistics company manager described, given the steel plant's good economic performance at the time, if an individual had sufficient funds to purchase, it became a stable and good investment choice, even under premium purchase conditions.

The second step involved encouraging the reorganisation of these sold resources into new external logistics companies under the logistics business division. Unlike the previous relationship between the logistics business division and Golden Camel, these newly established external logistics companies completely separated from the original steel plant structure, becoming external commercial entity. Their relationship with the steel plant transformed from a hierarchical structure to a cooperative mode. One of the main reasons for this approach was to facilitate the steel plant's unified management of transportation resources; another was that under the formal legal regulations at the time, single transport vehicles were not permitted to operate logistics-related businesses—they had to operate under a company structure (see Section 5.3.1 for details). Additionally, another reason for this heavy-to-light asset transfer was safety concerns. Due to inadequate regulatory enforcement at the time, truck overloading was prevalent. Combined with the characteristics of the rugged mountain roads in the Sichuan-Chongqing region, overloading accidents were frequent. However, as safety regulations were progressively strengthened, the government enhanced its supervisory oversight (detailed discussion in Section 5.2.1). The logistics department's transition to a light-asset model legally redefined logistics participants as external collaborators, which transfer those risks.

After three phases of reforms, T Steel has the embryonic form of the modern steel logistics network. It has a three-tier structure that is steered by the logistics business division, which oversees multiple external logistics companies, and each of logistics company owning and operating their own vehicles. The logistics department's transformation also reflected the nuanced approach to managing embeddedness in complex organisational and social contexts. By reconfiguring its logistics structure, the steel plant achieved a balanced embedded state, which retaining beneficial social and territorial connections while introducing market-oriented structures. This reorganisation not only addressed operational inefficiencies and safety issues but also enabled the logistics department to better adapt changing market conditions.

Moreover, this transformation led to a nuanced and layered form of regional embeddedness. While the town remained economically dependent on the steel plant and its associated logistics operations, the introduction of multiple organisational entities created a diversified economic landscape. Although this economic diversification remained centred around the steel industry, it introduced new forms of inter-organisational relationships and dependencies, complicating existing non-transactional interdependencies. In another word, the persistence of these non-transactional interdependencies in the face of organisational change created a unique situation where formal structures diverged, but informal social networks remained largely intact. This duality introduced new complexities to the town's social and economic structure. For instance, it creates situations where individuals have to navigate between formal roles in different companies and informal social relationships that span these organisational boundaries.

The second reform phase (2004-2008) represents a crucial turning point in T Steel's embeddedness evolution, as the company strategically reconfigured its logistics network to achieve a optimal state of embeddedness. By establishing the logistics business division and Golden Camel, T Steel effectively disentangled different forms of embeddedness while maintaining territorial and societal embeddedness. This reconfiguration created blurred corporate boundaries but achieved a more balanced state where network embeddedness could operate efficiently without being overly constrained by societal embeddedness. The

distinction between individual and organizational dimensions of embeddedness became clearer, as personal relationships could not directly determine logistics resource allocation. The third logistics reform, with its shift to light-asset operations and clear separation of internal and external entities, completed this transition toward optimal embeddedness. This period of reform demonstrates how organizations can strategically reconfigure embeddedness relationships while maintaining organizational cohesion, establishing a foundation for a market-responsive logistics network.

4.5 Third Reform Phase: Resilience Through Embeddedness (2008-2010)

Prior to 2008, the steel industry experienced a protracted period of sustained growth, characterised by continuous capital inflows into T Steel's logistics operations. This influx manifested in various forms, including investments in external logistics companies and participation as vehicle owners, fleet operators or lorry drivers. However, the onset of the 2008 global financial crisis precipitated a significant downturn in the steel industry.

Macroeconomic factors—including steel overcapacity across China, stabilising overall GDP growth, and deceleration in infrastructure construction—led to persistent contraction in the steel plant's profitability. This economic shock had immediate and profound implications for logistics operations, resulting in a precipitous decline in orders and financial stringency.

Under these circumstances, the preservation of established embeddedness structures provided T Steel's logistics network with substantial resilience. In particular, the territorial and societal embeddedness of individual actors contributed resilience to the organisation's network embeddedness, enabling the logistics network to withstand this significant external shock to a considerable degree.

4.5.1 Differential Responses to Economic Adversity

The 2008 financial crisis severely reduced steel demand, leading to a sharp decline in logistics orders and forcing many external logistics companies into bankruptcy. The responses to these challenging conditions revealed stark contrasts between external participants who joined after 2005 and local indigenous capital. The majority of external participants, connected primarily through economic relationships, opted for divestment and

market exit. This outflow highlighted the limitations of purely economic relationships in sustaining enterprise operations during periods of severe economic pressure. In contrast, local participants characterised by strong societal and territorial embeddedness chose restructuring rather than complete market withdrawal, even following the bankruptcy of external logistics companies.

The primary rationale for local actors' preference for restructuring from their profound territorial embeddedness. This concept refers to the anchoring of economic actors in specific localities (Hess, 2004). Undoubtedly, individuals' societal embeddedness also positively influenced organisational network embeddedness. However, I contend that the predominant factor was individual territorial embeddedness developed over extended temporal dimensions. Thus, this section centres its analytical narrative on territorial embeddedness.

In tracing the developmental trajectory of the steel plant, territorial embeddedness played a crucial role in shaping its course. The "Educated Youth to the Countryside" movement (also known as the "Up to the Mountains and Down to the Countryside" (知青下乡) movement, in China during the 1960s and 1970s significantly influenced this embeddedness (Bernstein, 1977; Pan, 2002). This policy dispatched numerous educated urban youths to rural and remote areas for work, bringing a substantial influx of skilled labour to the local area, such as this steel plant town. These young individuals, typically with higher education and professional skills in engineering, agriculture, and medicine. The movement persisted from 1968 to 1980, with approximately 17 million urban youth migrating to rural areas, significantly impacting the population and skill composition of many industrial towns (Bonnin and Horko, 2013).

Within the context of this industrial town, the influx of talent through the "Educated Youth" movement infused new vitality into the local economy. These well-educated young people not only provided necessary technical and managerial support for this steel plant and its related industries but also facilitated knowledge dissemination and innovation capacity throughout the region. Their presence consolidated the local human capital foundation, creating conditions for subsequent economic transformation and industrial upgrading.

Furthermore, as these educated youth stayed on to establish families and raise children in the town, they deepened their territorial embeddedness at this physical location. Building on this foundation of human capital development, the steel plant continued to attract educated talent in subsequent decades. During the 1997 privatisation period of this steel plant and subsequent logistics industry reforms, both the original educated youth from the movement and later university graduates provided crucial support. As recounted by a current external logistics company owner:

"In the 1990s, I was a university graduate assigned to work at the steel plant. Because I studied supply chain-related subjects, I was allocated to the logistics department. As a university graduate, the factory valued me, and I was quickly promoted. [...] In 2005, I drafted the heavy asset reform report and submitted it to the steel plant's CEO. For any industry, including logistics, it's a question of who invests and who benefits. If we continued with heavy asset operations, it would certainly be more profitable for the logistics department to operate with light assets. However, the steel plant owner's overall strategy at that time was to focus on the steel plant's core business, including investment in mine acquisitions, and did not want to invest too much in the logistics department. Additionally, the logistics department had complex internal relationships, chaotic management models, and safety issues. Therefore, we chose the light asset operating model. [...] Later, around 2010, despite the poor market conditions, I couldn't move too far away because my home, wife, and children were here. So, I left the steel plant, and because I had some resources from previously working in the steel plant's logistics department and was familiar with the steel plant's processes, I started a logistics business with several people who had also worked in the steel plant's logistics department. [...] Now my company is one of the steel plant's several appointed logistics partners." (B4, 01.01.2023)

This description vividly illustrates how territorial embeddedness manifests in multiple interconnected ways. Moreover, the physical assets owned by local actors, such as properties and other immovable assets, increased the costs of exit and incentivised them to seek methods of weathering the economic storm. Years of operation in the region provided local actors with intimate knowledge of local business environments, potential opportunities, and informal networks. This tacit knowledge, intimately connected with specific territories, represented a valuable asset that would be lost upon exit. Over time, dense networks of social relationships, including family connections, friendships, and professional networks, became intrinsically linked with the locality. As Granovetter (1985) observed, these relationships not only complemented economic transactions but often proved crucial in facilitating them. Shared local culture, dialects, and customs created a sense of belonging and mutual

understanding among local participants. While less apparent, this cultural embeddedness significantly influenced decision-making processes.

During the 2008-2010 crisis, the strength of these territorially rooted ties became particularly evident. When external logistics companies declared bankruptcy, indigenous capital opted for restructuring. While strong local connections lead to lock-in and reduced adaptability, they can also provide crucial support during crises.

4.5.2 The Positive Role of Embeddedness During Crisis

In contrast to previous phase where embeddedness exerted negative influences, necessitating constant adjustments by the steel plant to adapt to market conditions. This phase demonstrated how various forms of embeddedness positively influenced economic recovery. Through societal and territorial embeddedness established over extended temporal dimensions; the steel plant acquired sufficient resilience to withstand the impact of external shocks. The restructuring of T Steel's logistics network due to external shocks during this phase demonstrates the subtle relationships between various forms of embeddedness in certain degrees. As mentioned in section 4.1, network embeddedness appears to be the most "fragile" form of embeddedness. Once external dangers materialise, it has risk of disembedding. However, territorial and societal embeddedness developed over extended temporal dimensions exhibit greater stability and would not immediately dissipate. Particularly, disembedding from territorial embeddedness entails certain exit costs. Consequently, the partial entanglement of these three forms of embeddedness can provide regional resilience, ensuring maximum stability of original internal structures when external crises emerge.

Building on Uzzi's (1997) embeddedness paradox, this analysis reveals a crucial distinction. The impact of embeddedness entanglement on enterprise performance—whether positive or negative. It depends on how territorial and societal forms influence network embeddedness. When societal and territorial embeddedness interfere with organisational economic decision-making, embeddedness should be viewed as having negative implications for overall economic development. Examples include personal societal embeddedness affecting

organisational logistics network expansion during the multi-dimension over-embeddedness period. And as previously discussed, territorial embeddedness increasing enterprise relocation costs. However, when these two forms of embeddedness maintain certain entanglements with network embeddedness without directly intervening in organisational economic behaviour. It can achieve an optimal embeddedness state. In this state, societal and territorial embeddedness complement rather than constrain network expansion and provide regional economies with resilience against external shocks.

This phase (2008-2010) reveals how different forms of embeddedness provide resilience during external shocks. While the economic relationships proved fragile in the face of market contraction, territorial and societal embeddedness that had been developed over extended temporal dimensions offered stability and continuity. The contrasting responses of external participants versus indigenous actors highlight how territorial embeddedness in particular served as an anchor during economic turbulence. Building on this observation, the case suggests an important refinement to Uzzi's embeddedness paradox: the strategic value of embeddedness is temporally contingent, with its benefits and constraints shifting according to external conditions. During stable growth periods, over-embeddedness may constrain innovation, however, during crisis periods, the same strong embeddedness provides crucial resilience.

4.6 Fourth Reform Phase: Material Dimensions of Embeddedness (2010-2016)

Following the 2008 global economic crisis, world economic growth substantially decelerated, leading to overcapacity in the global steel industry. As China's economic growth began to slow, the steel industry's previous rapid and extensive development resulted in acute contradictions between supply and demand. The steel industry faced challenges of overall overcapacity, cyclical overcapacity, and structural overcapacity, presenting significant challenges for steel enterprises. These macro-level challenges laid the foundation for significant changes in steel logistics network structure and operations. The following section explores how these broader trends influenced the evolution of logistics practices, particularly regarding railway construction and the development of 3PL in the steel industry. After the

influence of these two key events, T Steel's logistics network completed its transformation from an internal logistics system under the planned economy state-owned system to a multi-tier outsourced logistics system before the emergence of digital freight platforms.

4.6.1 The Impact of Infrastructure on Embeddedness Configurations

In 2010, infrastructure underwent significant development with the completion of a local railway connecting the steel plant to the national rail network. This railway project, spanning 31 kilometres and employing a public-private partnership model, involving cooperation between the municipal government, local railway bureau, and private groups (Cheng et al., 2021). It reconfigured T Steel's logistics embeddedness patterns rather than merely improving operational efficiency. The new railway line successfully reduced the proportion of raw material lorry transportation to approximately 20% (A9, 09.05.2023), with the majority of imported raw materials shifting to railway transportation due to the cyclical nature and fixed transportation points of steel raw material flows. However, steel product transportation still to rely primarily on lorries due to price fluctuations, trains' inability to directly access construction sites, and the time-sensitive nature of steel products.

This infrastructure transformation altered the logistics network structure, shifting T Steel's land transportation logistics from a balanced centripetal-centrifugal system to a predominantly centrifugal system. The transition occurred as majority of the raw material transportation shifted to railways, transforming the road transportation logistics network from a non-independent market containing bidirectional transportation resources to a semi-independent market containing only unidirectional transportation resources. This structural change is crucial for understanding subsequent developments in embeddedness configurations and necessitated a reconsideration of how territorial and network embeddedness operated within logistics networks.

Before railway siding construction, the steel plant's road transportation logistics network constituted a centripetal plus centrifugal system jointly constructed by raw material entry and finished product exit. In this balanced system, lorry drivers and logistics companies possessed bilateral cargo sources, supporting complete transportation processes of outbound and

inbound goods. Transport vehicles could transport steel outwards and bring back iron ore, coal, and other essential raw materials for steelmaking on backhaul journeys, enabling the overall transportation state to maintain dynamic balance. For those actors, they only needed to embed themselves in the region where the steel plant was located, without overly concerning themselves about cargo sources. Nevertheless, the railway infrastructure disrupted this equilibrium by eliminating the backhaul cargo that had previously sustained the balanced system. As one logistics company manager explained the comparative advantages of rail transport:

" [...] local railways have a profit-oriented nature. Sometimes, to compete with road transportation for goods, national railways introduce preferential policies. For example, to attract certain goods from road transportation to railway transportation, they might offer 50% or even 60% freight discounts [...] if we reach a certain annual transportation volume, we can negotiate with the local railway company to obtain discounts on this line. " (B4, 01.01.2023)

Thus, when the steel plant's local railway siding was completed, because of the lower price of railway transportation, ore transportation shifted from roads to railways. This transformation forced logistics participants into a semi-independent market containing only unidirectional transportation resources, compelling them to fundamentally reconfigure their embeddedness strategies. Thus, those actors had to establish network embeddedness with external shippers beyond the steel plant to secure backhaul cargo resources, replacing their original backhaul cargo obtained from the steel plant. This expansion revealed the distinctive nature of territorial embeddedness in logistics networks. Unlike manufacturing operations anchored to fixed production sites, logistics participants required what might be termed "dynamic territorial embeddedness" across multiple operational locations. As a driver specialising in steel transportation explained:

"I usually run those few fixed routes, occasionally running other routes, but all within the regional range. I'm fairly familiar with these routes, knowing where tolls are high, where highways cannot be used, and which alternative routes can be chosen [...] And I'm very familiar with the shippers I frequently run to, because we often cooperate. I know their goods are very suitable for my backhaul route, and they also trust me. So generally, before I ship to a certain place, I call these shippers in advance to ask if they have suitable backhauls for me." (E4, 24.07.2023)

This interview illustrates how logistics participants developed territorial embeddedness spanning operational bases and delivery destinations, with societal embeddedness facilitating trust-based relationships with shippers across different regions. While establishing network embeddedness externally, drivers simultaneously developed societal embeddedness with these external shippers, enabling economic activities based on established trust.

The railway infrastructure catalysed a fundamental restructuring of embeddedness relationships throughout the logistics network. The semi-independent market structure led to reduced network embeddedness between lorry drivers and the steel plant logistics department, whilst simultaneously promoting increased network embeddedness between transportation participants and non-steel plant entities. This transformation-initiated changes logistics participants' operational modes and outward diffusion of network and territorial embeddedness.

This outward expansion of embeddedness created preconditions for the development of 3PL and digital freight platforms by generating both supply and demand for intermediation services. As logistics participants were forced to seek external cargo sources beyond their original steel plant relationships. They required new mechanisms to identify and coordinate with diverse shippers across broader geographical areas. Simultaneously, the proliferation of logistics companies with expanded operational networks created a fragmented market that demanded coordination intermediaries to efficiently match supply and demand. The trend represented a form of logistics network embeddedness expansion, causing the internal logistics network, previously completely controlled by large manufacturing shippers, to expand outward and create operational network overlap among shippers originally within a defined physical space. As the former owner of Chengdu Transfar Logistics Base (成都传化物流基地) recalled:

"From 2010 onwards, with rapid construction of large-scale logistics infrastructure Transfar logistics parks were the busiest [...] At its peak, the entire logistics park had over 3,000 logistics companies" (A3, 21.11.2022).

The expansion of network embeddedness, beginning with lorry drivers, subsequently affected cooperation modes between the steel plant and logistics companies. As a result of the infrastructure changes, when road transportation logistics companies transitioned from bilateral to unilateral cargo sources, logistics companies were compelled to expand their network embeddedness outward, seeking cooperation with other shippers beyond steel transportation endpoints. This strategic adaptation allowed them to increase income by obtaining backhaul orders from external sources whilst distributing these orders to lorry drivers, thereby compensating for the loss of steel plant backhaul cargo.

From an embeddedness perspective, this infrastructure development revealed how physical infrastructure changes reconfigure embedded relationships. The transformation emphasised the dynamic nature of embeddedness in logistics networks, with changes in territorial infrastructure catalysing corresponding changes in network and societal embeddedness. It also enhanced operational flexibility compared to internalised logistics networks. This transformation created a more dispersed and interconnected network that enhanced efficiency whilst creating a more resilient system capable of adapting to changing market demands. With strengthened embeddedness connections within the logistics network, smaller logistics providers and carriers gained autonomy and opportunities to expand their embeddedness into broader markets. However, increased network complexity also necessitated more sophisticated management approaches, creating market conditions that demanded intermediation services. The proliferation of logistics participants with expanded but fragmented networks generated both the demand and opportunity for logistics intermediaries, which emerge as coordination mechanisms between diverse shippers and carriers across broader geographical areas (More details about intermediaries in Chapter 5).

4.6.2 Third-Party Logistics and the Emergence of the Pyramidal Structure

The evolution of 3PL and steel logistics subsidiaries are the research focus of the next chapter. This chapter focuses on the formation of steel logistics landscape after the logistics transportation department transformed into a steel logistics subsidiary due to relevant government policies, and the analysis of embeddedness among them.

According to data published in the "China Logistics Yearbook 2010," a survey of 21 large commercial groups in Sichuan Province found that 98.5% of logistics services were provided by logistics companies controlled or directly operated by these groups, including manufacturing industries, such as home appliances, steel, and chemicals, as well as retail industries like supermarkets. This means that for large enterprises with significant logistics needs in Sichuan Province, majority of logistics remained within internal control (China Federation of Logistics and Purchasing, 2010). The report mentions that logistics in Sichuan Province broadly falls into two categories. First, large manufacturing enterprises typically outsource logistics to 3PL enterprises reformed, split, or restructured from their own enterprises, or outsource to logistics enterprises they control or have stakes in. Second, due to funding and development plan limitations, smaller manufacturers typically did not establish their own self-operated logistics systems. Thus, small and medium-sized manufacturing enterprises typically maintain stable cooperative relationships with two to three appointed external logistics enterprises.

This pattern of internal logistics control can be explained by the historical legacy of China's planned economy. Under the influence of the traditional system, most large logistics enterprises in China evolved from storage and transportation enterprises in commercial, food, and transportation departments during the planned economy period. This evolution from SOE to modern logistics companies was a gradual process. Many enterprises still retain "*da er quan*" (large and comprehensive) or "*xiao er quan*" (small and comprehensive) operational organisation models, providing "storage and transportation integration" services. These concepts reflect the self-sufficiency ideology of the planned economy era: "large and comprehensive" describes how major enterprises attempted to internalise all functions from production to services, minimising external dependencies, whilst "small and comprehensive" refers to smaller units that similarly sought to provide all necessary functions in-house despite their limited scale. This organisational philosophy emphasised vertical integration and self-reliance over specialisation and market-based coordination, creating highly integrated but often inefficient operational structures that persisted even after market reforms (Liu, 2014).

As of 2010, logistics activities in Sichuan Province were still largely internalised within manufacturing firms, with a relatively low level of logistics externalisation. Therefore, before 2010, analysis primarily focused on how large manufacturing logistics departments gradually transitioned towards externalisation under the influence of external market forces and macroeconomic policies. In December 2010, the The People's Government of Sichuan Province issued policies, such as the “Sichuan Province Western Logistics Centre Construction Planning 2012 Implementation Plan” (四川省西部物流中心建设规划 2012 年实施计划) and the “Sichuan Province Third-Party Logistics System Construction Planning (2009-2012) 2012 Implementation Plan” (四川省第三方物流体系建设规划 2009-2012). These policies aimed to accelerate the development of 3PL enterprises in Sichuan Province through strategies, such as market deregulation, increasing financial support, and supporting large enterprise development (Wang, 2024).

These policies provided strongly supports for the development of 3PL, setting ambitious growth targets for the industry. In response, T Steel further integrated previously scattered logistics operations, including railway, road, and water transportation management departments, as well as various internal logistics functions such as mine logistics, in-plant transfer logistics, and outbound logistics. These operations were integrated by a 3PL company controlled by the steel plant. The steel plant transformed its original logistics business division into a 3PL subsidiary and held controlling shares. By 2012, all logistics-related business were consolidated under this logistics subsidiary. This internal integration aligned with the government's goal of nurturing larger, more efficient 3PL enterprises. This was a strategic motivated by the steel plant to streamline its logistics operations and potentially benefit from policy support for 3PL development.

The transformation from logistics business division to steel logistics subsidiary/third-party logistics company did not significantly impact the overall process and participants' embeddedness in steel logistics. Although the overall logistics operation was "externalised" as a third-party logistics company, it could still regard as within enterprise boundaries. By this point, the steel logistics hierarchy had basically formed the current pyramidal structure,

characterised by a three-layer differentiation pattern (**Figure 4.3**). Notably, this pyramidal structure primarily reflects power relationships and the number of participants at each tier.

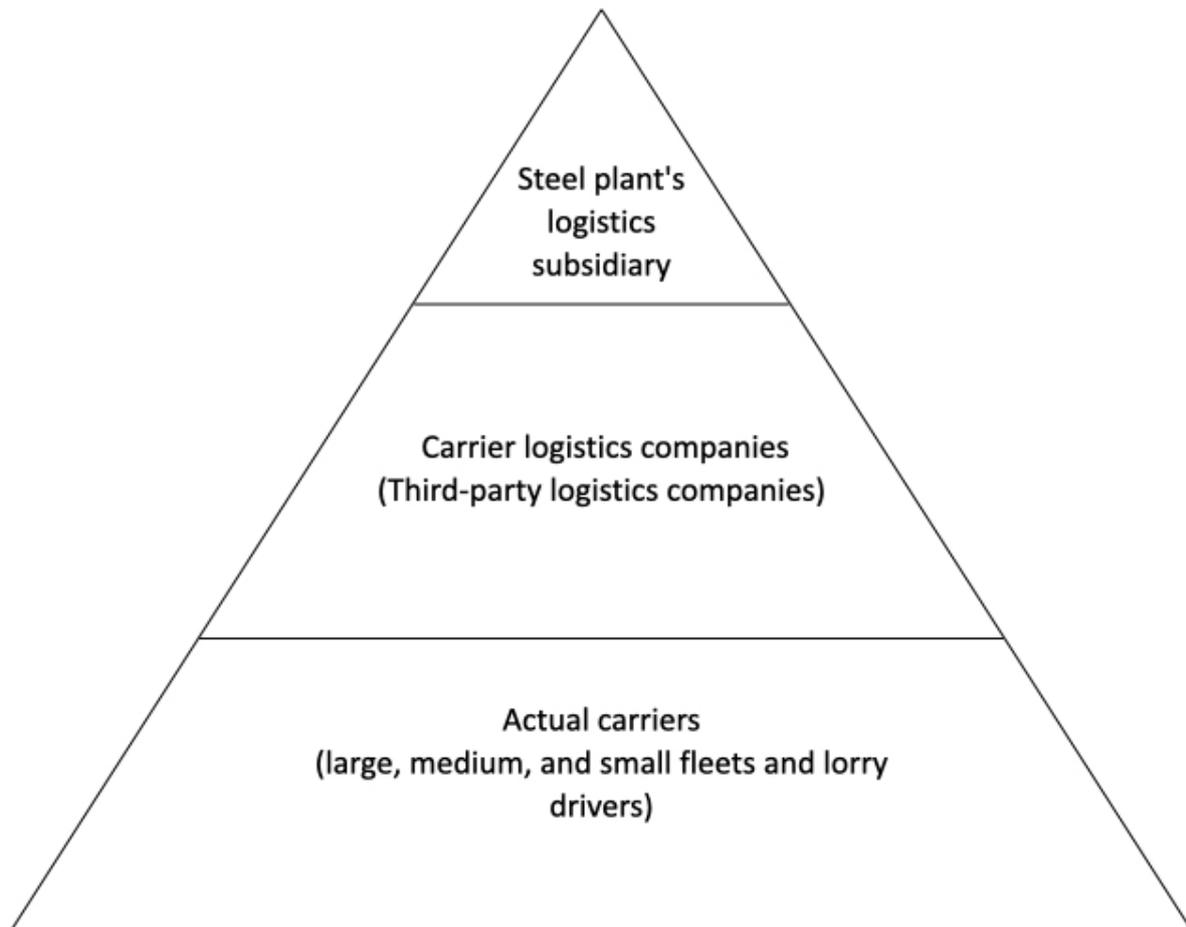


Figure 4.3: Pyramid structure of logistics participants

Source: Made by author

1. At the pyramid's apex is the steel plant's logistics subsidiary (hereafter referred to as the subsidiary), which controls all material flows for the steel plant. During the transformation process from logistics business division to subsidiary model, although the steel plant logistics department changed its formal structure, becoming a legally independent organisational entity, it remained deeply rooted within this steel company's operational framework. Its embeddedness was characterised by strong network connections with the parent company and

high territorial embeddedness locally. This did not fundamentally change its embeddedness relationship with the steel plant.

2. The second layer includes carrier logistics companies, also known as third-party logistics companies. Due to the subsidiary's requirements for material safety and efficiency, most subsidiaries directly cooperate with fixed carrier logistics companies. Similar to the steel logistics subsidiary, they are more independent but still maintain strong network embeddedness through fixed cooperation agreements with the subsidiary. As mentioned earlier, some of these 3PL companies are embedded within the same physical space as the steel plant, and personnel maintain certain societal embeddedness. However, due to railway construction leading to operational mode changes, their embeddedness has a larger activity range, making overall embeddedness more dispersed.

3. The pyramid's bottom comprises actual carriers. This layer has the individual participants in the entire system, mainly including large, medium, and small fleets and lorry drivers. For the fleet model is further introduced in Section 5.3.2. Participants at this tier undertake actual transportation tasks, realising material transfers across different spatial environments. This tier exhibits a more complex embeddedness pattern. Compared to the stable cooperative relationships relied upon by the steel logistics subsidiary and 3PL companies, for their non-fixed business cooperation models, their network embeddedness may be relatively weaker. However, they often have stronger territorial embeddedness within their frequently operational physical areas. Additionally, they develop significant societal embeddedness among themselves, especially in cases of informal organised fleets and between different individual participants.

This multi-layered structure embedded in the pyramid highlights the complexity of steel logistics networks. The interaction between different forms of embeddedness at each pyramid tier contributes to the overall stability and efficiency of the logistics network, while also presenting challenges for governance and coordination. The evolution of this structure reflects broader trends in China's logistics industry, including chasing for larger scale, more efficient logistics operations, and the gradual externalisation of logistics functions. However,

it also emphasises the continued influence of traditional organisational forms and the importance of relationships in shaping the actual functioning of logistics networks.

The infrastructure development period (2010-2016) demonstrates how material changes in the built environment fundamentally reconfigure embeddedness relationships. The construction of dedicated railway infrastructure transformed T Steel's logistics network from a equilibrium centripetal-centrifugal pattern to a predominantly centrifugal pattern, forcing logistics participants to expand their territorial and network embeddedness beyond original boundaries. This expansion created market fragmentation that necessitated of new coordination mechanisms. The resulting pyramidal structure of the logistics network represents an organizational response to this increased complexity. This structural evolution set the stage for further innovations in logistics coordination, particularly the emergence of digital platforms that would later transform how these multi-layered networks operate. As one of the major logistics intermediaries, the evolutionary path of digital freight platforms is examined in section 5.4.

4.7 Conclusion

This chapter began by reviewing the existing embeddedness research framework developed by Hess (2004). The analysis reveals that current frameworks appear insufficient for providing nuanced analysis of the co-evolution between regional industrial economies and embeddedness. The fundamental limitation stems from the prevailing enterprise-centric perspective in existing research, which overlooks the role of individual participants in economic development or treats them merely as components of different organizations. This analytical approach risks neglecting the multiple roles that individual participants play in industrial economies, thereby reducing the explanatory power of the research framework. As discussed in Section 2.4.3, research on individual participants cannot treat them as organizational components but should examine their different roles across varying contexts.

4.7.1 Refined Analytical Framework

Building upon the existing embeddedness research framework, this chapter further refines the embeddedness concept by distinguishing between individual embeddedness and organisational embeddedness. As existing research often assumes individual and organisational embeddedness operate in harmony. Nevertheless, during institutional transitions, the two may diverge or even conflict. The framework separately explains different individual and organisational patterns within territorial, network, and societal embeddedness.

For societal embeddedness, since it primarily involves personal social network relationships between different individual roles that shape economic outcomes, analytical focus should concentrate on the individual dimension. Network embeddedness, being directly related to business cooperation, requires analysis focused on the organisational dimension. Territorial embeddedness aligns more closely with Hess's (2004) discussion—when individuals or organisations become embedded in specific location, territorial embeddedness emerges through formal and informal interactions with physical space and participants within it. This distinction resolves specific conceptual ambiguities in existing literature by showing how personal social relations and organisational network positions interact, particularly crucial during institutional transitions when individual and organisational interests may diverge despite formal alignment.

4.7.2 Multi-Dimensional Over-Embeddedness

Using T Steel as a case study, this chapter examined the evolution from internalised logistics structures under the planned economy to multi-tiered outsourced logistics structures, analysing embeddedness impacts on regional economic evolution. The research reveals that for the steel logistics industry, evolution from internalised to outsourced structures can be described as a process of strategic reconfiguration—transforming originally entangled embeddedness relationships into more rationalised arrangements beneficial for economic development.

I conceptualize the distinctive characteristics of Chinese SOEs during the planned economy period as "multi-dimensional over-embeddedness." This concept extends beyond Uzzi's

(1997) original over-embeddedness by explicitly considering how different embeddedness types interact and compound within regional economic. Under this condition, these embeddedness forms mutually reinforce each other within fixed organisational boundaries, creating highly stable but rigid institutional arrangements. While the tight interweaving of societal, network, and territorial dimensions provided organizational stability, it also constrained innovation and market adaptability as reforms progressed.

4.7.3 Five-Phase Evolution: From Over-Embeddedness to Strategic Reconfiguration

The overall evolutionary pathway can be divided into five distinct phases, each characterised by specific embeddedness configurations and their inherent contradictions:

Phase 1 (Piror-1997): Multi-Dimensional Over-Embeddedness Under the Danwei System

During this period, institutional legacies of the planned economy, particularly the *Danwei* system, shaped embeddedness states not only in steel logistics but across the broader SOE system. The core contradiction of multi-dimensional over-embeddedness lay in providing stability while hindering market responsiveness—a contradiction that became unsustainable during market-oriented reforms.

Phase 2 (1997-2004): Embeddedness Entanglement and Role Ambiguity

As T Steel transitioned from state ownership to privatization alongside broader economic marketisation. The disadvantages of planned economy "over-embeddedness" gradually manifested. The core contradiction centred on how entanglement between organisational network embeddedness and individual societal embeddedness enabled individual participants exploiting role ambiguity for personal gain, thereby distorting organisational resource allocation efficiency. However, rapid enterprise growth and profit increases masked these behaviours, leading organizations to tolerate informal activities without addressing embeddedness entanglements.

Phase 3 (2004-2008): Strategic Reconfiguration Toward Optimal Embeddedness

This phase represented strategic restructuring from over-embeddedness toward optimal embeddedness. The core mechanism involved organisational separation to disentangle different embeddedness types: requiring participants to choose singular roles, thereby severing direct influence pathways from individual societal embeddedness to organizational network embeddedness. This innovation achieved Uzzi's (1997) optimal embeddedness state, demonstrating that healthy regional economic development requires relatively clear boundaries between different embeddedness forms—particularly separating individual societal embeddedness from organisational network embeddedness to prevent overly strong social ties from influencing rational organisational economic decisions.

Phase 4 (2008-2010): Embeddedness as Source of Resilience

Contrasting with previous phases where embeddedness created negative economic impacts, this phase demonstrated how regionally embedded relationships developed over extended periods provided economic resilience. During the 2008 global financial crisis, logistics network participants adopted two distinct approaches: those who joined during rapid growth periods chose to exit due to sustained losses, while participants who had continuously cooperated since the steel plant's transformation chose to remain. From an embeddedness perspective, those remaining had established powerful societal embeddedness with other regional participants. Crucially, strong territorial embeddedness through long-term regional residence and work. This territorial embeddedness, while increasing exit costs, simultaneously provided regional resilience, enabling mitigation of economic downturn impacts.

Phase 5 (2010-2016): Infrastructure-Driven Transformation and Connective Territoriality

This phase demonstrated territorial embeddedness's unique impact on the logistics industry. Unlike manufacturing where material flows support economic creation as auxiliary industries. For logistics itself, mobility constitutes the core process of economic value creation. The completion of railway infrastructure directly connecting T Steel transformed most inbound materials from road to rail transport, converting participants from a equilibrium centripetal-centrifugal logistics network to a predominantly centrifugal operational model.

This territorial embeddedness changes forced logistics participants toward external expansion, establishing societal and network embeddedness with broader non-T Steel shippers to secure bilateral cargo sources. Simultaneously, responding to local government initiatives promoting 3PL development, T Steel externalised its logistics department into a steel logistics subsidiary, forming the current steel logistics pyramidal structure: steel logistics subsidiary at the apex, independent 3PL companies in the middle, and actual carriers including lorry drivers and fleets of various scales at the base.

Through T Steel's evolutionary case, this research demonstrates two key properties of embeddedness. First, embeddedness is continuously dynamic; it is not a fixed attribute but changes correspondingly with different participants' economic behaviours and macro-environmental shifts. Second, embeddedness has varying effects on regional economies: it can hinder economic development during rapid growth periods as well as provide regional resilience during economic downturns. Building upon this chapter's foundation of logistics evolutionary pathways, the next chapter turns toward more specific actor evolutionary trajectories, analysing how intermediaries in the steel logistics industry (steel logistics subsidiaries, third-party logistics companies, fleets, and digital freight platforms) are shaped by the overall institutional environment, and how the formation of these logistics intermediaries, in turn, shapes the institutional landscape within the steel logistics industry.

Chapter 5: Intermediaries and Institutional Evolution in Steel Logistics Networks

In the evolution of steel logistics networks from internalisation to externalisation, one of the prominent characteristics is the proliferation of participants. Under the original internalised logistics structure, steel logistics networks exhibited a relatively simple configuration, comprising linear relationships between steel plants (as consigners), lorry drivers (as carriers), and end users (as consignees). As the number of logistics participants significantly increased, the network structure became progressively more complex, with an increasing number of specialised logistics intermediaries emerging as crucial "bridges" connecting the entire logistics network system.

A review of research on logistics participants reveals that it is primarily constrained to two mainstream directions. The first, in economic geography, it mainly focuses on formal participant research at the firm level. For example, Coe (2021) explored how third-party logistics providers deliver "seamless" services to clients, whilst Skender et al. (2016) examined the roles of different logistics intermediaries in international trade from an intermediary perspective. Alternatively, there is currently emerging research on digital freight platforms (e.g., Verfürth and Helwing-Hentschel, 2025). However, when it further disaggregates the entire logistics network, relying solely on third-party logistics companies between consigners and consignees is insufficient to support the efficient operation of the entire logistics supply chain. Some "invisible" participants are overlooked in manufacturing-focused research, such as fleets, steel logistics subsidiaries, and other "alternative" participants in logistics networks. Despite the logistics subsidiaries and logistics fleets constitute equally important components of logistics networks, this research systematically neglects such entities. This oversight represents a significant analytical limitation because studies that concentrate exclusively on formal, company-level institutional actors are inherently unable to capture the informal institutional arrangements that emerge during industry evolutionary processes.

The second realm is about logistics labour research (e.g., Danyluk, 2018; Sheffi, 2012). These studies focus more on the living environment and dynamics of individual logistics participants in the industry. For instance, Bensman (2008) described the logistics industry's "low road" model, which create cheap and easily exploitable labour through outsourcing, subcontracting, and using temporary agencies, leading to increasingly unstable workforces vulnerable to harmful management practices. This includes migrant labour, where employers actively seek workers from minority racial groups who can be paid minimal wages with the help of intermediary agencies, resulting in continuous deterioration of working conditions and wage decline, which Hesse (2020, P15) termed the "dark side of distribution". Whilst these studies enrich understanding by examining individual participant dynamics, they neglect overall industry development paths and the exploration of how institutional backgrounds shape labour practices. This lack of historical perspective limits the understanding of the fundamental causes underlying existing institutional configurations.

These two research streams operate as largely isolated systems, yet this fragmentation obscures how the logistics industry pattern emerges. As an integrated system, logistics industry interconnected by both formal organizational dynamics and informal institutional arrangements. To bridge this analytical gap and capture these interconnections, this chapter adopts an intermediary perspective that examines how different logistics actors emerge and coordinate within evolving institutional frameworks.

I collectively term the various participants that emerge between steel plants and end users as logistics intermediaries, including lorry drivers and the organizational entities that coordinate their activities. Although these actors have distinctive functions within logistics networks, their roles can equally be defined as intermediaries because they undertake tasks required by the logistics industry from steel plants to consignees, including coordinating flows (Coe and Yeung, 2015), absorbing supply chain uncertainty (Christopher and Peck, 2004), improving operational efficiency, financial management and so forth. However, existing research appears to majority emphasis on these participants' functions and roles whilst overlooking the important positioning and roles of participants connecting production networks within the entire network (Wood and Phelps, 2018). These logistics participants can also utilise their facilities to serve clients from different sectors (Coe, 2020). Therefore, elucidating these

interconnected relationships emerges as fundamental to comprehending the logistics industry's function within broader economic systems.

This chapter defines steel logistics intermediaries as spatially anchored business entities, including formal (logistics companies, digital freight platforms) and informal (fleets, *Guakao* [挂靠, affiliation models]) intermediaries. *Guakao* (affiliation models) is an operation model which individual lorry owners register their vehicles under qualified logistics companies to obtain legal transport permits while maintaining operational independence (further explained in Section 5.3). These logistics intermediaries emerge through geographical and functional restructuring of internal steel logistics operations. Their development reflects how the institutional structure of networks evolves with changing external economic conditions.

Central to this approach is understanding intermediaries as active institutional agents rather than passive recipients of external regulation. In this process, participants function as institutional "superheroes" with the purposeful ability to "create, change, and destroy institutions" (Bitektine & Haack, 2015, p.50). Thus, the emergence of intermediary both shapes and is shaped by broader institutional environment, creating mutually constitutive relationships (Martin and Sunley, 2006). By conceptualizing these participants as interconnected intermediaries rather than independent actors, this intermediary-focused perspective facilitates understanding of the nature of their interconnection and mutual influence. Building upon the previous chapter's macro-introduction of industry evolution backgrounds, this chapter turns to more specific research about the logistics participants. This addresses this thesis's second research question: ***"How do intermediaries (such as logistics companies, transportation fleets, and digital platforms) shape the power structure and spatial configuration of logistics networks?"***

Based on this research question, this chapter will address how intermediaries are shaped by institutional environments during formation, and how do they reciprocally shape institutional environments. Unlike the "traditional" intermediaries, digital freight platforms represent a unique institutional form, which is built upon institutional environments formed by "traditional" intermediaries. Whether considering development paths or institutional impacts

on logistics networks, it differs from other intermediary entities. Therefore, this chapter separately analyses digital freight platform evolution paths and functions.

The chapter is structured as follows. Section 5.1 examines the institutional legacy of China's steel logistics industry, which tracing how planned economy arrangements continue influencing contemporary organisational forms. Section 5.2 analyses two important regulatory shifts that led to intermediary emergence: asymmetric transportation regulation and financial deregulation. Section 5.3 explores traditional logistics intermediaries' functions, examining risk redistribution through the *Guakao* (affiliation models) system and capacity management across different intermediary types. Section 5.4 traces digital freight platforms' evolution from informal "small blackboard" model to formal institutionalised entity. Section 5.5 examines how platforms reshaped institutional configurations through three phenomena: industry expansion via institutional arbitrage, persistence of trust-based transactions, and transformation into tax compliance tools. Finally, section 5.6 synthesises how these intermediaries collectively reshape power structures and spatial configurations within steel logistics networks.

5.1 Institutional Legacy and Contemporary Organisational Forms

The evolution of logistics intermediaries in China's steel industry reflects a complex institutional legacy that continues to influence contemporary organisational forms. This section explores how historical institutional arrangements created distinctive patterns of intermediary development, with particular attention to the persistent influence of SOE structure in logistics organisation. Understanding this institutional background is crucial for analysing why certain forms of intermediaries emerged and how they operate within China's evolving logistics landscape.

The complexity of China's logistics industry is deeply rooted in China's unique systemic transition from a planned economy to a market economy after 1978. Under the planned economy, logistics was not regarded as an independent service but was incorporated into different ministerial systems. In general, transportation was managed by the Ministry of Railways and the Ministry of Transport, warehousing was controlled by the Ministry of

Commerce and various industrial departments, whilst industrial enterprises maintained their own internal logistics departments. This fragmented institutional structure created multiple overlapping logistics systems operating in parallel. During the economic transition, these various logistics sectors did not simply transform into market-oriented enterprises. Instead, they experienced "restructuring without privatisation," whereby SOEs underwent reorganisation whilst maintaining strong institutional connections with original administrative systems. This process resulted in the coexistence of formal market economy structures with relationship-based organisational forms inherited from the planned economy era (Boisot and Child, 1996).

The persistence of the institutional legacy is clearly demonstrated in contemporary logistics sector data. According to the "Notice on the Release of China's Top 50 Logistics Enterprises and Top 50 Private Logistics Enterprises in 2024" (关于发布 2024 年度中国物流企业 50 强、民营物流企业 50 强通告) (China Federation of Logistics and Purchasing, 2025), only 6 enterprises qualify as independent logistics enterprises among the top 20 logistics enterprises by revenue. Through examination of corporate documents and organizational structures, I have categorised these enterprises according to their institutional characteristics (**Table 5.2**):

Rank	Enterprise Name	Revenue (Billion RMB)	Ownership Type	Parent Company
1	China COSCO Shipping Corporation Limited	331.9	SOE	N/A
2	XIAMEN XIANGYU CO., LTD.	275.4	SOE	Xiamen Xiangyu Group (SOE)
3	S.F. Holding Co., Ltd.	251.1	Private	N/A
4	Beijing Jingbangda Trade Co., Ltd.	166.6	Private	JD.com, Inc.
5	Sinotrans Limited	101.7	SOE	China Merchants Group (SOE)
6	Shanghai YTO Express Group Co., Ltd.	82.19	Private	N/A
7	Shanghai Sankuai Zhisong Technology Co., Ltd.	68.43	Private	Meituan
8	China Materials Storage and Transportation Group Co., Ltd.	57.68	SOE	China Logistics Group CO., (SOE)
9	China Railway Materials Group Co., Ltd.	47.59	SOE	China Railway Construction Corp. (CRCC) (SOE)
10	Shanghai YUNDA Holding Group Co., Ltd.	44.98	Private	N/A
11	STO Express Co., Ltd.	40.92	Private	N/A
12	C&D Logistics Group Co., Ltd.	39.21	SOE	Xiamen C&D Inc. (SOE)
13	ZTO Express (Cayman) Inc.	38.41	Private	N/A
14	Huayuan International Land Port Group Co., Ltd.	37.35	SOE	N/A
15	J&T Express Co., Ltd.	34.97	Private	N/A
16	Deppon Logistics Co., Ltd.	32.27	Private	JD Logistics
17	Hubei Communications Investment Logistics Group Co., Ltd.	30.02	SOE	Hubei Communications Investment Group (SOE)
18	Jining Port and Shipping Development Group Co., Ltd.	28.6	Private	N/A
19	Sichuan Anji Logistics Group Co., Ltd.	28	Private	Wuliangye Yibin Co. Ltd.
20	SAIC Anji Logistics Co., Ltd.	26.81	SOE	SAIC Motor (SOE)

Note: N/A means there is no parent company.

Table 5.2: Ownership Structure and Institutional Background Classification of China's Top 20 Logistics Enterprises in 2024

Source: Author's compilation based on "Notice on the Release of China's Top 50 Logistics Enterprises and Top 50 Private Logistics Enterprises in 2024"(China Federation of Logistics and Purchasing, 2025)

Non-independent logistics enterprises typically exhibit two key characteristics: (1) State-owned asset background: If a logistics enterprise is a SOE or its parent company is a SOE, it is typically not considered an independent third-party logistics provider. (2) Subsidiary company: If the logistics enterprise is a logistics department or subsidiary of a manufacturing enterprise or commercial platform, primarily serving its parent company's logistics needs, it is not regarded as an independent third-party logistics enterprise.

However, further investigation reveals that all six are express companies, and even these exhibit significant institutional dependencies. Four major players—YTO Express, Yunda Express, STO Express, and ZTO Express—demonstrate high dependency on Alibaba's e-commerce ecosystem, with 60-70% of their order volumes originating from Alibaba platforms. Moreover, according to their 2024 annual reports, Alibaba has become the largest shareholder of STO Express, the second-largest shareholder of both ZTO and YTO Express, and the fifth-largest shareholder of Yunda Express (YTO Express Group Co., Ltd., 2025; STO Express Co., Ltd., 2025; YUNDA Holding Group Co., Ltd., 2025; ZTO Express (Cayman) Inc., 2025). Similarly, J&T Express demonstrates significant platform dependency, with 52.3% of its package deliveries originating from PDD (*Pinduoduo*, 拼多多) transactions, whilst *Douyin* (抖音) e-commerce expansion has contributed an additional 28% of its delivery volume. This concentration of business from specific e-commerce platforms illustrates how express companies' operational capacity has become structurally dependent on platform ecosystems rather than diversified client bases (J&T Global Express Limited, 2025). This platform dependency demonstrates that even "independent" logistics enterprises operate within constrained institutional environments, where their business viability depends heavily on maintaining relationships with dominant e-commerce ecosystems.

Consequently, within this ranking, only SF Express can be defined as a truly independent logistics enterprise. This finding reveals that institutional embeddedness in China's logistics sector extends beyond traditional SOE affiliations to include platform ecosystem dependencies. For the broader logistics industry, genuinely independent third-party participants without institutional resource backgrounds typically obtain orders from these top logistics companies. As one independent third-party logistics company chairman observed:

"Look at these large logistics companies today—they are not logistics enterprises, but enterprise logistics." (B4, 01.01.2023)

(The distinction between logistics enterprises and enterprise logistics will be analysed in detail in Section 5.3.2)

Other than those express enterprise, these enterprise logistics operations typically emerged through one of three institutional pathways: direct conversion of original ministerial logistics departments, spin-offs from large manufacturing SOEs, or transformation of provincial or municipal storage and transportation companies. For China's large steel plants, most followed the second pathway, inheriting existing institutional structures and relying on steel plants' cargo resources to provide "institutional thickness" for subsequent institutional evolution.

This straightforward arrangement conceals significant internal complexity. The absence of clear functional boundaries and division of labour created what Chapter 4 described as "multi-dimensional over-embedded structures." (See Section 4.2) This institutional ambiguity resulted in role duplication and unclear responsibilities, particularly manifesting in role ambiguity where individual participants often occupied multiple positions within logistics networks. During the period industry rapid growth, this role complexity was somewhat masked by the industry's expansion, where timely material transportation became the logistics sector's primary objective, often at the expense of organisational clarity.

Paradoxically, this historical institutional complexity, which with its overlapping organisational forms and ambiguous functional boundaries created both constraints and opportunities for subsequent market-oriented reforms. The entanglement of roles and responsibilities, whilst potentially inefficient, provided fertile ground for institutional innovation. As noted by Mahoney and Thelen (2010), institutional change typically occurs through gradual transformation of existing arrangements rather than wholesale replacement. In the case of China's steel logistics, this historical complexity created multiple potential pathways for organisational evolution. Within complex steel logistics networks, various

entities, from steel logistics subsidiaries to third-party logistics companies and fleets of different scales, they gradually found different institutional niches. A fleet owner described this transformation's impact from his perspective:

"I have been transporting for this steel plant since the early 21st century. Initially, my vehicles were directly managed by the steel plant. After the plant's logistics department reform, my vehicles were affiliated with their third-party logistics company. Their upper structure has been constantly changing, but I don't understand it, nor do I care much. [...] Although market competition has intensified, as long as I have cargo to transport and can make money, their organisational changes don't affect me." (E2, 5.4.2023)

This grassroots perspective illustrates how participants found their institutional niches during structural changes whilst maintaining business continuity. With the transforming of logistics network structures, even within the same institutional background, embeddedness at various levels evolved. During this transformation process, two key policy dynamics became particularly important: regulatory asymmetry and financial deregulation. These policy dynamics reorganise the entangled institutional landscape into distinct hierarchies, facilitating the emergence of specialised intermediaries whilst preserving valuable aspects of existing network relationships. As described in the next section, these policy dynamics did not operate in isolation but interacted with inherited institutional complexity to reshape steel logistics network organisation.

5.2 Policy Dynamics and Intermediary Formation

The stratification of China's intricate steel logistics institutional environment was primarily shaped by two key regulatory dynamics: asymmetric road transport regulation and financial deregulation in the logistics industry. Whilst other policies, such as promoting third-party logistics and infrastructure development, also impacted logistics industry development. Nevertheless, I found they are less important in intermediary emergence and institutional evolution. For example, policies promoting third-party logistics primarily optimised existing organisational models rather than logistics organization structural reforms. Similarly, infrastructure development policies, whilst crucial for strengthening regional connectivity. It represented broader macroeconomic interventions rather than direct catalysts for logistics industry institutional transformation. Although these policies undoubtedly facilitated overall

industry development, empirical evidence suggests that regulatory asymmetry and financial deregulation were most important in reshaping network structures and promoting intermediary emergence. Therefore, this analysis primarily focuses on these two transformative forces.

5.2.1 Asymmetric Road Transport Regulation

China's logistics industry governance exhibits pronounced regulatory attention asymmetry between heavy-asset and light-asset enterprises, and this asymmetric regulation became a significant driven force of organisational transformation in the sector. As described in Section 4.4.2, due to government's gradually enhanced regulation of road transport safety. Enterprises operating logistics departments through heavy-asset methods responded by attempting to shift towards light-asset operations. This operational transition served two strategic purposes: reducing their direct safety risk responsibilities and partially evading enhanced government regulatory oversight. Such restructuring allowed companies to maintain logistics capabilities whilst distancing themselves from regulatory liability.

This regulatory dynamic can be illustrated through empirical evidence from fieldwork. Interviews with logistics practitioners revealed that when discussing light-asset versus heavy-asset transformation, respondents consistently emphasised two key factors: "cost" and "safety." The impact of cost considerations on logistics industry structural change has been detailed in Chapter 4 (see Section 4.3). Here, I focus particularly on the safety dimension and its institutional implications. In the broader logistics industry, a railway bureau official's description of the 2012 railway bureau structural adjustment embodies government emphasis on safety issues, showing how policy pressure spreads across different organisational levels:

"The Railway General Administration issued an internal official document in 2012 requiring all local railway bureaus to no longer own terminal delivery vehicles. Therefore, we outsourced all land transport-related business and sought cooperation with other logistics companies to complete the original last-mile delivery. [...] The primary consideration is funding—leadership wants us to concentrate more funding on our main business—trains. Because each vehicle requires a driver, and if safety accidents occur, this becomes our company's responsibility. But if you outsource it, there won't be such problems." (A8, 20.04.2023)

Within the road transport industry, for logistics companies operating at scale, these regulatory asymmetries also create significant operational pressures. One owner of a 200-vehicle fleet explained:

"Our company created over 200 employment opportunities for the entire market. However, the government implemented stricter regulations and restrictions on logistics companies owning large numbers of vehicles. [...] We bear social insurance and housing fund responsibilities for all employees, including drivers. Additionally, if traffic accidents occur, compared to *Guakao* [affiliated model] vehicles, it's more difficult to identify responsibility [...] Through strict regulatory scrutiny, the government puts more emphasis on physical transport companies." (B5, 21.03.2023)

When I interviewed with him, he termed his company a "physical logistics company" and those companies that outsourced cargo transport rights as "virtual logistics companies." This distinction between "physical" and "virtual" logistics operations, whilst colloquial, reveals profound insights into how industry participants perceive institutional transformation in logistics networks. This terminology reflects not only operational differences; it also encapsulates fundamental shifts in how logistics services are conceptualised and delivered within evolving institutional frameworks. "Physical" logistics companies, burdened with tangible assets and direct employment relationships, remain deeply embedded in traditional institutional structures and bear the accompanying regulatory obligations of logistics assets. In contrast, "virtual" logistics operations represent a new institutional layer that more emphasis on logistics companies possess sufficient reconcilable transport capacity, rather than ownership. This dichotomy, expressed through respondents' linguistic choices, demonstrates how practitioners themselves recognise the emergence of different institutional layers within the logistics sector.

This regulatory asymmetry reflects broader institutional tension between safety oversight and operational flexibility. Whilst both enterprises and local governments share common regional economic growth objectives, government entities clearly favour strict safety controls. This preference stems from broader institutional contexts where safety incidents may impact government credibility more significantly than enterprise profitability. Thus, organisations

must strategically navigate regulatory constraints associated with asset ownership whilst maintaining operational flexibility. This led logistics companies to gradually shift towards light-asset operational models, fundamentally altering industry structure. This transformation gained particular momentum after the emergence of digital freight platforms (discussed in detail in Section 5.5). In addition, this regulatory-driven transformation facilitated the emergence of specialised intermediaries including steel logistics subsidiaries, third-party logistics companies, and fleet models. The shift to light-asset models involved trade-offs of those participants, which from one perspective may potentially decrease profitability and weakened capacity control. From another perspective, it could provide enterprises with operational flexibility and reduced regulatory exposure, which creates adaptive business models suited to evolving institutional environments.

By dispersing government regulatory attention from top-tier logistics participants whilst creating new institutional layers, logistics intermediaries demonstrated their first key function: simultaneously redistributing operational risk. This dual role reflects how intermediaries emerge from institutional pressure and actively reshape regulatory landscapes through their organisational forms (Bitektine & Haack, 2015). However, this road transport risk was not ultimately transferred to logistics companies, through the "*Guakao*" mechanism it further transferred downward to lorry drivers. Risk redistribution is discussed further in Section 5.3. Moreover, it also reveals an important dynamic in logistics network evolution: intermediaries act as operational bridges between different network participants and institutional buffers helping manage regulatory pressure (Obstfeld, 2005). This dual role helps explain why the industry maintained sufficient flexibility to adapt to changing market demands despite increasingly strict regulatory scrutiny across the logistics industry.

Therefore, the asymmetric nature of logistics industry regulation became a key catalyst for institutional stratification and intermediary emergence. This process, whilst primarily driven by safety and regulatory considerations, also created new organisational forms that balanced regulatory compliance with operational flexibility. The resulting transformation is intrinsically linked to industry financial deregulation and the rise of digital freight platforms, indicating how institutional pressure can reshape network structures whilst maintaining fundamental functionality.

5.2.2 Financial Deregulation in Vehicle Financing

The second major driver of logistics industry transformation is financial deregulation, which fundamentally reshaped market participation dynamics by lowering entry barriers. This institutional shift, combined with the asymmetric regulation discussed previously, enabled enterprises with substantial logistics needs (such as steel plants) to adopt light-asset operational models whilst ensuring access to sufficient transport capacity.

Financial deregulation primarily concentrated on vehicle financing, with a series of progressive policy reforms accelerating this transformation. Building upon the "Measures for the Administration of Automobile Consumer Loans"(汽车消费贷款管理办法) (1998) and "Guiding Opinions on Developing Personal Consumer Credit"(关于开展个人消费信贷的指导意见) (1999), the People's Bank of China introduced the "Automobile Loan Management Measures"(汽车贷款管理办法) in 2004. These regulatory reforms lowered market entry barriers through three key mechanisms:

1. Expanding the eligible lending scope of state-owned commercial banks to include all commercial banks, urban and rural credit cooperatives, and approved non-bank financial institutions.
2. Categorising borrowers into individuals, automobile dealers, and institutional borrowers, with specific qualification standards and risk management requirements for each category.
3. Establishing different loan terms, maximum limits, and risk prevention measures for different types of automobile loans, extending loan periods from 3 to 5 years. (See The People's Bank of China, 2004)

These policy changes not only relaxed vehicle purchase restrictions but also facilitated the emergence of innovative financing institutions that further lowered market entry barriers. Through creative financing arrangements, those financing institutions provided unofficial alternative pathways for participants who aiming to enter the logistics transport industry with lower barriers. Compared to traditional bank loans that still required substantial down payments and strict approval procedures, these new financial institutions established cooperative models with logistics companies. By directly reducing vehicle purchase restrictions and capital requirements, they promoted participant entry into the logistics industry. With the same time, through various additional mechanisms, such as higher overall vehicle prices, mandatory company affiliation, administrative fees, insurance premiums, and invoice-related services, these institutions could also earn profit through this process. A lorry driver's description vividly illustrates the impact of these changes:

"Now many drivers, due to lack of sufficient funds, turn to these so-called 'logistics companies' to purchase vehicles. Compared to banks, these companies adopt more lenient approval mechanisms and provide zero down payment options, which means drivers can drive away freight vehicles by paying only certain handling fees. [...] Since these people usually lack collateral assets, banks are unwilling to provide them loans. However, when companies act as guarantors, loan approval becomes feasible. [...] Besides potentially higher monthly loans, these purchased vehicles must be affiliated with designated logistics companies, requiring registration with these companies, purchasing insurance through them, and paying approximately 2,000-yuan annual liaison fees. Better companies might provide guaranteed transport rights as compensation. Then, these companies generate additional profits by using accumulated vehicle inputs invoices to issue transport invoices for other light-asset businesses (detail see Section 5.5.1). This phenomenon has become prevalent, leading to substantial increases in freight vehicles." (E5, 24.07.2023)

This substantial financing channels created a surge for the amount of logistics participants, especially individual operators and small fleets. National Bureau of Statistics data demonstrates the scale of this transformation: road freight vehicle ownership increased from 6.05 million units in 2005 to 14.19 million units in 2013 (National Bureau of Statistics, n.d.). It should be noted that statistical methodologies differed before 2005 and after 2013, making these periods incomparable. Therefore, I focus on this specific interval to illustrate the trend. However, this rapid growth masked a fundamental structural shift: most new entrants

operated under debt-financing models. According to the 2023 Survey Report on the Employment Status of Truck Drivers (2023 年货车司机从业状况调查报告). Until August 2024, owner-operators comprised 78.22% of freight drivers, with 48.11% still repaying vehicle loans (China Federation of Logistics and Purchasing, 2024). The broader implications of this debt-driven operational model will be discussed in Chapter 6's analysis of network dynamics. Nevertheless, this debt-fuelled expansion created abundant available transport capacity, enabling heavy-asset enterprises to transition to light-asset operations whilst maintaining supply chain efficiency through outsourcing arrangements. As one third-party logistics company manager noted when asked about ensuring sufficient transport capacity under light-asset models:

"We actually don't need to worry about this problem. In today's market, if you have cargo, vehicles will be available at any time. Logistics companies will even actively seek you out. As long as we retain the right to transport cargo, we never worry about finding vehicles to handle our transport needs." (B8, 15.10.2023)

However, with internal transport capacity transferred to external suppliers, the logistics structure became more dispersed. It requires more effective mechanism to manage it, particularly for enterprises, such as steel plants who with strong logistics transport resource demands. Under the original internalised steel industry logistics systems, the role of transport capacity management became fragmented. Thus, this market evolution revealed logistics intermediaries' second key function: capacity management. This transformation aligns with what Bensman (2008) described as the logistics labour market's "low road" labour model. Whilst Bensman's analysis primarily focused on warehouse operations, similar patterns emerged in China's transport market. In China, the surge of individual carriers created a temporary labour structure requiring a more systematically coordinate through intermediaries. Considering operational scale, logistics intermediaries became crucial, as typically a large steel plant requires hundreds or thousands of vehicles operating simultaneously. The complexity of coordinating such extensive operations is reflected in a steel logistics subsidiary manager's observation:

"Managing ten logistics companies is far simpler than managing one thousand vehicles. It doesn't increase our transport costs and actually reduces management overhead. When

problems arise, we deal directly with third-party logistics companies. [...] Additionally, we can assign specific third-party suppliers to individual customers, making them familiar with customer processes and improving satisfaction." (D13, 07.09.2023)

This "low road" model's emergence in China's logistics industry reflects broader patterns of labour market segmentation and risk distribution within production networks. Intermediaries serve not only as operational coordinators but also as institutional buffers, managing complexity created by market saturation whilst enabling steel plants to maintain operational efficiency without directly engaging with dispersed transport capacity. This transformation created a self-reinforcing cycle: financial deregulation caused logistics industry participant proliferation, and its proliferation conversely increased demand for intermediary coordination to help cargo owners with substantial logistics needs stabilise expanded market structures. Therefore, financial deregulation with the same time facilitated market entry, it also reshaped logistics network institutional structure by creating necessary conditions for effective capacity management intermediary emergence.

5.3 Risk Redistribution and Capacity Management: Functions of Traditional Logistics Intermediaries

Having established how policy dynamics created conditions for intermediary emergence, this section examines the specific functions of these intermediaries perform within steel logistics networks. At first, it addressed the risk redistribution mechanism among logistics participants under the asymmetric road transport regulation, which demonstrate how the logistics intermediaries manage the transportation risk through the whole logistics. For the second part, this study reveals the role of steel logistics subsidiaries and fleet models in capacity management. Moreover, steel logistics subsidiaries, 3PL companies, and fleet models correspond to different elements in the institutional evolution process: preservation of old institutions, emergence of new institutions, and appearance of informal institutions, respectively. Therefore, to more clearly and intuitively observe these different logistics intermediaries' specific operational mechanisms within logistics networks. In the transport capability management part, this section adopts a comparative approach for presentation.

5.3.1 Risk Redistribution Through the *Guakao* (Affiliation) System

In logistics sector, risks primarily include operational safety risks, such as traffic accidents, cargo damage, and vehicle losses. Through outsourcing logistics functions, steel plants successfully transferred risks and regulatory attention to external entities. However, these logistics companies do not serve as ultimate risk bearers. Through the *Guakao* (挂靠, affiliation) mechanism, these logistics companies further transferred logistics transport risks to lower tiers of the industrial pyramid. This ultimately transferred to those with the weakest bargaining power rather than those capable of managing risks (Sheffi, 2012). Steel logistics subsidiaries also undertake the function of transferring steel plants' own logistics risks. However, for steel logistics subsidiaries, their primary function focuses more on capacity management, which is discussed in the section 5.3.3.

The *Guakao* system represents a unique institutional arrangement in China's logistics industry. According to Document No. 703 issued by the General Office of the Ministry of Transport in 2016, "*Guakao* operation" defined as: motor vehicle owners who undertake the road transportation operations and lack road transport operation qualifications could under the qualifications of qualified enterprises. Affiliated enterprises (enterprises providing credentials) bear corresponding legal responsibilities for affiliated operators' business activities (Ministry of Transport of the People's Republic of China, 2016).

This affiliation model stems from local government restrictions on issuing road transport permits for transport vehicles. To facilitate transport vehicle management, governments established requirements that vehicles engaged in road transport must register and possess road transport permits. At the national level, the Ministry of Transport clearly stipulated that individual operators who have lawfully completed industrial and commercial registration and meet permit conditions, transport operation permits shall be issued, with no barriers set for individual operators applying for operation qualifications. Additionally, according to "Road Transport Regulations" (道路运输条例) and "Road Freight Transport and Station Management Regulations" (道路货物运输及站场管理条例). Freight operation applicants must possess vehicles that passed inspection and appropriate for their business operations; qualified drivers meeting relevant requirements, and safety production management systems.

National government regulations impose no additional restrictions on individual vehicle owners applying for road freight transport business permits. Simultaneously, according to relevant laws and regulations, road freight transport operators must strengthen safety education and training for on-duty lorry drivers and other practitioners, strengthen vehicle safety management, and ensure road transport safety (Ministry of Transport of the People's Republic of China, 2021).

Nevertheless, these licences are not uniformly issued by the state, they are issued by the local governments within specific regions. Under these circumstances, these ambiguous national regulations granted local governments considerable discretionary power. As regional governments aim to raise road transport permit thresholds to narrow regulatory scope whilst providing regional safety regulatory resilience. Thus, when these policies were implemented within specific urban areas, some regions raised the permit thresholds of registration road transport. On the basis of original national policies, they formulated "additional" policy restrictions. Moreover, regions possess different restrictions, which raising registration road transport permit standards from several to dozens of vehicle requirements. However, because these local policies conflicted with national policies to some extent, I could not find clear regulations regarding quantity restrictions online. These regulations are often learned by visiting local government departments to handle relevant procedures, and I obtained this information through interviews with logistics industry practitioners. As one Chongqing lorry driver described:

"The municipal government doesn't allow private operations. When I bought my lorry two years ago, the local government stipulated that registering a logistics company required at least 5 vehicles and prohibited private freight operations. Although I purchased the vehicle with cash, I had to cooperate with logistics companies and pay annual management fees. Recently, new vehicles seem to be able to register independently for private operation. However, I'm not entirely clear—these policies constantly change, and I can't keep up." (E11, 24.07.2023)

This phenomenon of local "additional" policies above national policies indeed exists and varies significantly between different regions. However, for regions themselves, these local "additional" policies actually provide regional resilience against risks to some extent. In

interviews, a lorry driver explained how this system serves regulatory and operational purposes:

"Think about it, if a city has 5,000 vehicles, is it easier for the government to manage 5,000 individual drivers or several hundred logistics companies? Obviously, the logistics company answer is self-evident. Additionally, if these freight drivers cause serious accidents resulting in major losses, where would they obtain sufficient compensation funds? In the worst case, they might simply abandon their vehicles and flee. But being associated with companies is different companies can't just disappear. If individuals can't afford compensation, they can sue the company." (A5, 30.12.2022)

From this perspective, local governments raised road transport permit restrictions was aiming to maintain social stability and encourage more capable risk-bearing participants to engage in freight projects. Rather than attempted to transfer freight safety and financial risks to private lorry drivers unable to bear them. However, under the environment of massive participant influx into logistics transport, these road transport permit restrictions largely limited new participant entry. For participants owning freight vehicles below local road transport permit requirements, *Guakao* policies became their only option for participating in logistics transport network operations. Through *Guakao*, private lorry drivers could obtain legal road transport qualifications by registering their transport vehicles under companies possessing road transport permits.

Nevertheless, the legal ambiguity of affiliation system provisions provided with space for logistics companies to create informal institutions based on formal *Guakao* models. Although *Guakao* mechanism is considered a "written rule" in China's logistics sector and has relevant legal provisions for support. The initial intention of *Guakao* policy was to transfer risk from grassroots operators to affiliated logistics companies, who with financial capability, so that it could establish multi-level responsibility and accountability systems in logistics industry. In practice, its imperfect legal framework and logistics participants' extended behaviours for profit protection led to this model with mixed formal and informal institutional. Reviewing legal provisions related to the *Guakao* system, responsibility allocation mechanisms are primarily defined by the following legal framework (*Tongling Municipal Bureau of Human Resources and Social Security, 2024*):

1. The "Labour Contract Law of the People's Republic of China"(中华人民共和国劳动合同法) (effective January 1, 2008) stipulates that relationships between affiliated enterprises and drivers employed by *Guakao* do not constitute labour relationships.

2. Article 54 of the Supreme People's Court's "Civil Procedure Law Interpretation (2015)"(中华人民共和国民事诉讼法) stipulates that in civil activities conducted through affiliation, when parties request *Guakao* operators and host enterprises to jointly bear civil responsibility, both parties are co-defendants.

3. Article 178(3) and Article 1121 of the "Civil Code"(民法典) stipulate that joint liability is determined by law or party agreement. For road transport activities conducted through *Guakao*, when traffic accidents cause damage, affiliated operators and host enterprises shall bear joint liability.

4. The "Work Injury Insurance Regulations" (工伤保险条例) clearly stipulate that after host enterprises bear responsibility, they retain the right to seek compensation from vehicle owners.

Careful examination of these legal frameworks, they do not explicitly determine responsibility allocation of *Guakao*, but delegate this power to logistics network participants per se. This institutional ambiguity created operational flexibility for logistics participants, enabling them to transfer risks to individual operators with weaker bargaining power through more explicit contractual arrangements. Whilst cargo owners successfully transferred risks to logistics companies through outsourcing logistics functions, these logistics companies were unwilling to bear uncertainties brought by risks from the *Guakao* model. Therefore, as participants were dissatisfied with formal institutional arrangements, under this formal *Guakao* model, they extended informal institutions under formal frameworks made the affiliation model a grey area between formal and informal institutions. For example, in

practice, affiliated companies typically require affiliated operators to purchase extensive insurance coverage and bear ultimate responsibility for losses exceeding insurance limits. As one third-party logistics company manager explained:

"[...] For these affiliated vehicles, if accidents cause losses, companies must bear joint responsibility. However, after bearing joint responsibility and advancing compensation, payment first goes through insurance. If insurance is insufficient, it goes through affiliated enterprises' joint responsibility, then vehicle owners must ultimately bear remaining costs. If vehicle owners lack payment capacity, affiliated companies can advance compensation but retain recourse rights. We have these terms clearly stipulated in affiliation contracts. [...] If you want to obtain road transport qualification permits through affiliation, then this responsibility ultimately falls entirely on you." (B5, 21.03.2023)

This arrangement reveals a key aspect of how intermediaries manage risk: whilst formal regulations establish joint responsibility, contractual arrangements effectively transfer ultimate responsibility to individual operators. This creates a mechanism which intermediaries serve as risk buffers—temporarily absorbing risks when necessary but maintaining legal rights to transfer risks downward. Moreover, this *Guakao* model has evolved into a default institutional arrangement within the logistics industry. It effectively requires freight vehicle owners to accept risk-bearing affiliation as a condition for network participation. This forms a malleable mixture of formal and informal institutions to some extent. Field interviews revealed widespread dissatisfaction among private lorry operators with this cooperative model. Besides mandatory affiliation fees, most drivers reported that they received no assistance in ensuring cargo safety whilst facing additional regulatory burdens, such as mandatory high-value insurance policies. It increased operational costs and forced them to work harder to maintain profitability. However, for entering the logistics industry, both local additional policies and logistics companies' "additional" terms became the compulsory rules which these participants had to follow up.

Consequently, it forms a unique risk transmission mechanism within the logistics networks. In this mechanism cargo owners (steel plants) transferred logistics transport risks to logistics companies through outsourcing to evade government regulation. Local governments dissatisfied with central government vehicle operation registration regulations, extended

stricter audit mechanisms to enhance regional resilience. Under these stricter audit mechanisms, logistics companies transferred these risks to bottom-tier actual carriers through the "*Guakao*" mechanism. To ensure their own safety control whilst evading government regulation, logistics companies served as intermediaries redistributing risks downward. Finally, actual carriers (private freight vehicle owners) had to accept this risk-bearing responsibility to obtain road transport permits. In this process, different tiers of participants, dissatisfied with formal institutions established by upper-tier rule-makers. Thus, with the same time maintained original formal institutional foundations, they added additional restrictive conditions to protect their own interests, simultaneously transferring risks to lower tiers with weaker bargaining power. This formed unique risk-bearing institutions within the steel logistics industry.

5.3.2 Capacity Management: Formal and Informal Institutional Coexistence

In the context of capacity management, 3PL companies and fleets occupy different positions within logistics networks' institutional hierarchies, with each intermediary playing distinct roles in capacity expansion and management. This institutional arrangement embodies what North (1990) described as complex interactions between formal and informal constraints in economic organisation. However, unlike North's emphasis on formal institutions gradually replacing informal institutions, the steel logistics industry presents a unique case where formal (third-party logistics companies) and informal (fleets of various scales) arrangements coevolve, creating complementary institutional layers.

As mentioned in Chapter 2, existing research appears insufficiently to explore dynamic interactions between formal and informal institutions, particularly regarding how these two institutional forms coexist and mutually influence within the same spatial networks. The case of steel logistics network structures suggest that formal and informal institutions are not mutually opposing but can transform into each other under certain conditions. This institutional plasticity is particularly evident in how relationships between fleets and logistics companies are mediated through societal embeddedness. To understand how these formal and

informal institutional arrangements function together, detailed analysis of the fleet model is necessary.

Fleet models are built upon relationships between participants rather than formal legal institutions. These fleets typically comprise several to dozens of vehicles, consisting of one or multiple vehicle owners, without formal company registration. They operate on informal verbal agreements, united through societal and network embeddedness, aiming to achieve better order acquisition and capacity assurance than individual transport vehicles. Due to lack of legitimate corporate registration identity, these fleets cannot issue specialised transport invoices for included drivers, leading them to seek specific logistics companies through affiliation to issue transport invoices. As Peng and Heath (1996) described, informal arrangements typically rely on formal institutions to achieve certain legitimisation functions. For fleets, "most fleets do not exist independently but are affiliated with steel plants or logistics companies" (D17, 13.09.2023). A logistics company manager provided detailed explanation of the fleet model:

"The so-called fleet model involves some private vehicle owners having very close connections with each other. For example, your vehicle is affiliated with Company A, then his vehicle is affiliated with Company B. Especially when there was more cargo, everyone was busy and might not have time. When some couldn't handle everything, they could mutually cover for each other, without needing to seek cargo outside. Or when there's no backhaul cargo and they need to backhaul empty to catch up on time, this is the first point. Second, if there's backhaul cargo outside, because each vehicle owner has their own relationship networks for finding backhaul cargo outside, if their own vehicle can't go currently, if there are vehicles from the fleet available, you can also help transport this cargo. [...] Everyone works for common interests, essentially mutually connecting and covering for each other, facilitating everyone's benefit maximisation. So actually, there's not much difference from our company operations, but it belongs to a relatively loose organisation. [...] Under these circumstances, several vehicle owners call themselves a fleet." (B7, 23.09.2023)

Compared to formal company organisation, fleet models are relatively loose organisations formed by freight vehicle owners with common objectives, without strict rules and regulations. Moreover, there are no excessive interest entanglements between them, but rather informal institutional models formed to create greater collective benefits. Research reveals that fleet models and logistics company models can transform into each other to some extent.

These findings challenge traditional binary opposition between formal and informal institutional research, providing more diversified relational models between them. Regarding transformation from fleets to logistics companies, a steel logistics subsidiary manager noted:

"Most logistics companies started as fleets, especially in our Southwest region. They might initially have had only one lorry, then gradually expanded. Many transport company owners were previously drivers. For example, in this case, you might have one lorry and handle business for me. As your position grows, I might suggest one lorry isn't enough and encourage you to build more business volume and acquire more lorries. You could buy five lorries and form a fleet with me. But gradually, as my enterprise grows larger, or you're handling increasingly larger customers. Previously, some small companies with annual output values of hundreds of thousands or tens of thousands might not need invoices and could handle accounts through other channels. As companies develop, this practice becomes unsustainable. Tax authorities will investigate them, and they need proper invoices. What should be done in this situation? So, they establish companies, this is the only way to continue cooperating with these consigners. After company establishment, possibly due to our relationships, our business grows larger. Now five lorries seem insufficient, with temporary demands and even backhaul transport opportunities, because these transport companies all develop backhaul transport resources. Gradually, you feel five lorries aren't enough, so you buy more. Later, you might realise that although you can't handle large orders, some business is unstable. In this case, you might think you've stabilised and shouldn't buy more lorries but need to recruit affiliated vehicles. Thus, a large transport enterprise emerges." (D17, 13.09.2023)

Another subsidiary logistics company manager provided reasonable explanation for reverse transformation:

"[...] some small transport companies—those with only several or ten vehicles—might find independent operation very difficult, so they directly cancelled company registration, transformed into fleet models, and continued operating by connecting with specific logistics companies. [...] Because under company structures, you definitely need regular operational procedures, invoice issuance, and various other quite complex matters. If a logistics company cannot continue operating, becoming a fleet might be a better choice, allowing more flexible operation without worrying about these formal legal procedures." (D15, 12.09.2023)

This demonstrates that despite various restrictions related to affiliation limiting participant entry into logistics networks and registration as logistics companies. Sometimes, informal institutions are not merely "suboptimal" choices compared to formal institutions (Helmke and

Levitsky, 2006). From this perspective of mutual transformation between formal institutions represented by logistics companies and informal institutions represented by fleet models, this generalisation seems oversimplified, which ignores participants' subjective thinking. In some circumstances, choosing informal institutions might result from participants' subjective choices. For example, research on fleet leaders and lorry drivers shows that some fleets prefer not to become logistics companies but favour fleet or affiliation operational models. In this way, it could provide autonomy and flexibility without constraints from "logistics company" official frameworks. Carol Mershon (1994) provided broader explanation for this motivation, arguing that participants create informal institutions when they believe creating informal institutions costs less than establishing formal institutions conforming to their preferences. Formal versus informal institutions seem do not have priorities but rather represent participants' subjective choices of most suitable results based on actual situations.

Moreover, boundaries between fleet models and logistics companies are relatively ambiguous. Fundamentally, both logistics companies and fleet models result from division of labour refinement and functional reorganisation based on original regional assets under external influences. Particularly informal institutions, such as the fleets model arise from conflicts between micro-level decisions and macro-level institutions. The overall logic can be summarised as: under external forces, such as regulatory imbalance and financial deregulation, logistics networks formed new hierarchical structures through functional differentiation and reorganisation based on existing institutional levels. Simultaneously, because these new institutional levels of 3PL companies could not fully satisfy various needs of logistics participants, informal operational models emerged. Moreover, due to the common purpose of transporting goods to designated locations, fleet-based informal institutions and formal logistics company institutions became mutual complementary institutions.

These arrangements illustrate that institutional evolution in the steel logistics industry did not lead to mutual replacement between formal and informal institutions or compression of survival space. It resulted in more complex hybrid institutional models. This supports that informal institutions are not merely temporary solutions during transition periods (Peng, 2003). When they perform unique and valuable functions, they can become permanent features of modern economic organisation.

5.3.3 Enterprise Logistics versus Logistics Enterprises: Institutional Coexistence

Another detail frequently overlooked by researchers in logistics studies is the distinction between logistics enterprises and enterprise logistics. In steel logistics networks, they correspond to independent 3PL companies and steel logistics subsidiaries, respectively. Although traditional transition economy theory frequently predicts market-oriented entities gradually replacing state-related organisational forms (Peng, 2003), this research reveals a more complex institutional coexistence pattern. Steel logistics network evolution did not follow the path of institutional replacement but produced a hybrid system in which different institutional logics coexist and actively complement each other through functional specialisation.

This institutional hybridity is manifested in the emergence and stabilisation of two different organisational forms within formal institutional frameworks. Both are legally registered logistics companies, which is why they are often uniformly regarded as 3PL companies. However, they embody fundamentally different institutional logics. I argue that this coexistence stems from two interrelated processes: strategic retention of control by powerful institutional actors through partial preservation of existing organisational frameworks, and functional differentiation of network participants driven by different development objectives but unified by common operational needs. Whilst they essentially belong to third-party logistics companies, they differ fundamentally in creation intentions, development strategies, and primary functions.

In the steel industry, for logistics enterprises, as mentioned in the previous section's description of logistics enterprises and fleet models, their initial creation purpose typically stems from obtain fixed cargo sources. Because the organization of them are too large to be the fleets. Their business partners prefer cooperating with legally recognised entities to satisfy formal institutional requirements, such as issuing transport invoices. Thus, they register as logistics companies to better adapt to environments. For enterprise logistics, their establishment usually results from that parent enterprises wanting to partially avoid various

risks from logistics departments, such as previously mentioned safety risks and financial risks. Therefore, they externalise their original logistics departments, making them as legally independent logistics companies. However, their functions and nature show little difference from original internal logistics departments. They primarily undertake logistics support, managing transport capacity to ensure production and related matching transport work for parent companies.

As mentioned in Section 4.6.3, in Southwest China, another major driving force for the emergence of steel logistics subsidiary emergence was alignment with government objectives for developing 3PL and obtaining related subsidies and preferential policies. These 3PL companies evolved from logistics departments manufacturing industry, through registration as legally independent companies, leveraged their parent companies or other manufacturing advantages, and rapidly became leading logistics enterprises in Sichuan region through transferring trade costs and utilising inherent logistics resources. In steel industry, although steel logistics subsidiaries registered as legally independent entities, maintain profound institutional embeddedness within their parent company frameworks. In field interviews, this embeddedness manifested linguistically, with subsidiary employees typically using "we" to refer to entire steel plant groups rather than their specific logistics entities. Boundaries between steel logistics subsidiaries and steel plants were inadvertently blurred in their discourse. This linguistic pattern not only reveals organisational affiliations but also discloses entrenched institutional identities influencing business priorities and decision-making processes.

This dual institutional structure formation involves both external policy pressures and internal strategic considerations. Externally, government policies encouraging 3PL companies' development created incentives for logistics business externalisation, providing subsidies and preferential policies for companies establishing independent logistics entities. Internally, it reflected strategic calculations by powerful institutional actors for the specific forms of externalisation. As Zietsma and Lawrence (2010) observed, incumbent organisations facing potential power transfers to balance maintaining existing institutional arrangements and adjusting formal structures. In steel logistics cases, when enterprises reaching certain scales, it typically needs to split business departments into different legal entities to avoid risks and

facilitate settlements. However, even after splitting into different legal entities, strong embeddedness still exists within the same group companies. This led to establishing legally independent but institutionally embedded logistics subsidiaries, enabling to maintain strategic control logistics operations whilst formally complying with market-oriented reforms. Therefore, based on their own substantial logistics needs and existing logistics department institutional backgrounds, steel plants can construct large logistics enterprises at relatively low costs and gain stronger bargaining power in business due to larger organisational scales. Establishing enterprise logistics appears to be an efficiency way for authority maintenance whilst preserving original institutions.

Similarly, this strategic balance between institutional continuity and market adaptability is also reflected in different organisational forms conduct network expansion. Both enterprise logistics and logistics enterprises expressed expansion intentions beyond original steel plant networks, but their approaches show fundamentally different institutional logics. Steel logistics subsidiaries frame expansion as "maintaining overall enterprise transport stability" (C1, 07.09.2023) and "enhancing controllable transport capacity" (D16, 12.09.2023), showing persistent orientation toward parent company strategic priorities. This reveals that for steel logistics subsidiaries, the primary expansion aim is to satisfy their own steel plants' logistics needs, with profit generation being less important objective. In contrast, independent 3PL companies, eagerly demonstrated their external cooperation, rather than describing themselves as the companies which limited in local steel plant logistics networks. Although their development path depended on local steel plant logistics resources and maintain close cooperation with steel logistics subsidiaries. They showed stronger desires to integrate into external markets whilst maintain the cooperation relationship with existing network frameworks. As one third-party logistics company manager described, their development objective was: "based on X steel plant's inbound and outbound materials, gradually expanding outward" (B1, 11.26.2022). Institutional logic divergence becomes particularly evident in when it refers handling business priorities and profit considerations. Field research revealed patterns of steel logistics subsidiaries prioritising operational stability over immediate profitability. As one subsidiary manager explained:

"Sometimes we might incur losses. [...] First, we are a service industry, and for our reputation, we need to provide good service for our customers, including steel plants, which are our main customers. Additionally, for steel logistics subsidiaries, our primary objective is ensuring smooth transport for the entire group. Of course, we usually maintain profit margins because we need to make money and pay employee salaries." (D5, 4.9.2023)

Another steel logistics subsidiary manager's emphasis on business priorities further reinforced this institutional embeddedness:

"Our top priority must be ensuring transport, ensuring cargo flow. We don't discuss costs first; transport assurance comes first. Only after ensuring transport do, we consider appropriate costs." (D13, 7.9.2023)

Operational stability priority over profitability reflects that ensuring steel plant operational efficiency remains steel logistics subsidiaries' primary objective, which is similar to logistics department periods in the original internalised logistics structure. Although they are independent logistics companies, their development remains centred on parent, which is the core reason they are classified as "enterprise logistics" rather than independent logistics enterprises. As well, their operational models are strictly controlled by parent companies, with industrial models following strictly defined parent company standards. Correspondingly, 3PL companies operating under market-oriented institutional logic that exhibit different strategic calculations. As one logistics company manager stated:

"Because we private enterprises focus more on economic benefit maximisation. Unlike steel plants that put maintaining production and sales above economic benefits. For us, if we can't make money, we don't do it. [...] But now with intensified competition, including steel plants we cooperate with, their bidding processes involve many companies competing. When steel plants have demands, many enterprises maintain sustainable cooperative relationships at a loss. To ensure overall economic effects, we have to make necessary sacrifices." (A6, 30.12.2023)

That evidence demonstrates that both are willing to accept certain sacrifices, at least short term. Nevertheless, 3PL companies, whilst following market logic, also recognise the necessity of maintaining social relationships through strategic compromises. Their core

objective is to profit through logistics transport business. This indicates that despite different institutional logics, a common understanding makes economic cooperation possible. However, core objective distinctions—ensuring production versus ensuring profitability—became another major difference distinguishing them.

The third distinction between logistics enterprises and enterprise logistics lies in their functional differences. As the logistics intermediaries undertake capacity management and risk transfer functions, logistics enterprises serve as "buffer zones" for payments between enterprise logistics and lorry drivers. This enables a 3PL company to find unique niche markets as external logistics suppliers distinct from enterprise logistics. This mechanism's core stems from different network participants' varying sensitivities to payment cycles within logistics network frameworks. Under original internalisation frameworks, these roles were entirely performed by internal logistics departments. Since all logistics operations were managed within the same organizational structure, payment cycles were internally coordinated and did not require external cash flow management between different entities. However, during network expansion, payment functions were enhanced and amplified. As overall logistics hierarchies increased, different tiers of logistics participants' understanding of this function increasingly diverged, leading to institutional differentiation. Evidence shows that different network-tier participants have varying payment requirements. Grassroots participants have limited tolerance for extended payment cycles, as evidenced by one lorry driver's strong response when asked about cargo payment settlement cycles:

"[...] Generally, monthly settlement, or every two to three trips. But these arrangements usually only occur with familiar partners. For unfamiliar people, I won't accept such arrangements because it doesn't give me security. So usually, for unfamiliar cooperation partners, I only accept per-trip settlements." (E1, 30.12.2023)

However, unlike lorry drivers who only accept short-term project settlement systems. Steel logistics subsidiaries typically align their settlement cycles with steel trading settlement cycles, operating on monthly, quarterly, or project-based cycles far exceeding grassroots participants' expectations. This temporal discrepancy in payment requirements between steel plants (steel logistics subsidiaries) and lorry drivers created "institutional gap" areas. Logistics enterprises' emergence successfully filled this gap. For logistics enterprises, due to

smaller scales, they typically demonstrate greater flexibility in capital, perfectly serving as capital buffers. It enables them to maintain capital flows of entire logistics networks, which is developing complex capital management capabilities to bridge different payment times. This arrangement solves practical problems in regional economic networks through creatively reorganising institutional elements. 3PL companies have evolved from simple transport coordination into important financial intermediaries, enabling networks to adapt to different payment requirements whilst maintaining operational stability. This advance payment function effectively connects entire logistics networks whilst enhancing network resilience through complementary institutional arrangements. From institutional evolution perspectives, new and old institutional coexistence stems from what Mahoney and Thelen (2010) described as "institutional layering through functional specialisation". Original internalisation structures have evolved into more resilient systems managing transport capacity and capital, enabling logistics networks to improve efficiency whilst maintaining original structures.

This institutional coexistence pattern challenges traditional understanding of institutional evolution in three key aspects. First, steel plants created new organisational forms maintaining control whilst adapting to market pressures. It demonstrates how incumbent actors' power retention drives institutional innovation rather than merely institutional protection. Second, functional differentiation emerges from interactions between different institutional logics, creating stable hybrid arrangements rather than temporary transitional forms. Finally, it reveals how regional institutional thickness shapes organisational form evolution, as deep embeddedness of steel industrial networks enables complex institutional complementarities to develop. Furthermore, the enterprise logistics versus logistics enterprises analysis reveals that steel logistics subsidiaries and independent third-party logistics companies achieve stable coexistence through functional complementarity, with each addressing distinct coordination challenges within steel logistics networks. Steel logistics subsidiaries provide strategic control and operational stability for their parent companies, whilst independent logistics enterprises offer market flexibility and act as crucial financial intermediation. Their functional specialisation created a stable institutional division of labour that enhances overall network resilience and adaptability.

5.4 The Evolution of Digital Freight Platforms

Following the analysis of traditional intermediaries and their evolutionary pathways, together with their interactions with institutional change. This chapter now turns to examine digital freight platforms. In this chapter, the term "digital freight platform" is used to refer to technology-enabled logistics intermediaries, although various terms exist in different contexts. Whilst major enterprises often use "digital freight platform" in their corporate communications, Chinese government policies use "*wangluo huoyun*" (网络货运, network freight). This study adopts 'digital freight platform' as it better reflects the technological nature and industry standard of these platforms, whilst specifically referencing the Chinese term "*wangluo huoyun*" (网络货运, network freight) when discussing relevant government policies and regulations.

The original intention of digital freight platforms was to establish an information intermediary through the internet, facilitating matching between cargo sources and transport capacity. This was designed to replace traditional methods of offline information exchange, shippers and carriers could be matched through digital platforms. To some extent, this was intended to make information about goods and capacity pools more transparent, enabling more efficient information matching across larger geographical areas, thereby eliminating information barriers between shippers and actual carriers. From a statistical perspective, digital freight platforms have achieved considerable success in market penetration. According to the "2023 Report on the Employment Status of Truck Drivers" (2023 年货车司机就业状况报告), there is steady growth in the use of digital freight platforms in recent years (China Federation of Logistics and Purchasing, 2024).

However, in practice, digital freight platforms seem not achieved their anticipated functions. Field research reveals that, except for occasional drivers and new entrants to the logistics industry, most drivers still tend to maintain their original non-platform operational models, which utilise digital freight platforms as a last resort. They prefer to cooperate with familiar logistics companies to find cargo sources, only considering digital freight platforms for capacity matching when familiar shippers have no cargo available. Moreover, the function of digital freight platforms as information intermediaries is less important; instead, they

increasingly serve as tools for logistics participants, particularly 3PL companies, to issue transport invoices.

The fundamental cause of this phenomenon is impacted by the transition process of digital freight platforms from informal to formal institutional arrangements. Whilst digital freight platforms fulfil the needs of logistics participants to some extent (such as cargo safety, information matching, and satisfying government requirements for financial supervision and taxation), it seems that traditional offline trust-based logistics cooperation institutions are difficult to be replaced by online cooperation systems. Having said that, due to tax preferential policies granted by the government to digital freight platforms, and their development of functions to issue VAT invoices for logistics participants who are unable to issue them independently, the primary function of digital freight platforms has gradually shifted from logistics information matching to VAT invoice issuance.

The following sections of 5.4 trace the platform's evolutionary trajectory from basic "small blackboard" models through non-vehicle carriers to contemporary digital freight platforms, demonstrating how digital freight platforms gradually transformed from original informal models into formal institutions. Section 5.5 examines the subsequent impact of digital freight platforms on logistics network institutional hierarchies through analysis of three interconnected phenomena that emerged following platform formalisation.

5.4.1 Small Blackboard Model: The Genesis of Logistics Information Intermediaries

In the early 21st century, responding to increasing logistics business outsourcing and the proliferation of logistics participants, a unique form of logistics intermediary emerged. During this phase, due to highly asymmetric information matching, the formation of this type of logistics intermediary was more based on trust-based models established within small-scale "small blackboard" operations. As section 4.6.1 described, the operation structure of the logistics enterprise and drivers are transfer to the predominantly centrifugal logistics network. Logistics participants increasingly required matching backhaul cargo sources to reduce logistics costs, effective matching of freight supply and transport capacity became

increasingly important. This led to the development of logistics information departments—a new type of intermediary organisation specialising in information coordination.

Initially, given the rapid development of the steel industry and broader manufacturing during this period, ensuring production and transport requirements for the main manufacturing industry are the primary concern for logistics networks. These information intermediaries played a relatively minor role in these industries. However, for some smaller enterprises that more emphasis on the logistics costs, or for manufacturing enterprise lacking logistics supply systems. This kind of logistics intermediary is vital in the broader logistics transport field. Although these information departments had similar functions with 3PL companies, they represented a unique institutional form which characterised by minimal or no direct ownership of transport assets. They were typically located near logistics parks or freight stations, specialising in aggregating dispersed cargo information and disseminating it to lorry drivers, facilitating information matching between goods and vehicles.

This information intermediary displayed significant institutional simplicity: shippers posted order information through written on blackboards in logistics park offices. Drivers visited these information departments, identify suitable cargo matches from blackboard listings, and confirm arrangements by telephone. Information departments generated revenue through intermediary fees. Although electronic displays eventually replaced physical blackboards, this era became known as the "small blackboard" period in Chinese logistics history, reflecting its basic matching mechanism. Compared with 3PL companies in institutional scope and risk allocation, this form of information departments mainly focuses on facilitated information matching, collecting service fees without assuming responsibility for cargo safety or financial transactions. These limited roles meant that mature logistics network participants with stable freight volumes continued to prioritise relationship-based economic models for information acquisition, due to safety considerations. A logistics company manager's reflection vividly illustrates the operational dynamics of this era:

"[...] When bidding for certain state-owned enterprise logistics projects, each company needed at least 500,000 yuan as a deposit. If you won the bid, that money would be transferred to that enterprise. Any problems, such as cargo damage or delays, would be

deducted from this deposit. [...] Whilst these large enterprises required logistics companies to provide deposits to ensure cargo safety, many private enterprises were more concerned with costs. They didn't care much about these issues, only requiring drivers to purchase insurance before transporting goods [...] We not only paid deposits but also had freight charges retained by shippers. Therefore, these large enterprises trusted us completely. [...] Even now, with advanced digital freight platforms, many large enterprises still prefer to cooperate with established companies like us rather than these logistics information departments or digital freight platforms." (A3, 21.11.2022)

This testimony reveals how institutional arrangements differentiated 3PL companies from logistics information departments. Large enterprises maintained strict control over their logistics flows, largely bypassing information departments. However, for smaller enterprises that valued cost-effectiveness over logistics control, these information departments served as their primary channel for accessing logistics information before digital freight platforms emerged. Furthermore, the constraints of physical distance represented one of the fundamental barriers to the development of this type of logistics intermediary during that period. Despite the strategic location of information departments near logistics parks and stations, this strong geographical embeddedness created significant information flow limitations. Their reliance on physical visits and telephone communications restricted information dissemination. Therefore, whilst these departments profited from information asymmetries, they primarily served as important intermediaries for independent carriers and small shippers unable to access established large-scale logistics supply networks. The geographical embeddedness of these information departments created different operational patterns amongst drivers. As one driver explained:

"Before digital freight platforms appeared, when we couldn't arrange backhaul cargo in advance, after completing a delivery in a city, we would go to local logistics information departments to find suitable cargo." (E9, 24.07.2023)

When asked how he handled backhaul cargo to remote or unfamiliar cities, he replied:

"First, we would definitely ask shippers or locals about the location of local freight information departments. If there weren't any, or if local freight information departments didn't have suitable cargo, we could only backhaul empty. Or we had to go to nearby large cities because their logistics information departments usually had more

comprehensive cargo options. But this would generate additional time and fuel costs."
(E9, 24.07.2023)

At the same time, the resulting bidirectional asymmetry of cargo and capacity information posed certain obstacles to the development of these logistic information departments. Although it did not severely affect logistics networks of large manufacturing enterprises with complete logistics systems, it constrained the development of centrifugal logistics models (see section 4.6.2). Lorry drivers faced unstable circumstances in finding backhaul cargo, forcing steel plants and 3PL companies to increase freight rates to compensate for financial losses from empty backhauls. Due to information circulation limitations, uneven distribution of regional logistics resources resulted, with substantial logistics resource information confined to large cargo markets. For logistics networks in some remote areas, lorry drivers needed to personally visit logistics information departments to seek freight information, which further highlighting the institutional limitations of this early information intermediary model.

The "small blackboard" model established the foundational concept of logistics information intermediation, operating through simple cargo-capacity matching at fixed locations. While this model successfully addressed basic information asymmetries between dispersed shippers and drivers, it was constrained by geographical limitations and minimal institutional responsibilities. These structural weaknesses, particularly the inability to transcend local markets or provide comprehensive service guarantees positioned it as a transitional form that would require technological enhancement and institutional formalisation to meet the evolving demands of expanding logistics sector.

5.4.2 Digital Transformation and Enhanced Matching: The Platform Revolution

In the second phase of digital freight platform development, the primary focus was on resolving information matching issues during the platform evolution process. With the rapid popularisation of internet technology and smartphones in China, the foundation was laid for digital transformation across multiple sectors. From 2012 onwards, the emergence of B2B

enterprises such as "*Zhao Mei Wang*" (找煤网, Find Coal Network), "*Zhao Gang Wang*" (找钢网, Find Steel Network), and "*Zhao You Wang*" (找油网, Find Oil Network) marked a significant transformation in commodity trading. These platforms demonstrated the potential of digital technologies to disintermediate traditional trading relationships by connecting buyers and sellers directly through internet platforms, creating more transparent and efficient matching mechanisms across various commodity sectors and providing a model that could be adapted for logistics services.

After 2014, Chinese government promote the "Internet Plus" economy facilitated platform development across various industries, accelerating digital transformation (State Council of the People's Republic of China, 2015). Inspired by the success of commodity trading platforms, between 2012 and 2016, numerous enterprises attempted to revolutionise logistics information matching through digital platforms, with *Yunmanman* (运满满 [established 2013]) and *Huochebang* (货车帮 [established 2014]) becoming industry leaders. These companies later merged in 2018 to form *Manbang Group* (满帮集团), China's largest digital freight platform.

During the initial establishment period, these platforms attracted numerous shippers to publish cargo information on their respective platforms, digitally echoing the traditional "small blackboard" model. These platforms enabled shippers to publish comprehensive supply information through digital interfaces, including cargo details, transport locations, schedules, pricing and so on. After platform registration, users could access this information whilst also posting their vehicle specifications, preferred routes, and price expectations. This digital matching mechanism transcended geographical limitations, achieving direct freight capacity matching and initiating a digital disintermediation process that began reshaping traditional information intermediary models. This transformation generated numerous platforms dedicated to digital freight matching, fundamentally changing traditional information dissemination patterns in logistics networks. Thus, this early digital freight platforms essentially represented digital evolution of the "small blackboard" model, commonly described in the logistics industry as "advanced logistics information departments".

While this enhanced matching mechanism increased lorry driver mobility, the impact varied significantly across different types of logistics network participants. For individual drivers and smaller shippers, platforms provided opportunities by offering more effective cargo sourcing channels. As one driver explained how his work changed after the emergence of this type of logistics intermediary:

"Before digital freight platforms appeared, we couldn't publish information online; everything depended on private relationships. We could only contact a few drivers we regularly cooperated with through freight departments, unable to enter broader markets. Now it's completely different. We can search directly on platforms, enter broader markets, and access more information. In my view, this is the biggest difference." (E10, 24.07.2023)

This accessibility enhancement benefited participants with limited network embeddedness. Compared to the "small blackboard" model, digital platforms successfully enhanced matching mechanisms between goods and transport capacity, improved logistics information transparency, and imitate geographical limitations in certain degrees. Nevertheless, for major industry players, the deeply embedded societal and network relationships in created resistance to this kind of digital intermediaries.

As mentioned in section 5.2.1, for large shippers, their primary concern is maintaining logistics efficiency whilst ensuring safety. However, during this period, the digital freight platform could not satisfy these requirements. Due to the lack of standardised regulatory frameworks during this period, such as financial and cargo safety responsibility allocation, information security protocols, route tracking mechanisms and so forth. These early digital freight platforms that evolved from the "small blackboard" model primary focused on addressing cargo sourcing and information matching needs for lorry drivers and 3PL companies. They have limited capacity to coordinate dispersed lorry drivers, which unable to provide stable transport capacity as 3PL companies. Thus, they were failing to meet large enterprises' substantial logistics demands. Thus, whilst platforms improved matching efficiency, they struggled to address the core concerns of large enterprises, namely cargo safety and operational efficiency. It majority focused on rapid matching and facilitating lorry

drivers find cargo sources, particularly backhaul cargo, to reduce logistics operational costs. This priority difference meant a fundamental mismatch between platform capabilities and institutional requirements within established logistics networks. Thus, digital freight platforms were not yet primary considerations for these large enterprises.

Although these platforms enhanced cargo capacity matching beyond physical location limitations, they still failed to fulfil the comprehensive needs of large shippers. Logistics network participants, particularly drivers and 3PL companies, still heavily relied on established relationships based on trust, process familiarity, and safety considerations. Digital freight platforms remained a supplementary channel rather than the primary means of securing backhaul cargo. This gap between technological capability and institutional requirements would set a stage for the regulatory interventions and formal institutionalisation processes that would follow in the next phase of platform evolution.

5.4.3 Regulatory Formalisation and Tax Integration: The Rise of Digital Freight Platforms

In the third phase of digital freight platform development, the government shifted attention to digital freight platform development. Given their foundation on internet operations, platforms possessed relatively transparent business processes that could be more easily monitored compared to offline operations. Furthermore, as the logistics industry had long existed within tax regulatory gaps under the business tax framework, with many freight vehicles operating without issuing tax invoice during transport. Platforms are better aligned with government tax departments and their tax reform requirements, specifically the transition from business tax to value-added tax (VAT). Through this transformation, government could better regulate the overall logistics transport industry. Therefore, government attempted to establish comprehensive formal institutions for digital freight platforms to address negative factors that had previously limited platform development.

Before 2016, digital freight platforms existed in an era of "unregulated growth". Although from 2015, the State Council's official website repeatedly mentioned encouraging logistics enterprises to develop "non-vehicle transport" (无车承运) projects, no formal documents

were issued to define and regulate these operations. These platforms primarily represented informal combinations of traditional logistics intermediaries with internet technology, lacking formal oversight in key areas including licensing, operational supervision, integrity assessment, and tax management. Whilst these platforms facilitated logistics industry development and provided certain services to dispersed shippers and lorry drivers, their existence within a regulatory vacuum and lack of formal institutional background limited large shippers' adoption.

To promote the development of digital freight platform development, between 2016 and 2019, government implemented a three-year pilot programme, defining these platforms as "non-vehicle carriers" (无车承运人). This policy provided legal status to logistics intermediaries who primary focus on information match and with limited transportation asset (Ministry of Transport of the People's Republic of China, 2016). This phase coincided with China's logistics industry facing broader transition from business tax to VAT. Although this transformation began in 2012 for the logistics industry. It initially operated only on a pilot basis, concentrated in major cities. For example, Shanghai began pilot work on business tax to VAT transition for transportation and modern logistics industries in 2012 (Shanghai Tax Bureau, 2012), but this was not extended nationwide until 2016, when two key policy documents created major institutional transformation.

The first change was comprehensive implementation of VAT pilots. According to the Ministry of Finance and State Administration of Taxation's "Notice on Comprehensively Implementing the Pilot Programme for Replacing Business Tax with Value-Added Tax" (关于全面开展营改增试点工作的通知) (Ministry of Finance and State Administration of Taxation, 2016). It indicated that non-vehicle carriers as transport service providers would pay VAT. In addition, as legitimate taxpaying entities, non-vehicle carriers have rights to issue 11% VAT invoices to shippers. The second change was when the Ministry of Transport issued "Opinions on Promoting Reform Pilots to Accelerate Innovation in Non-Vehicle Transport Logistics Development" (关于推进改革试点加快无车承运物流发展创新的意见) (Ministry of Transport, 2016). This document established the legal status of non-vehicle carriers, requiring enterprises engaged in non-vehicle carrier activities to apply for approval and obtain road

transport licences, with their business scope clearly defined as "general road freight transport (non-vehicle carriers)". The document provided a precise definition of non-vehicle carriers: operators who sign carrier contracts with shippers, collect transport fees, assume carrier responsibilities, then delegate actual carriers to complete transport services.

In general, this policy framework involved three main aspects. First, it clearly defined non-vehicle carriers as "operators who sign carrier contracts with shippers, collect transport fees, assume carrier responsibilities, then delegate actual carriers to complete transport services". Second, it established formal non-vehicle carrier approval processes, requiring government review before issuing road transport licences with specific business scope as "general road freight transport (non-vehicle carriers)". Approved non-vehicle transport enterprises legitimate taxpayer status with rights to issue 11% VAT invoices to shippers. Finally, it emphasised non-vehicle carriers' obligation to assume full transport responsibility. This marked non-vehicle carriers' transformation from informal institutional models to formal frameworks, demonstrating how informal institutions can evolve into formal institutions under specific conditions.

However, implementing VAT framework through non-vehicle carriers revealed significant practical challenges. A fundamental problem emerged: logistics participants found it difficult to obtain ordinary VAT invoices from lorry drivers, who still needed to visit local tax bureaux to issue invoices. This created substantial friction in tax chain completion. As lorry drivers used to accustomed "invoice-free" transport practices, which proved resistant to new administrative requirements. Even now, over ten years after VAT reform, field interviews revealed majority of lorry drivers remained unaware of tax-related regulations and did not care about them. Therefore, they would not spend time issuing corresponding transport invoices after completing each business transaction. This resulted in tax chain breaks preventing logistics companies from applying for VAT input deductions, thus creating a key industry problem.

In response, several major policy developments emerged in 2017. The State Administration of Taxation issued "Announcement on Value-Added Tax Issues Including Tax Exemption

Filing for Cross-Border Taxable Activities" (国家税务总局关于跨境应税行为免税备案等增值税问题的公告) (State Administration of Taxation, 2017), which expanded VAT input tax deduction scope for the logistics industry, clearly including fuel costs and toll fees incurred by logistics enterprises or non-vehicle carrier companies as deductible expenses. Additionally, the State Administration of Taxation issued the "Administrative Measures for Small-Scale Taxpayers in Freight Transport Industry to Apply for Proxy Issuance of VAT Special Invoices" (货物运输业小规模纳税人申请代开增值税专用发票管理办法) (State Administration of Taxation, 2017), enhanced invoice issuance flexibility. It stipulated that qualified small-scale taxpayers in freight transport could apply for VAT special invoices at multiple locations including their tax registration location, cargo departure location, arrival location, or transport business contracting location (including digital freight platforms).

Most crucially, the State Administration of Taxation issued the "Notice on Piloting Work for Internet Logistics Platform Enterprises to Issue VAT Special Invoices on Behalf of Others" (国家税务总局关于开展互联网物流平台企业代开增值税专用发票试点工作的通知)(State Administration of Taxation, 2017), which established one of the most important functions of digital freight platforms: bridging tax chains between legal entities and natural persons. This policy authorised online non-vehicle carriers to issue 3% VAT invoices on behalf of tax bureaux to small-scale taxpayers including individual drivers, enabling input deduction. This development led some industry participants to describe non-vehicle carriers' role as "mobile tax bureaux". Although the practical implementation of these tax integration mechanisms proves more complex than anticipated (as detailed in Section 5.5), these changes represented a fundamental shift in platform function. However, implementing these tax integration measures encountered resistance from long-established informal practices, particularly lorry drivers' habitual avoidance of tax-related responsibilities. Whilst policy frameworks encouraged tax compliance, persistent gaps between formal requirements and informal behaviours created unexpected consequences that reshaped industry dynamics (See Section 5.5.1). To address ongoing challenges, the Ministry of Finance and State Administration of Taxation issued the "Notice on Adjusting Value-Added Tax Rates" (关于调整增值税税率的通知) (Ministry of Finance and State Administration of Taxation, 2018), which reduced downstream VAT rates to 10%. In the 2019, this proportion was further reduced to 9%, a figure retained today.

Although current digital freight platforms representing formal institutions remained imperfect, they had largely addressed safety and information circulation problems contained in previous logistics intermediary forms whilst meeting government macro tax reform needs. It enabled substantial company-level logistics participants to actively participate in VAT chain completion within formal institutional environments. In 2019, the Ministry of Transport issued the "Interim Measures for Road Freight Transport Management by Network Platforms" (网络平台道路货物运输经营管理暂行办法) (Ministry of Transport of the People's Republic of China & State Administration of Taxation, 2019), formally ending "non-vehicle carrier" pilots and introducing the term "network freight" (网络货运). This regulation, effective from 1 January 2020 to 31 December 2025, provided a more comprehensive framework for digital freight platforms:

“Network freight operation refers to business activities where operators integrate and configure transport resources through internet platforms, sign carrier contracts with shippers, delegate actual carriers to complete road freight transport, and assume road freight transport business carrier responsibilities. Network freight operations do not include activities that merely provide information intermediary and transaction matching services for shippers and actual carriers. Actual carriers refer to operators who commissioned by network freight operators, use qualified freight vehicles and drivers to engage in road freight transport.” (Ministry of Transport, 2019)

This regulation imposed stricter regulatory requirements on digital freight platforms. It was particular reflected in the complex challenge of institutionalising technological innovation within existing economic structures—a process that required careful balancing of operational efficiency, regulatory oversight, and tax management concerns.

The resulting transformation demonstrated how institutional change occurs through layering rather than replacement. Platform evolution followed a distinctive pathway where new formal structures emerged through careful integration with existing practices, creating a developmental trajectory with three distinct stages: the initial emergence of platforms as informal matching mechanisms; their subsequent recognition as non-vehicle carriers with specific regulatory responsibilities; and their final establishment as comprehensive network

freight operators within formal institutional frameworks. Whilst regulatory frameworks can be rapidly established through policy directives, informal institutions based on original institutional frameworks, such as trust relationship-based logistics networks and participants' tax cognition. These informal constraints rooted in customs, traditions, and behavioural norms are much more resistant to intentional change. This transformation required precise boundary delineation and behavioural standards, necessitating gradual adaptation.

Furthermore, progression from informal to formal status revealed how institutional change typically occurs through "functional accumulation" (Polenske, 2007), where new capabilities and responsibilities are gradually added to existing operational frameworks whilst attempting to replace originally conflicting functions. Although not necessarily successful or achieving complete replacement, such formal framework-based formal institutions largely eliminate informal factors within original institutional frameworks. The resulting institutional arrangements represented more than simple regulatory compliance. They positioned digital freight platforms as key intermediaries bridging multiple institutional domains: connecting formal and informal sectors; linking different levels of tax systems; and facilitating interaction between large shippers and actual carriers. This multifunctional role highlighted how technological innovation by appropriately institutionalised, and it could enhance both regulatory effectiveness and market efficiency.

5.5 Digital Platforms and Institutional Reconfiguration

Following the introduction of digital freight platforms, this section examines how platforms were reshaped by participant behaviours across different organisational levels, leading to fundamental functional transformation. Whilst digital freight platforms have gradually enhanced their capabilities during evolution and satisfied logistics participants' needs in certain degrees, particularly serving as invoice issuance tools connecting natural persons and legal entities within the VAT framework. Their core function has undergone significant transformation. As mentioned previously, official data shows digital freight platform usage rates consistently demonstrate upward trends. Field research reveals that although majority of lorry drivers and third-party logistics companies use network freight platforms, their function

as cargo-capacity matching tools is gradually weakening, increasingly serving as transport invoice issuance tools. As one logistics company manager described:

"Nowadays, many freight platforms primarily provide invoice issuance functions, whilst their original purpose of publishing cargo sources and facilitating connections between shippers and carriers has become secondary" (A3, 26.11.2022)

This transformation of network freight platform institutional arrangements results from three interconnected phenomena. First, VAT reform and regulatory ambiguity surrounding *Guakao* (affiliation) policies enabled vehicle affiliation to serve as effective enterprise input tax deduction certificates, becoming new profit opportunities within the financial institution and "affiliated" logistics company cooperation model described in Section 5.2.2. This further reduced freight vehicle purchase restrictions, promoting rapid participant growth within the logistics industry. Second, this expansion intensified industry competition, with supply-demand imbalances between cargo sources and transport capacity making traditional trust-based transaction models appear more valuable. Third, under traditional trust-based models, due to government-level tax regulatory pressure and continued government tax preferential policies for network freight platforms, 3PL companies and some shippers adopted hybrid models of "offline" cargo sourcing, which combined with network freight platform transport invoice issuance. This model gradually became the industry's mainstream institutional arrangement. Consequently, digital freight platforms gradually transformed from information matching intermediaries into VAT transport invoice issuance tools.

This transformation reflects complex interactions between platforms' emerging intermediary roles, policy reforms (particularly tax reform), existing institutional frameworks, market practices, and participant relationships. Whilst regulatory and policy pressures have formally incorporated platforms into official institutional arrangements, research demonstrates their ultimate function remains influenced by adaptive behaviours within logistics networks. Therefore, this section examines this transformation through analysis of these three interconnected phenomena, demonstrating how participant behaviours mutually influence each other following digital freight platform emergence, thereby reshaping logistics networks' institutional environment.

5.5.1 Market Expansion Through Institutional Arbitrage

The first impact of network freight platforms and tax reform policies on the overall industry was unexpected industry re-expansion. Under the original business tax framework, as described in Section 5.2.2, financial deregulation led to substantial "private financing channels". The cooperation between financial institutions and affiliated logistics companies reduced purchase restrictions, attracting numerous new participants into the logistics industry. They generated profits through affiliation fees and insurance premiums. Following the transition from business tax to VAT, circumstances changed. Vehicle purchase certificates could serve as enterprise VAT deduction vouchers, adding new revenue sources for these institutions.

This usage of vehicle purchases as input deduction certificates under the VAT framework directly relates to vehicle ownership issues under the affiliation model. Although the State Administration of Taxation Commercial Service Tax Division redefined affiliated operations after VAT reform, its definition remained broad. Building upon the original affiliated operation concept, the State Administration of Taxation's "VAT Comprehensive Reform Pilot Policy Training Reference Materials" ("营改增"专题业务培训参考材料) described *Guakao* (affiliated) as:

"Enterprises or partnerships reaching subordination agreements with other business entities, where affiliated parties usually conduct business under the affiliate's name, with affiliates providing qualifications, technology, and management services whilst collecting regular management fees. " (State Administration of Taxation, 2016)

The key ambiguity concerns asset classification, which vehicles purchased individually but affiliated to certain logistics company for obtain permits exist in a legal grey area. Despite these vehicles without operational relationship with companies, they can be calculated as company assets for VAT purposes. Therefore, even transport vehicles purchased by individuals, and the affiliation actions merely aim to obtain road transport permits. These affiliation vehicles can be still counted as affiliation company fixed assets under the VAT framework.

These ambiguous institutional definitions provided logistics industry participants, especially financial institutions and affiliated logistics companies, with institutional arbitrage opportunities, which defined as the "purposeful deployment of multiple institutional logics by an actor to achieve valued organizational outcomes" (Perkmann et al., 2022, p. 2). Specifically, building upon existing cooperation between financial institutions and affiliated logistics companies, these participants further reduced lorry sales prices whilst requiring purchasers to affiliate vehicles with designated logistics companies. Even though some regions permit individual lorries to operate as individual commercial operators in freight transport, if freight vehicles are not affiliated with designated logistics companies, individual purchasers cannot access related preferential policies, such as low-down payments, zero down payments, or lower vehicle prices. Through this approach, these participants can construct logistics companies possessing substantial "actual" assets, enabling them to issue large quantities of VAT invoices for vehicle purchases based on their "actual" assets for input deductions. As one logistics enterprise chairman described:

"After VAT reform, to attract individual drivers to join, they (these institutions) even reduced prices by 7-8 percentage points [...] The reason is they gained 17% VAT input deductions from vehicle purchases and could issue more VAT invoices." (B4, 01.01.2023)

This created a dual profit mechanism: first, financial institutions could claim 17% VAT input deductions on vehicle sales; second, affiliated logistics companies could issue 9% VAT transport invoices based on these "paper assets" without actually purchase vehicles. Consequently, freight vehicle purchase barriers were reduced again, attracting numerous participants, especially lorry drivers, into the logistics industry. This market expansion resulted in logistics networks filled with numerous actual carriers, presenting oversupply situations. Combined with digital freight platforms' gradually enhancement the regulation of verifying driver identities and monitoring transport routes, operational safety significantly improved through platform usage. This results some small shippers and logistics companies gradually begin using platforms obtain cheaper capacity resources. Unlike early non-vehicle carrier periods, using digital freight platforms could provide safety guarantees at this stage.

Therefore, many shippers and logistics companies with relatively low logistics demands start use digital freight platforms. This promoted industry-wide outsourcing trends.

Although large manufacturing shippers, such as steel plants, are not primary platform users due to potential short-term massive logistics demand considerations. These changes still affect their operations. As market expansion creates supply-demand imbalances, external logistics companies can provide cheaper capacity through platforms when shippers do not require short-term massive capacity, at the same time the digital freight platforms can partially guarantee transport safety.

The market expansion phenomenon reveals how institutional arbitrage emerges from intersections between policy reform and regulatory ambiguity. VAT reform, intended to formalise tax compliance, inadvertently created profit opportunities through vehicle sales financing, further expanding an already saturated market. This demonstrates that the formal institutional change generates unintended consequences when participants exploit regulatory gaps (Perkmann et al., 2022). This analysis reveals that institutional change rarely follows predetermined linear paths. Conversely, participant economic behaviours extended under formal rules often reshape institutional landscapes in unexpected ways. Despite there are comprehensive design, formal institutions cannot fully predict, or control adaptive strategies participants will develop.

This market dynamic created a low-price cycle where platforms facilitated price transparency, reducing shipper concerns about capacity availability. Outsourcing through platforms became increasingly attractive, as it could offer access to adequate transport capacity at competitive prices. However, this gradually squeezed grassroots participants' survival space, making it increasingly difficult for lorry drivers to obtain appropriately priced matching cargo sources through digital freight platforms. This oversupply created a paradox: whilst platforms provided more choices, the abundance of choices increased uncertainty regarding quality and reliability. However, logistics operations require precise timing and reliability—factors that price-oriented platform matching cannot guarantee. It generated the second phenomenon:

participants increasingly preferring trust-based original transaction models over digital freight platforms.

5.5.2 The Persistence of Trust-Based Networks Coordinating Through "Private Capacity Pools"

As increasing numbers of participants enter the logistics industry, both logistics companies and lorry drivers increasingly prefer traditional trust-based cooperation methods. This "countertrend" stems from two key factors resulting from rapid industry expansion: first, since network freight platforms eliminated geographical restrictions of information barriers. It combined with rapid capacity expansion creating supply-demand imbalances, lorry drivers increasingly hope to sell their capacity at lower prices to obtain orders, triggering destructive industry competition with continuously declining transport prices. The advantages originally provided by network freight platforms, such as eliminating geographical restrictions, are no longer sufficient to compensate for impacts from significantly declining prices.

Second, massive influxes of new participants led to uneven service quality, including drivers abandoning cargo upon finding better opportunities during transport, companies delaying payments beyond agreed periods, and operators lacking appropriate insurance or qualifications. These problems can be filtered through reputation mechanisms within trust-based networks but are difficult to prevent in anonymous platform environments. Therefore, compared to these uncertainties, trust-based cooperation became the preferred choice for both lorry drivers and logistics companies. This generated a unique "private capacity pool" model based on digital freight platforms.

Compared to the "small blackboard" period logistics intermediary model, current digital freight platforms enhanced safety supervision regarding goods and financial aspects. It provides safety guarantees for transactions between unfamiliar parties and reduces the importance of established relationships. However, this operational model is not favoured by lorry drivers. As one fleet boss who has transported for a steel plant for nearly 20 years described:

"Our outbound materials definitely rely on X steel plant's product transport, but for backhaul cargo, I generally still make enquiries through familiar contacts. Because steel transport routes are basically quite fixed, over these many years, we've basically developed familiar shippers at different destinations. Before going to a specific location, I enquire in advance whether they have backhauled cargo to cities around the steel plant. Only when there's really no cargo do I search for backhaul cargo through digital freight platforms, but this proportion is small, less than 30%." (E2, 05.04.2023)

Compared to seeking cargo sources through network freight platforms, from logistics industry participants' perspectives, they still prefer seeking cargo sources through originally established social relationships, with network freight platforms serving only as backup choices for finding cargo sources. When asked why he operated this way, he continued:

"First, price is naturally the primary consideration. On digital freight platforms, because information is overly transparent, prices are sometimes pushed very low. Some drivers, eager to find backhaul cargo, sometimes even compete for orders at a loss. Then platforms also charge certain proportions of order commissions [...] Additionally, now basically no shippers publish information on digital freight platforms; they're all third-party logistics companies subcontracting orders, and these third-party logistics companies also charge portions of fees. Therefore, platform prices are usually suppressed to very low levels [...] I've been in this industry for many years, I have more familiar shippers, I'm very familiar with their processes, ensuring smooth loading and delivery procedures. They also trust my service level and pay quickly. So directly contacting familiar shippers remains our main operational method. Furthermore, after cooperating with some shippers through digital freight platforms, if both parties feel satisfied, we exchange contact information for future direct cooperation, bypassing digital freight platforms." (E2, 05.04.2023)

Through conversations with him, price undoubtedly emerges as the primary reason they abandon network freight platforms as their first choice. When price becomes the primary competitive factor on platforms, lorry drivers have to knock down their prices to obtain orders. Combined with platform commissions and intermediary fees, sometimes, the freight charges even below operational costs. Nevertheless, the traditional trust-based cooperation ensures reasonable prices and stable business volumes. Moreover, even when network freight platform and familiar shipper prices tend toward parity, compared to network freight platforms, traditional trust-based cooperation models can reduce commercial cooperation uncertainties, including punctual payments and specific operational process details.

Therefore, despite digital freight platforms enabling provide matching cargo sources and transport capacity across geographical areas, logistics participants tend to cooperation by establishing mutual societal embeddedness. As he described, even cooperation facilitated through network freight platforms, if both parties are satisfied with cooperation, they exchange contact information. So that, they can establish future cooperation to bypass network freight platform frameworks and achieve cooperation directly through "offline" modes. This approach of establishing "offline" cooperation through network freight platforms also widely exists in logistics company/small shipper capacity selection processes. As one logistics company manager explained:

"Initially, everyone found capacity or cargo sources online [...] For these dispersed transport resources, if they performed well, we would retain their contact information and add them to different WeChat groups according to specific routes they mainly operated... We have dedicated WeChat groups for each route. When we receive cargo sources, for example from Chengdu to Chongqing, we publish cargo source information in that specific WeChat group. If interested vehicles want to book, they can call directly. [...] After several cooperations, everyone becomes familiar, so basically people in WeChat groups are people we know well. Because they're familiar, we don't need to explain processes. [...] Essentially, it follows the same principle as digital freight platforms—publishing cargo sources and competing for orders. But the advantage of this method is we can establish fixed connections with drivers, and working with drivers familiar with processes saves much trouble." (E12, 23.09.2023)

From logistics companies' perspectives, this cooperation with familiar lorry drivers can eliminate repeated workflow introductions whilst providing certain guarantees for entire process controllability. Therefore, after carriers and shippers establish successful cooperation relationships through platforms, shippers typically invite drivers with high quantity performances to join in "WeChat Groups" (WeChat, as China's largest social media network, functions similarly to WhatsApp) around specific transport routes as "private capacity pools". These private capacity pools typically comprise lorry drivers which selected by logistics companies or shippers, with guaranteed service quality and pricing, providing trustworthy capacity resources. They typically focus on specific transport routes. Through repeated cooperation, these drivers become familiar with certain transport and unloading processes. Compared to unfamiliar drivers on digital freight platforms, utilising these pre-screened capacity pools reduces logistics companies' procedural supervision requirements. Therefore, for logistics companies and shippers, these "private capacity pools" have become their

primary capacity sources. The resulting operational model demonstrates how market participants actively reconfigure institutional arrangements to balance efficiency with trust. When transport demands arise, shippers or logistics companies first publish orders in their private WeChat groups. Only when these "private capacity pools" cannot provide suitable capacity do logistics companies turn to broader platform markets. The specific logic regarding this top-down and bottom-up cooperation partner selection model is introduced in Chapter.

The emergence of "private capacity pools" represents sophisticated institutional innovation challenging technology-centric digital transformation narratives. Rather than digital platforms displacing existing arrangements, participants strategically combine information technology tools with established practices to create hybrid institutional for serving their operational needs. This pattern demonstrates that institutional evolution involves creative recombination rather than wholesale replacement. As advocated by gradual institutional change (e.g., Mahoney, 2010; Mahoney and Thelen, 2009), in this case, technological capabilities gradually embedded within existing social and economic relationships. The resilience of trust-based networks in an increasingly digitised industry suggests that effective institutional change could accommodate rather than eliminate existing social capital and embedded relationships. This has important implications for understanding how digital technologies reshape economic organisation—their impact depends not only on technical capabilities but on how they interact with existing institutional arrangements and participant preferences, often producing outcomes quite different from original design intentions.

Therefore, for logistics participants, the "private capacity pool" in WeChat groups is superior for cargo matching compared to digital freight platforms. However, this trust-based "private capacity pool" model faces a crucial institutional constraint: despite participants' preference for trust-based cooperation methods, government tax regulatory requirements and shippers' demands for VAT invoices **preclude their complete abandonment** of digital freight platforms. This institutional pressure generates the third phenomenon: digital freight platforms gradually transforming into tax compliance tools.

5.5.3 Digital Platforms as Tax Compliance Tools

Whilst the emergence of private capacity pools appears to signal a return to relationship-based coordination, VAT reform requirements create institutional pressures forcing logistics participants to continue using platforms as invoice issuance tools. Therefore, the specific operational process becomes participants typically conducting cargo matching through "private capacity pools," then logistics companies arranging for lorry drivers to register on designated digital freight platforms, subsequently publishing cargo to lorry drivers through these platforms to enable VAT invoice issuance through platforms, thereby completing tax chains.

Under the original business tax framework, enterprises cannot process input taxes deduction. The tax relationships between legal entities (logistics companies or shippers) and natural persons (drivers or fleets) are relatively simple, participants only needed to pay taxes according to corresponding transaction amounts. The transition to VAT fundamentally altered this arrangement. General taxpayers, such as shippers and large logistics companies, require VAT invoices to deduct input taxes. However, individual drivers and fleets, who are classified as small-scale taxpayers, can only issue ordinary invoices rather than VAT special invoices. This tax gap causes tax chain breaks for large logistics companies or shippers, which creating additional economic losses for companies in the process tax deduction. Therefore, incorporating individual participants into company frameworks through the affiliation system enables companies to issue VAT special invoices. Alternatively, issuing VAT special invoices to individual participants through network freight platforms serves as input deduction certificates. These two methods became the primary approaches for logistics participants requiring transport invoices to maintain tax chains, typically through the second method.

Moreover, this tax chain pressure from particularly prominent in bulk commodity trading. Since bulk commodities, such as coal, scrap materials, and agricultural products, often originate from small mines or dispersed individual operators. Bulk commodity trading enterprises typically employ local individual drivers for transport during procurement stages. Since individual drivers cannot or are unwilling to issue invoices through tax bureaux, for these participants, following standard invoice issuance procedures is practically difficult. As one lorry driver described:

"Invoices? I don't understand these things, nor do I care. As long as shippers tell me the time and location, I deliver cargo safely and on time, they pay me promptly. That's all I need to do. As for invoices, that's their business, nothing to do with us." (E1, 30.12.2022)

For lorry drivers, they neither care about nor concern themselves with invoices and tax-related issues. Consequently, these enterprises face dilemmas—they have actual transport costs but cannot obtain VAT input deductions. Thus, enterprise income tax deductions process is difficult to obtain transport invoices. To satisfy invoice requirements and reduce tax expenditures, bulk commodity trading enterprises have to cooperate with qualified 3PL companies (including "affiliated" logistics companies) to "reconstruct" transport scenarios and business processes to obtain required input tax invoices. However, these qualified 3PL companies also face the issues about insufficient input tax deduction. Thus, they try to seek invoice solutions by coordinating individual transport resources through digital freight platforms.

The initial aim of digital platforms from policymakers was matching tax functions, creating transparent, traceable logistics transactions. However, the policies inadvertently separated these functions—platforms became purely tax intermediaries rather than operational coordinators. Because, under existing frameworks, network freight platforms serving as "mobile tax bureaux", which means issuing tax invoice on behalf of lorry drivers through digital freight platform is the most convenient way. Irrespective of the specific mechanisms through which matching and coordination transpire, this exclusive regulatory authority establishes digital platforms as essential intermediaries in logistics value chains. Therefore, a common pattern emerged: after logistics participants obtain business through "private capacity pools", companies instruct drivers to register on specific platforms to complete tax-related documentation. Subsequently, digital freight platforms issue 9% VAT invoices to companies. This approach allows participants to meet tax requirements whilst maintaining their preferred trust-based coordination methods. For digital freight platforms themselves, they can issue 3% transport fee VAT invoices on drivers' behalf, deducting their own VAT input revenue. In this model, digital freight platforms serve as tax buffers between 3PL companies and drivers, completing tax chains whilst complying with network freight and VAT-related policies.

Furthermore, local government tax preferential policies for digital freight platforms further reinforced this pattern. Local government tax rebate policies created perverse incentives: since rebate amounts increase with invoice quantities, platforms and logistics companies are incentivised to maximise invoice quantities regardless of actual operational integration. These policies further reinforcing the separation between tax compliance and operational coordination. Using *Mianyang* (绵阳) City, Sichuan Province policies as an example:

"For network freight enterprises with annual revenues of 300-500 million yuan, 500 million-1 billion yuan, and over 1 billion yuan, rewards are given at rates not exceeding 3%, 3.5%, and 4% of annual revenue respectively [...] For 2024-2025, VAT retention is 50%, enterprise income tax is 40%, and other taxes are 100%. The reward rate is 95%, with tax costs of 4.39." (*Mianyang* Municipal Transportation Bureau & *Mianyang* Municipal Finance Bureau, 2023)

This practice has further intensified VAT invoice issuance through digital freight platforms. For logistics companies and shippers, platforms effectively resolve VAT input problems whilst platforms receive government subsidies proportional to invoice quantities. Since tax rebate amounts increase with invoice quantities, as mentioned previously, these logistics companies typically cooperate with specific network freight platforms by arranging lorry drivers to issue transport invoices on designated network freight platforms. Network freight platforms achieve business volumes required for tax preferences, then engage in tax rebate profit sharing with these cooperating logistics companies. This formed the phenomenon of network freight platforms weakening information matching functions whilst transforming into transport invoice issuance tools. Currently, digital freight platforms primarily serve as tax intermediaries, providing formal documentation for transactions actually arranged through other channels.

These three interconnected phenomena demonstrate that whilst regulators intended to shape digital freight platforms as information matching intermediaries, participant adaptive behaviours ultimately redefined platform functions. Through institutional arbitrage, platforms facilitated further market expansion; through returning to trust-based transaction model, participants created hybrid coordination modes; due to tax compliance needs, platforms

transformed into invoice issuance tools. This evolutionary process reveals core characteristics of institutional change: formal institutional design cannot completely control participant behaviour. Conversely, participants creatively adapt and reshape institutional arrangements to satisfy their own needs. Therefore, digital freight platforms' functional transformation is not the result of technological determinism but the product of multi-tier participant games within complex institutional environments, demonstrating intermediaries' agency as institutional actors.

5.6 Conclusion

This chapter has introduced the key intermediaries within logistics networks, including logistics companies, steel logistics subsidiaries, fleet models, and digital freight platforms. Through in-depth analysis of various intermediary organisations in steel logistics networks, this research reveals the crucial role of logistics intermediaries in industrial institutional evolution processes. The findings demonstrate that the formation and development of logistics intermediaries is not merely a simple response to market demands, but rather a complex process involving dynamic interactions between institutional pressures, market forces, and organisational innovation.

Initially, this chapter focuses on traditional participants, the research revealed that regulatory asymmetries subject heavy-asset enterprises to stricter safety regulations, prompting their transition towards light-asset operational models. Financial deregulation has lowered market entry barriers, leading to substantial influxes of individual operators. These two forces jointly created urgent needs for intermediary coordination, catalysing the emergence of diverse intermediary forms including steel logistics subsidiaries, 3PL companies, and fleet models. Steel logistics subsidiaries, as "enterprise logistics", maintain deep institutional embeddedness with their parent companies, prioritising operational stability. Independent 3PL companies, as "logistics enterprises", follow market-oriented logic whilst undertaking crucial financial buffer functions. Fleet models, as informal institutional arrangements, demonstrate fluidity and complementarity between formal and informal institutions. This functional differentiation exemplifies the "institutional layering" process described by

Mahoney and Thelen (2010), where new and old institutions achieve coexistence through functional specialisation.

Following the introduction of traditional intermediaries, this chapter then examined digital freight platforms—a special type of logistics intermediary whose emergence introduced new external forces upon existing logistics institutional structures, reshaping industrial institutions. From initial "small blackboard" models to formal digital freight platforms, although policymakers granted digital freight platforms formal institutional status based on market demands and their own tax regulatory considerations, participants proved unsatisfied with platform functions under this formal institutional framework. This generated a series of institutional arbitrage (Perkmann et al., 2022) behaviours aimed at satisfying self-interest, leading to fundamental transformation of platform core functions—from information matching intermediaries to tax compliance tools. This functional transformation reflects persistent tensions between formal institutional requirements (tax compliance) and informal practices (trust-based transactions).

The analysis reveals that comprehensive institutional analysis requires identifying as many participants as possible within regional industries and understanding their interactions. Even within the same spatial and industrial contexts, different participants' interests often conflict. Even though formal institutions were established, those actors who with greater political and economic resources typically re-shape these rules to advance their own objectives. As North (1994) mentions: "...formal rules, are created to serve the interests of those with the bargaining power to create new rules" (p.361). This means that policies are rarely neutral but instead systematically favour power holders, often based on the sacrifice of other network participants. Therefore, for satisfying own participants' interests, actors create informal institutions to better adapt to their environments, thereby influencing overall regional institution configurations. Such changes are difficult to identify without comprehensive analysis through approaches focusing multi-dimension participants.

Additionally, there are three points worth to mention regarding intermediary emergence and institutional evolution processes in steel logistics networks.

Firstly, concerning intermediary emergence and institutional evolution processes, a general conclusion is that institutions and participants mutually influence each other. Intermediary formation processes simultaneously constitute institutional transformation processes. Institutions possess plasticity because they can both enable actor transformation and be changed by actors' behaviours over time (Strambach, 2010). Intermediaries are not merely network participants but active institutional agents. As Smedlund (2006) described, intermediaries can essentially be viewed as collections of specific functional roles within particular regions or industries. From this perspective, institutional evolution can be understood as processes where participants, to adapt to environments, decompose functions within original institutional frameworks, enhance or weaken certain functions to suit circumstances, and ultimately reconstruct new institutional hierarchies. During this process, intermediaries became the entities within different institutional hierarchies. However, such transformations often deviate from policymakers' predetermined paths, which may generate alternative developmental trajectories. When these trajectories become uncontrollable, policymakers implement macro-adjustments, creating cyclical patterns.

Second, regarding to the concept of institutional change. The research reveals that institutional change is not radical (e.g., Djelic and Quack, 2003). As Mahoney and Thelen (2010) described: "Institutional change often occurs precisely when problems of rule interpretation and enforcement open up space for actors to implement existing rules in new ways" (p. 4). The research demonstrates that even seemingly major institutional transformations, such as digital freight platform development path, comprise series of continuous micro-changes that accumulate to form new institutional configurations. It exhibits gradual transformation characteristics. However, researchers typically more emphasis on identifying major impacts on institutional change, often overlooking how gradual transformations shape institutional evolution (Mahoney and Thelen, 2010). Yet, like major external shocks, slow transformations are equally crucial for institutional change and often more detailed represent institutional legacies' importance in economic development. These gradual and slow institutional evolutions undergo subtle changes over time. Although not as dramatic as sudden large-scale transformations, they are equally important for forming human behavioural patterns and substantial political outcomes (Mahoney and Thelen, 2010).

This slow institutional evolution may be overlooked because it represents "mild" incremental changes that are often imperceptible and require long-term observation to detect. Therefore, careful attention to historical factors' shaping of institutional evolution is necessary.

From this perspective, North (1990) presented compelling arguments that history plays important roles in institutional change processes, as past decisions shape participants' future expectations, locking institutional change into specific developmental paths. However, this does not necessarily lead to economically efficient outcomes: some institutional arrangements persist despite lacking efficiency because they continue serving power holders' interests (see Hodgson, 1996). Compared to power-centric perspectives, I argue for further refining power influences on specific actors' actions. This shifts research focus from original power perspectives to more detailed examination of actor behavioural changes caused by power. As actor behavioural changes directly lead to institutional changes. Therefore, this analytical approach can more directly observe direct causes of institutional evolution. Through Eric Schickler's (2001) institutional layering perspective, this gradual institutional evolution process becomes more observable. This analytical approach describes situations where original institutional structures are retained whilst new elements are added alongside old systems, possessing transformative potential over time (Streeck and Thelen, 2005).

Overall, institutional evolution processes involve two opposing institutional forces: preserving original old institutional structure to some extent whilst forming reorganised new institutions and generating informal institutions when formal institutions cannot achieve objectives effectively. These interactions between new-old and formal-informal institutions, combined with original institutional evolution, jointly cause institutional changes. During this process, friction occurs between new-old and formal-informal institutions. But sometimes, such friction gradually converges due to shared objectives, ultimately achieving dynamic equilibrium until new external influences sufficient to affect entire industries emerge.

Third, let us turn to formal and informal institutional discussions. Based on the case study of this chapter, the development paths of informal institution may involve three situations. First, they may be directly prohibited. For example, behaviours like overloading that emerged due

to lack of strict regulatory in early stage. This kind of informal behaviours were generally considered participant-accepted informal institutions. However, since such economic-benefit-pursuing informal institutions ignoring overall social safety stability or involving legal risks are essentially harmful, they gradually disappear along with the perfection of policy regulations. Second, these informal institutions gradually become officially tolerated, existing between formal and informal institutions with unclear attributes. Examples include the "*Guakao*" model and fleet models. Such informal institutions maintain social stability to some extent and serve as formal institution supplements. However, since they originate from bottom-up group behaviours without written rules for management. When they develop to certain scales and become difficult to formalise, policymakers establish written formal regulations on these original informal institutions to enable normal supervision whilst maintaining original informal institutional frameworks. Third, formal institutions transform into informal institutions, such as "small blackboard" logistics intermediaries' transformation to digital freight platforms. Since such informal institutions better align with power holders' interests, informal institutions where both rule-makers and rule-users benefit are likely to eventually become formal institutions.

In addition, formal-informal relationships are multifaceted. Examples include formal-informal institutional convertibility under fleet models; due to dissatisfaction with formal institutional risk distribution, participants re-allocate the risks under written "*Guakao*" rules; the counter-trend behaviours where participants create "private capacity pools" due to preferring original institutional trust-based cooperation models. This evidence reveals that although formal institutions constrain participant behaviours, informal institutions still occupy important positions. As Streeck and Thelen (2005) described, institutions are defined by continuous interactions between rule-makers and rule-acceptors, where new rule interpretations are discovered, invented, suggested, rejected, or temporarily adopted. Neither formal nor informal institutions are perfect, they perpetually exist in changing states. Returning to initial institutional discussions, institutions are humanly designed and/or socially constructed constraint and enablement rule sets for human interaction (North, 1990) or "formal and informal rules guiding actor perceptions and activities" (Strambach, 2010, p. 408). Therefore, their relationships should be more diversified, requiring specific analysis within different concrete scenarios whilst avoiding deterministic risks.

Following the preceding analysis of overall logistics network evolutionary pathways and detailed examination of steel logistics industry participants. The next chapter examines overall logistics network dynamics to analyse the governance of the entire steel logistics network.

Chapter 6: A Hybrid Governance Model of Logistics Network Dynamics

After nearly three decades of development, China's steel logistics industry has undergone a substantial transformation characterised by increasingly fine-grained specialisation and complex network structures. The evolution from internalised logistics processes within enterprises to the current multi-tier outsourcing structure (Chapter 4) has introduced numerous participants into the logistics network between shippers and actual carriers (Chapter 5). This transformation raises a critical question: How is the efficient operation of the entire logistics network maintained while ensuring the interests of its various participants?

This question points to a fundamental theoretical puzzle that has not received sufficient attention in existing literature on production networks and logistics governance: How do networks comprised of highly substitutable service providers maintain stability and coordination in increasingly competitive environments? Traditional theoretical frameworks emphasizing transaction costs, power asymmetries, or normalised governance structures appear inadequate to explain the empirical realities observed in China's steel logistics networks, which the persistence of stable cooperative relationships despite severe service homogenisation and extreme information transparency.

The logistics industry exhibits distinctive characteristics that shape its network dynamics. As a service industry, logistics companies and lorry drivers inherently lack significant differentiation, resulting in a highly homogenized market. With financial deregulations and broader macroeconomic developments, entry barriers have dramatically decreased. The proliferation of those participants has fundamentally altered the industry's supply-demand structure, while the emergence of digital freight platforms has increased the transparency of price and information, intensifying competition at all tiers. In this highly homogenized, fiercely competitive, multi-tier outsourcing industry, participants face a fundamental challenge: "With competitors similar to you in the market, why would others choose to cooperate with you?" (C3, 12.09.2023)

This chapter directly addresses the third research question: *How do top-down institutional logics and bottom-up actor strategies interact to form network dynamics?* Empirical evidence reveals a dialectical relationship between formal contractual arrangements and informal relational coordination. These formal and informal institutions do not operate as separate systems; rather, informal institutions complement formal ones in maintaining the distinctive network dynamics of logistics networks.

As this chapter demonstrates, network dynamics in China's steel logistics industry are formed through the complex interaction between formal transaction-based coordination and "guanxi" (Personal relationship, 关系) under informal institutions, with the latter being a core governance mechanism permeating all tiers of the logistics network built upon a foundation of formal institutions. Through empirical analysis there are two key mechanisms maintaining network stability and coordination, which I term them as top-down "*Strategic Payment Postponement*" and bottom-up "*Deliberate Profit Sacrifice*". These mechanisms create and manage chains of obligation between participants, encompassing relational debts and credits that are accumulated, exchanged, and strategically deployed throughout the network beyond purely transaction-based networks.

The remainder of this chapter proceeds as follows. Section 6.1 conceptualises network dynamics by first examining the limitations of transaction-based analytical frameworks before introducing the concept of "guanxi" as a complementary analytical lens. Section 6.2 develops a hybrid framework for analysing network dynamics, exploring the evolution of network governance models and introducing the key mechanisms that operate within this framework. Sections 6.3 and 6.4 examine the two key mechanisms in detail: bottom-up Deliberate Profit Sacrifice and top-down Strategic Payment Postponement, analysing their development paths and operational logics. Section 6.5 integrates these mechanisms to demonstrate how they interact to produce distinctive network dynamics outcomes, including maintaining stability amid competition, enabling adaptive responses to market changes, and creating a dynamic equilibrium that characterises China's logistics networks. Finally, Section 6.6 synthesises the theoretical contributions of the hybrid governance model, discussing how the empirical findings advance understanding of network dynamics.

6.1 The Concept of Network Dynamics

Contemporary Chinese logistics networks present a complex theoretical puzzle that challenges traditional analytical frameworks. Steel logistics networks that have evolved since the 1990s exhibit characteristics that neither transaction cost economics nor conventional power relations frameworks can fully explain. In a market characterised by highly homogenised services, extremely low entry barriers, and increasingly transparent pricing, neoclassical economic theory would predict purely price-based competition and frequent switching between service providers. However, empirical evidence reveals a different reality: despite a highly homogenised sector, participants maintain relationship-based partner selection mechanisms, and relatively stable cooperative relationships persist despite the availability of lower-cost alternatives in a fiercely competitive business environment. This stability suggests that the operative governance mechanisms transcend price and contractual terms, being deeply rooted in social and cultural contexts.

6.1.1 Distinctive Characteristics of the Logistics Industry

Following the discussion in Chapter 4 and 5, the road transportation industry has gradually developed into a highly homogenized sector with high information transparency and intense competition. Research findings indicate this is primarily due to three characteristics of the logistics industry. First, road transportation services are inherently standardised, with limited opportunities for meaningful differentiation. Unlike manufacturing, where product innovation can create competitive advantages, the core logistics service, which transporting goods from point A to point B. This process is essentially the same regardless of the provider. It can be viewed as an "easily replicable" industry (E2, 05.04.2023). As one logistics company manager jokingly stated:

"As long as you can secure cargo sources and find transportation vehicles, you can run a logistics transportation company tomorrow and start making money" (D13, 07.09.2023).

While this scenario is not entirely realistic—it encompasses not only the low-barrier nature of the logistics industry itself but also the need to have cargo sources for transportation—it fully

reflects the distinctive characteristics of road transportation: it does not require advanced technology or even substantial financial support, only the matching of cargo sources with transportation capacity to conduct transportation business activities. However, since logistics is a highly localised industry (Hesse, 2004), it has relatively transparent variable costs in specific regions, such as tolls, highway fees, fuel, and labour costs, all of which can be calculated based on transportation routes. These factors have made the logistics transportation industry a sector with low entry barriers and high homogenisation in terms of both pricing and service.

Second, the industry has experienced significant market saturation and unprecedented price and information transparency. Vehicle financing deregulation policies and subsequent emerged of various kind of financial institutions have reduced entry barriers to a large extent, leading to a surge in transportation capacity providers (Section 5.2). Moreover, with the emergence of digital freight platforms, this impact has further expanded (Section 5.5), further increasing price transparency. These platforms allow all participants to view market prices, pushing the logistics market toward a highly intense competition environment. Against this background, information asymmetry in the logistics industry has been fundamentally improved. As the head of a logistics subsidiary of a steel company explained:

"Actually, in the past, these logistics branch lines were usually operated by a fixed few companies, but now this situation is becoming increasingly rare. This is because the market information barriers have been broken. About 5-10 years ago, due to information asymmetry and underdeveloped information channels, this situation was more common. If we trace back further, such as 20 years ago in China, these situations were even more prevalent. But in the past decade, with the rise of the internet and various logistics platforms, information channels have become more transparent. The significant increase in the number of logistics enterprises, individual logistics operators, manufacturing enterprises, as well as our respective customer groups or material users, has greatly improved information asymmetry throughout the logistics field. So, in this situation, whether for manufacturing enterprises, material-using enterprises, logistics companies, or the numerous individual participants in the road transportation field, the transparency of logistics information has become very high. Information channels are more extensive, and the fundamental problem of information asymmetry has been substantially improved". (D2, 27.04.2023)

As he explained, this surge in market participants and increased price and information transparency has led to intense competition. While price and information transparency provide participants with diverse business cooperation selection opportunities, they have significantly compressed the survival space of logistics participants who relied on information gaps to establish competitive advantages, especially for previously information-isolated branch line transportation. Under the original logistics landscape, shippers could only inefficiently publish cargo information offline to seek matching transportation capacity. Due to the lack of backhaul cargo resources in these areas, prices for the same distance were typically higher than trunk line transportation. The emergence of digital freight platforms has fundamentally altered competitive dynamics by eliminating information asymmetries, which especially for some participants who have the specific regional advantages previously. This technological shift has pushed the industry toward the highly homogenized, transparent competitive environment that characterizes contemporary logistics markets.

Third, the multi-tier outsourcing structure that has formed in the industry has created an intermediary layer, with each intermediary seeking to extract value for themselves from the transportation chain. Because, for shippers, the things they concern about are transportation efficiency is maintained at an acceptable cost range. For lorry drivers, other than reasonable transportation fees, they primary focus on receive the fees in time. Both of them less concern about what happens between logistics companies. Thus, for such a network with numerous participants, since it is difficult to obtain cargo sources directly from shippers, many logistics companies attempt to obtain orders from other logistics companies rather than directly from the shipper level. This proliferation of intermediaries has further intensified competition and commoditization. The same transportation operation may involve multiple logistics companies rather than a linear structure from shipper to actual carrier. In logistics networks, the concept of third-party logistics companies often becomes blurred, with frequent re-outsourcing between logistics companies. This seems different from the relationship between the formal relationship and rentier in some less developed counties (e.g. Sial, 2020), and the low-road model labour intermediary in logistics industry in the US (see Section 5.2.2). As one international freight forwarder succinctly pointed out:

"As long as there is profit margin, there can be third-party, fourth-party, or even fifth and sixth-party logistics companies entering this market. They can outsource infinitely." (A9, 09.05.2023)

It can be observed that this multi-tier outsourcing structure is caused by the low barriers of the logistics industry itself, adding complexity to the structure of the original homogenized industry. As one lorry driver mentioned, many information providers on digital freight platforms now are second-hand contractors rather than shippers—even the vast majority. Because shippers do not want to be involved in logistics operations, as long as cargos can be transported at the reasonable price, they do not care who exactly process the transportation (E2, 05.04.2023).

These three characteristics, service homogenization, market saturation with high transparency, and multi-tier subcontracting structures, have fundamentally transformed China's logistics industry from its regional monopolies and information asymmetries states in early stage. They create a paradoxical environment where, as the following section demonstrates, these conditions reveal the limitations of transaction-based analytical frameworks in explaining the persistent stability of cooperative relationships within such highly competitive, commoditized markets.

6.1.2 The "Failure" of Transaction-Based Analysis Frameworks

These industry characteristics create a theoretical puzzle that challenges transaction cost economics and power-based governance theories. In markets characterised by service homogenization, price transparency, and low switching costs, neoclassical economic theory would predict frequent supplier switching based purely on cost optimization. Transaction cost economics specifically suggests that buyers should exhibit minimal partner loyalty when asset specificity is low, and alternatives are readily available (Williamson, 2008). However, empirical evidence from China's steel logistics industry indicates that these transaction-based frameworks have significant limitations. A core issue is that they cannot explain the process of supplier selection in highly competitive environments and the subsequent persistence of stable cooperative relationships that are not price-driven.

From a top-down perspective, as described in Section 4.6.2, steel logistics subsidiaries in this competitive environment still tend to cooperate with a familiar group of several to dozens of logistics companies rather than easily changing their logistics service providers. This phenomenon is also evident in the relationship between logistics companies and lorry drivers. As described in Section 5.5.2, after the emergence of digital freight platforms, for logistics companies, these transparent information channels seem to provide them with "unlimited" underlying labour. However, they still choose to establish their own "private capacity pools" and prefer to select lorry drivers from these groups as their cooperation partners rather than unfamiliar lorry drivers from digital freight platforms.

This behaviour is also reflected in bottom-up partner selection. Lorry drivers prefer to seek cargo sources from trust-based channels rather than directly selecting from digital freight platforms. Similarly, logistics companies also tend to establish stable and long-term cooperative relationships with stable shippers or large logistics companies, even if the direct benefits from these cooperative relationships may be lower than market prices or even result in losses. As one regional manager of an international freight forwarding company described:

"We have been cooperating with XX (a large manufacturing company) for ten years. For their orders, we are almost in a non-profit state. But we still maintain cooperation because I need certain large clients as my benchmark to be able to cooperate with other companies and strengthen my bargaining power." (A9, 09.05.2023)

Through this empirical evidence, it can observe that many buyer-supplier relationships remain very stable despite the existence of lower-cost alternatives. Moreover, this cooperation does not fluctuate significantly with changes in the external environment. Instead, it presents a state where continuous cooperation leads to increasingly close connections and decreasing external influence. In addition, for business cooperation itself, it seems that the transaction logic is not limited to labour and economics themselves; factors outside the contract, such as reputation and experience that he mentioned, are also treated as factors that can be exchanged equivalently with money in business cooperation. It can be observed that transaction-based on differentiated service or cost considerations seem to have

become ineffective in the current logistics industry. In this non-monopolistic industry, when there are numerous participants who do not have differentiated services and prices approach similarity, these theories cannot explain this phenomenon.

These limitations suggest the necessary for a more comprehensive analytical framework to explain the complex interaction between formal and informal governance mechanisms in Chinese steel logistics networks. While transaction-based approaches provide valuable insights into certain aspects of network coordination, they offer an incomplete description of how these networks actually function, especially in cultural environments where relationship-based governance plays an important role.

6.1.3 Introducing the Concept of *guanxi*

Throughout the field research process, respondents frequently employed relationship-based terminology such as "*guanxi*" (personal relationships, 关系), "*Ke hu guanxi*" (client relationships, 客户关系), and "*Shu ren*" (familiar acquaintances, 熟人) to describe how they secure orders and solidify cooperation. Especially when describing cooperative relationships that are difficult to explain using traditional transaction-based theories, relationship-based vocabulary became their preferred terms for describing network dynamics with partners. Therefore, the concept of *guanxi* seems well positioned in explaining the formation and maintenance of these dynamics.

Guanxi can be roughly translated as particular ties or personal networks (Gold et al., 2002), implying social obligations and seeking special favours (Peng, 2004), and emphasizing how interpersonal relationships based on trust and reciprocity facilitate business operations beyond formal institutional frameworks (Luo, 2000). This concept originates from Chinese Confucian thought, where a fundamental principle emphasises the importance of an individual's position within a social hierarchy of relationships: individuals are part of an interdependent relationship system rather than isolated entities (Yeung and Tung, 1996). Cultural studies scholars consider *guanxi* a unique type of relationship or a behavioural pattern deeply rooted in Chinese historical culture (Jacobs, 1979). It is considered central to Chinese social order, economic structure, and changing institutional landscape. From politics

to business, from officialdom to street life, it is considered important in almost every domain of life (Gold et al., 2002).

Regarding to the Chinese composition of *guanxi*, the two characters that form this word represent "gate/channel" (*Guan*, 关) and "connection" (*Xi*, 系) respectively. Therefore, *guanxi* refers to establishing connections between two independent individuals, enabling the bilateral flow of personal or social transactions, and both parties must benefit from this *guanxi*-based channel to ensure the continuity of the relationship. Louis Kraar refers to *guanxi* as the "Chinese art of reciprocal back-scratching" (Millington et al., 2006). Here, I adopt Bian's (2006) definition of *guanxi*: "a dyadic, particular, and sentimental tie that has potential of facilitating favour exchange between the parties connected by the tie" (p. 312).

In English contexts, *guanxi* is often compared to the concept of nepotism in Western societies; they both involve situations where those in power make decisions based on family relationships or connections rather than objective assessments of ability. These decisions refer to employment or business transactions or the awarding of contracts. However, the concept of nepotism seems do not to fully capture the meaning of *guanxi* in the Chinese context. *Guanxi*, can be roughly divided into two types: expressive and instrumental (Hwang, 1987). The important distinction is that expressive *guanxi* mostly refers to specific kinship and family relationships rather than interest networks. For the instrumental type, it intends to establish specific connections to achieve certain goals. Undeniably, both types of *guanxi* coexist in business networks. Expressive type of *guanxi* is based on blood ties or emotions, with stronger embeddedness. Nepotism is more similar to this type of *guanxi*. As mentioned in an interview, an interviewee mentioned that all steel from a certain large steel plant had to be sold through a specific steel distributor because that distributor was actually controlled by the steel plant owner's wife. Due to the inherent special nature of this type of *guanxi*, it cannot be explained by specific theories and represents minority cases.

Besides this, *guanxi* also includes the instrumental type. It does not rely on blood ties or any kinship domestic relationships; this is established purely by participants to obtain certain specific benefits. This type of *guanxi* is the mostly carefully established and maintained

through actor strategies developed over time and has strong mutual obligations and interests (Qi, 2013). Therefore, this research mainly focuses on how this instrumental *guanxi* plays a role in network dynamics. Compared to the expressive type of *guanxi*, the instrumental type is more common in business networks. For network dynamics analysis, this instrumental type of *guanxi* seems to better reflect the behavioural logic of actors in business activities through its establishment and maintenance. Thus, in later parts of the thesis, when *guanxi* is mentioned, this refers to instrumental *guanxi* rather than the expressive type.

Another concept related to *guanxi* is the concept of social capital. As Qi (2013) states, *guanxi* can be viewed as a manifestation of the social capital concept under China's special institutional settings. Bourdieu (1986, p. 249-250) defines social capital as: "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition or in other words, to membership in a group, which provides each of its members with the backing of the collectively-owned capital, a 'credential' which entitles them to credit, in the various senses of the word." Similar to the concept of *guanxi*, the social capital concept emphasises the sum of resources that participants can access, possess, and apply in business practices or daily life. They are both not merely limited to transactions themselves but attempt to generalize broader factors such as trust, reputation, social status, and so on.

However, I argue that *guanxi* operates through a distinctively long-term temporal logic that sets it apart from both social capital and Western reciprocity models. Unlike social capital, which can provide immediate access to resources, or reciprocity, which typically seeks relatively quick returns, *guanxi* deliberately extends obligations across extended timeframes. From the literature, scholars consistently emphasize that *guanxi* must be "nurtured," "maintained," and "sustained" over time, otherwise it loses its effectiveness (Lin, 2002). This temporal dimension is not merely about patience but represents a strategic approach to relationship management where immediate settlement paradoxically weakens rather than strengthens bonds.

As described in the previous chapters, logistics participants willingly accept economic losses in cooperation with large enterprises to establish long-term relationship for future benefits. Whether logistics companies or lorry drivers, they prefer to establish long-term stable cooperation, even when this cooperation may not bring direct economic value within a certain period (See Section 5.3.2). These participants consistently pursue long-term, stable cooperation by establishing connections with specific partners rather than optimizing short-term economic returns.

Despite many similarities with Western concepts, "*guanxi*" has unique characteristics in the Chinese context that make it particularly relevant for understanding Chinese business activities. While Western scholarship has demonstrated how relationship-based strategies significantly impact organizational performance and survival (Uzzi, 1996), *guanxi*-based approaches in Chinese contexts operate through culturally specific mechanisms that require separate analytical treatment. Moreover, in the Chinese institutional context, the emphasis on using "*guanxi*" rather than "relationship" or "connections" precisely highlights the inherent mutual benefit of this concept, and *guanxi* has a sufficiently specific meaning in Chinese (Guthrie, 2002). Due to its strong cultural specificity, it is not suitable to be fully expressed by a single English word (see also Parnell, 2005; Bian, 1997; Walder, 1988; 1985). Therefore, this thesis employs the term "*guanxi*" in its original Chinese form to preserve its culturally specific meaning and analytical precision.

6.1.4 Analytical Challenges and Value of *Guanxi* in Network Dynamics

While the concept of *guanxi* offers valuable analytical potential for understanding network dynamics, researching it presents significant methodological challenges. During the interview, majority of participants are unwilling to discuss *guanxi* directly with me, which may stem from two reasons. First, as a concept of exchange institutions based on social capital, *guanxi* is often directly related to factors such as corruption, bribery, malfeasance, and unfair competition (Wank, 1999). Second, Chinese people view *guanxi* as a form of personal wealth (Yeung and Tung, 1996) In many cases, this wealth is considered to provide special access to resources, and this special access does not rely on formal structures (Qi, 2013). Because the ways of establishing *guanxi* are often directly linked to social occasions such as lunches, dinners, and gift-giving, or through symbolic gift exchanges and so forth.

Therefore, during the research process, respondents usually deliberately avoided these issues. These *guanxi*-based forms of legitimacy are easily condemned by regulatory agencies or major actors (DiMaggio and Powell, 1983). Furthermore, the fundamental reason seems to be that *guanxi* practices conflict with the rational-legal system emerging at the state level (i.e., formal laws, policies, and reasonable procedures) (Guthrie, 1998). They fear mentioning *guanxi* because it refers information leaks which could affect them personally. Even though interviewers strictly adhere to research ethics informing respondents about relevant information protection regulations. Tracing back to the broader Chinese social context, both the government and actors are deliberately trying to eliminate formal discussion or acknowledgement of *guanxi* (Dickson, 1992). From the overall macro environment, participants try to explain their economic behaviours and decision-making backgrounds through a more market-oriented approach.

However, I believe that the *guanxi* institution still exists and provides meaningful insights into the complex interplay between social culture, institutions, and social practices in Chinese business context. For example, in the communication with respondents, *guanxi* is often inevitably mentioned, and frequently accompanied by phrases like "you know". This indicates that while they are reluctant to mention it extensively, *guanxi* is already a default mechanism in Chinese business cooperation. They consider that words like *guanxi* do not need further explanation, or it has already become a normalized institution in economic activities and social lives.

As mentioned in previous chapters, when it comes to how lorry drivers find backhaul cargo, they always casually reply that it's through "familiar acquaintances" (*shuren*, 熟人) without further explanation. This mechanism of cooperation built on *guanxi* seems to have gradually been institutionalised and is regarded as the taken-for-granted "way we do things" (Zucker, 1986). Nevertheless, this state of default knowledge that both parties already know and deliberately avoid seems to further confirm that these relationship-based mechanisms are not peripheral but central to explaining how networks operate. It suggests that *guanxi* is one of the fundamental governance mechanisms permeating the entire logistics network and requires a more substantive incorporation of the concept of *guanxi*.

Some scholars also provide more market-oriented explanations for the role of the *guanxi* mechanism. As Yang (2016) emphasized, *guanxi* is not equivalent to corruption; *guanxi* more strongly emphasizes long-term obligations and relationship bonds, while corruption only emphasizes material benefits. In the process of establishing *guanxi*, it is not only interest obligations realised, but trust between actors is also established (Smart, 1993). Through this trust mechanism, establishing *guanxi* can reduce uncertain risks in business processes for actors to some extent. Similarly, Chang (2011) described that reliance on *guanxi* as the primary institution stems from resource uncertainty and information asymmetry; she evaluates *guanxi* as a form of partnership emphasising long-term forms, which helps reduce market uncertainties related to knowledge transfer and coordination. This view derived from the *guanxi* mechanism gives network dynamics a multi-dimensional exchange beyond transaction-based analysis. Beyond the physical movement of goods and monetary compensation, these networks involve exchanges of information, favours, flexibility, preferential treatment, and other intangibles that are rarely formally specified in contracts but fundamentally shape network dynamics. This multi-dimensionality corresponds to relational economic geography, which emphasises that economic interactions involve far more than simple monetary exchanges of goods and services.

However, as described in these literatures, the specific manifestations of *guanxi* in different usage scenarios do not reach a consensus. Even though some scholars have given more substantive explanations of *guanxi*, descriptions of *guanxi* are more focused on their "mutual benefit" nature. For the role that *guanxi* play in specific events, there has not been a unified definition. Although scholars generally recognise that *guanxi* is a specific Chinese social networking idiom, closely connected with other components of Chinese sociality such as "*renqing*" (emotional obligation or human sentiment, 人情), "*qing*" (affection or feeling, 情), and "*mianzi*" (face or social standing, 面子) (Chen and Chen, 2004). They have different views on the extent to which *guanxi* are influenced by institutional backgrounds and its future in the reform era (Gold et al., 2002). What can be found is that when *guanxi* is placed in specific industries or regions, the specific role that *guanxi* plays and the description of its function seem to be vague in literatures. It may be because it is related to specific operations, as Smart and Hsu (2017) describe the establishment of *guanxi* is more based on informal or

even illegal means, such as gift-giving. Therefore, not much content is involved in the literature. However, when it comes to formal transactions, I argue that *guanxi* still exist and play a crucial role. The key to resolving these definitional ambiguities lies in understanding how *guanxi* operates across different temporal dimensions than conventional business analysis assumes.

This temporal distinction becomes evident when examining actor behaviour in competitive industries. As mentioned in the previous chapter, participants in severely homogenized and fiercely competitive environments, such as the logistics industry, willingly accept losses over certain time periods to establish stable cooperative relationships. This behaviour reveals a fundamental limitation of transaction-based analytical frameworks: they operate within different temporal dimensions than the phenomena they seek to explain. Transaction-based theories typically analyse business cooperation as discrete, time-specific processes occurring within defined contractual periods. However, *guanxi*-based cooperation operates according to a fundamentally different temporal logic that extends across multiple transactions and indefinite timeframes. Business cooperation encompasses not merely the immediate exchange of labour and money, but broader exchange mechanisms involving social credit, reputation, trust, and future opportunities. These multi-dimensional exchanges operate across extended timeframes that transcend individual contractual periods. Therefore, network dynamics between actors are not equivalent to individual transactions themselves, but rather represent multi-dimensional exchanges and long-term relationships built upon these transactions. The concept of *guanxi*, with its inherently long-term orientation, provides an analytical framework capable of explaining actor behaviours that appear economically irrational from a purely transactional perspective.

While the concept of *guanxi* offers valuable analytical potential for understanding network dynamics, researching it presents significant methodological challenges. More fundamentally, for analysing network dynamics in China's logistics industry, the concept of *guanxi* requires more detailed explanation to understand its specific role and function. Therefore, building on this background of transaction-based framework limitations, I take *guanxi* as one of the core concepts for explaining network dynamics, combining it with formal transaction analysis to explore how this hybrid framework operates in practice.

6.2 A Hybrid Framework for Analysing Network Dynamics

A fundamental insight emerges from the empirical analysis: *guanxi* in contemporary Chinese logistics networks does not substitute for market mechanisms but rather transforms how these mechanisms operate in practice. Building on this finding, this section proposes a hybrid governance framework that explains how formal transactions and *guanxi*-based coordination work together to create distinctive network dynamics. This framework recognises that *guanxi* mechanisms and formal transaction-based analyses do not operate as separate systems, but rather as complementary governance mechanisms that jointly maintain network stability and coordination.

6.2.1 Incorporating *Guanxi* into the Analytical Framework

Empirical evidence demonstrates that *guanxi* functions as a complementary institution built upon formal institutional foundations, rather than substituting for or operating parallel to formal transactions. As one supplier explained during an interview:

"Gift-giving cannot serve as a fig leaf. Rather, in a context of homogenized competition, gift-giving becomes a tacit custom, and accepting gifts signifies agreement. Built upon this foundation of gift exchange, it signifies the completion of a transaction and implies that neither party will create difficulties for the other. [...] Gift-giving does not mean establishing cooperative *guanxi* through informal means, but rather a way of consolidating *guanxi* on the basis of already satisfying formal conditions." (A14, 07.09.2023)

This evidence reveals how *guanxi* operates within formal business systems. Market transactions still constitute the basic structure of the logistics network, but these transactions are embedded within a complex web of relational obligations and expectations that fundamentally determine how business is conducted. In steel logistics networks, this means that while contracts and pricing remain formal, the process of partner selection, payment terms, and operational coordination are significantly shaped by *guanxi* institutions. This aligns with Bathelt and Glückler's (2011) relational economic geography perspective, which views economic behaviour as embedded in ongoing social relations rather than isolated

transactions. To effectively analyse how these relational dynamics shape network governance in the subsequent sections, a clear conceptualisation of *guanxi*'s institutional function is necessary. Therefore, for analytical purposes, I define *guanxi* as:

a social property built upon interpersonal relationships that emphasizes reciprocity and mutual benefit, requiring ongoing maintenance to sustain intimacy. Crucially, *guanxi* does not compensate for deficiencies in formal frameworks but serves as an informal complement built upon formal structures. It provides a stable yet flexible system for accumulating, trading, and redeeming various forms of debt across different timeframes and contexts.

By recognising that formal transaction-based and informal *guanxi* institutions operate as complementary governance mechanisms, this concept enables a deeper understanding of how networks maintain stability and coordination in highly competitive environments. This complementarity, however, raises an important question that must be addressed: with the increasingly sophisticated and transparent contemporary China business contexts, why do *guanxi*-based governance mechanisms remain significant? Understanding this persistence requires examining how *guanxi* itself has evolved in response to changing market conditions.

6.2.2 Evolution of Network Governance: The U-Shaped Curve of *Guanxi*

This issue about *guanxi*'s continued relevance reflects broader scholarly debates. One of the central questions for the research incorporating *guanxi* is whether this concept remains relevant in contemporary Chinese business context. Scholarly attention to *guanxi* has notably declined, with researchers arguing that several factors have diminished its importance: the emergence of Weberian rational-legal systems that emphasise bureaucratic impartiality over personal connections (Guthrie, 1998); changing institutional structures that formalise decision-making processes (Guthrie, 2002); and the increasing importance of market mechanisms (as well the later emerge of digital platforms) that create more level playing fields as China transitions to a market-oriented economy (Yeung and Tung, 1996). From the logistics industry perspective, the fundamental reasons appear to be that information barriers are gradually being broken down and information is becoming increasingly transparent with

the emergence of digital freight platforms. Combined with lower industry entry barriers leading to an influx of participants, business competition has intensified. Under these market economy conditions, enterprises have more opportunities to pursue profits. Compared to being fixed on traditional relationship-based perspectives to seek business partners, theoretically, market economies in an open economic environment could provide enterprises with greater commercial benefits, allowing actors to seek cooperation from a broader range. However, some scholars hold contrary views, arguing that despite the increasing importance of monetary relationships and transactions, this evidence does not indicate a decline in the importance of *guanxi* per se (Yang, 2016). Similarly, Bian and Zhang (2014) believe that unless China's *guanxi* culture undergoes significant transformation during economic transition, *guanxi*-based enterprise social capital will continue to exist (see also Dickson 1992; Nathan and Tsai 1995).

I contend that these research conclusions are not contradictory. These studies collectively confirm that *guanxi*, as a crucial informal institution within China's business context, continues to exert persistent influence. The apparent disagreements among scholars primarily concern the degree of *guanxi*'s importance in commercial transactions rather than its fundamental existence. Moreover, when extending the temporal dimension of *guanxi* research, these seemingly disparate findings correspond to variations in relational importance across different economic institutional contexts. By synthesising these studies, it can better understand the complex entanglement between *guanxi*-based coordination and formal transactional mechanisms. Furthermore, these ostensibly contradictory findings can be reconciled by considering the temporal dimension of institutional change. Rather than following a linear trajectory of decline or persistence, *guanxi*'s significance has evolved dynamically in response to changing market conditions. As the analysis of steel logistics networks within this thesis, in the era of intensified competition, particularly following the emergence of digital freight platforms. It has witnessed a countertrend toward *guanxi*-based (trust-based) cooperation among network participants. This manifests in the prevalence of "private capacity pools" for matching transport capacity and cargo sources, rather than broader information matching through digital freight platforms (see Section 5.5.2). This empirical evidence supports the argument that heightened market competition has paradoxically reinforced the strategic value of *guanxi*-based relationships in logistics coordination.

Thus, based on these discussions, I argue that the importance of *guanxi* has displayed a *U-shaped curve* development pattern as China's reform and opening-up gradually progressed. It shows that, initially highly important, then declining with the implementation of market-oriented economics, and subsequently rising again with intensified competition. Taking the logistics industry as an example, during the internalisation phase and the initial phase of externalisation in logistics sector. Due to incomplete industry competition, *guanxi* had a significant impact on the industry itself. This stems from the uneven distribution of social and economic resources under this system, which were often controlled by the central government (internalisation phase) or large organizations (in the early phase of externalization). In this context, *guanxi* functioned as an effective mechanism to bypass official approvals and complex bureaucratic procedures, while also establishing clientelist relationships with more powerful participants who could provide protection and preferential treatment (Xin and Pearce 1996). Without such patron-client networks, these enterprises would have faced significant difficulties in obtaining essential resources and navigating regulatory challenges.

Even in the early stages of externalisation, as mentioned in previous chapters, participants in these steel plant logistics networks were almost derived from the steel plant logistics resource externalisation, whether lorry drivers or logistics companies. Therefore, transportation resources from specific steel plants were their main source of orders. The fundamental reason was that they found it difficult to obtain logistics resources outside the steel plants. Logistics networks established between different shippers were like information islands, with no intersection between them. With the same time, these cargo resources established through specific relationships were sufficient to keep them operating and profitable. Therefore, this cooperation based on *guanxi* with steel plants became their main source of orders. Within this system, *guanxi* exhibited high importance, both for the shippers themselves and for logistics participants.

Subsequently, due to lowered industry barriers leading to gradually intensified competition, as well as the increasing information transparency. Along with the differentiation of factors, such as quality, price, and speed, among different participants as market-oriented economics

progressed, *guanxi*'s importance showed a gradually declining trend. A more apparent manifestation is that at the end of the first decade of the 21st century, with the decline of the steel market itself, many logistics companies originally attached to steel plants began to restructure (Section 4.5). Participants could achieve differentiated advantages through their own strengths in a broader, more information-transparent market to pursue profits. Compared to being fixed on *guanxi*-based perspectives to seek business partners, the market economy in an open economic environment could provide enterprises with greater commercial benefits by seeking cooperation from a broader range. As Yeung and Tung (1996) mentioned, *guanxi* is crucial in the initial stages of entering the Chinese market. However, after exceeding a certain threshold level, other factors become more important. Yet their conclusion does not seem to consider the subsequent impacts of this deeply rooted institution after an industry has entered more intensified competition within this cultural context.

Therefore, this article proposes a third stage regarding the impact of *guanxi* on the overall industry: the role of *guanxi* in business activities within intensified competition. It responds to Chang's (2011) argument that existing research lacks clear conceptualisation of what *guanxi* is and how it operates, creating confusion about its fundamental logic in contemporary business contexts. Due to financial deregulation that has lowered industry entry barriers, a large number of participants have flooded into the logistics market. When the overall industry exhibits homogenised competition—where neither price nor service quality show significant differences, and especially when digital freight platforms create regional network information transparency—commercial competition based solely on transactions becomes insufficient to differentiate participants. This creates conditions where historically inherited relationship-based mechanisms regain strategic importance. When competition tends toward homogenisation, *guanxi* institution, as a unique differentiating factor in business competition, re-emerges with its importance showing an upward trend. This raises a fundamental question, as a steel plant manager mentioned in an interview: "With competitors similar to you in the market, why would others choose to cooperate with you?" (C3, 12.09.2023).

This three-phase evolution reveals a distinctive U-shaped trajectory in *guanxi*'s importance throughout China's logistics industry development. This U-shaped pattern suggests that *guanxi*'s role is not simply displaced by market mechanisms but rather evolves in response to

changing competitive conditions, becoming more important precisely when participants show minimal differences within economic activities. As well as it helps explain the seemingly paradoxical observation that *guanxi*-based governance has gained renewed significance precisely when market competition has reached intense stage. With industry participants facing severe service homogenisation, extreme price transparency, and minimal differentiation opportunities, *guanxi* has reemerged as a critical factor in determining network formation and stability.

6.2.3 Key Governance Mechanisms and Network Characteristics

Having established *guanxi* as a central concept in the hybrid framework and demonstrated its evolving importance through the U-shaped curve, I identify two key actor strategies that operate within this framework. These mechanisms, one bottom-up and one top-down, illustrate how formal and informal institutions interact to create distinctive network dynamics.

Deliberate Profit Sacrifice represents a bottom-up strategy whereby lower-tier participants willingly accept suboptimal economic conditions to build *guanxi* with upper-tier partners. Rather than simple price competition, this involves calculated investments in future opportunities through strategic economic losses (detail in Section 6.3).

Strategic Payment Postponement operates as a top-down approach where upper-tier participants deliberately extend payment terms to maintain influence while strengthening *guanxi* bonds. This goes beyond financial constraints to function as a sophisticated *guanxi*-building strategy (detail in Section 6.4).

These mechanisms are not independent but closely interrelated, operating alongside formal institutions to maintain the overall functioning of the logistics network while allowing adaptation to changing market conditions and policy environments. Understanding how

Strategic Payment Postponement and Deliberate Profit Sacrifice can coexist and mutually reinforce each other within the same network requires examining the structural conditions that enable their transmission across multiple network tiers. Three characteristics prove fundamental to this process: role ambiguity among network participants; the strategic exchange of *guanxi* credit and debit; and the re-conceptualisation of government as an active network participant. Each contributes to the distinctive governance patterns that characterise Chinese logistics networks.

Role Ambiguity as an Enabling Condition

The first characteristic pertains to the inherent ambiguity of participant roles, which stems from the multi-tier outsourcing structure. Regarding logistics participants, apart from the top-tier shippers and bottom-tier actual carriers in logistics pyramid structure (Section 4.6.2), all intermediate participants can simultaneously function as both clients and providers. This dual positioning creates a network where the same entity may act as both a superior party imposing conditions and a subordinate party accepting conditions, depending on the specific relationship context. This ambiguous positioning of participants has been recognised in various streams of literature. For example, scholars examining boundary-spanning roles (Williams, 2002) noted how intermediaries simultaneously manage relationships with both upstream and downstream partners, which navigating conflicting demands and expectations. Taking 3PL companies as an example, when they undertake logistics outsourcing orders from steel logistics subsidiaries, they operate as subordinate providers within that relationship. However, when they re-outsource these orders to other logistics companies or lorry drivers, they function as dominant clients. This role ambiguity has two significant implications for network dynamics. First, it creates efficient transmission pathways for both mechanisms throughout the network. When a participant experiences Strategic Payment Postponement as supplier in one relationship, they might implement similar practices as client in other relationships. Similarly, when a participant engages in Deliberate Profit Sacrifice to secure business, they gain insight into the strategic value of such practices and may come to expect similar behaviours from their own providers. Building on this perspective, second, role ambiguity complicates traditional analyses based on fixed power hierarchies. As a company might simultaneously hold dominant positions in some relationships while accepting

subordinate positions in others. This pattern creating a complex web of interdependencies that power within the industry network is unstable and changing.

Throughout this analysis, 'suppliers' refers to entities providing logistics services (including steel plants, logistics companies, and platforms), while 'clients' refers to service recipients. These terms are used interchangeably with industry terminology of 'upper/lower-tier participants' to reflect the hierarchical nature of logistics networks.

The Exchange of Guanxi Credit and Guanxi Debit

The second critical characteristic concerns the mechanisms of "*guanxi credit*" and "*guanxi debit*". These are examined fully in Section 6.5.2, where their theoretical foundations and operational dynamics are examined in detail. Here, I only provide a brief overview to establish their role in enabling mechanism transmission. In brief, "*guanxi credit*" refers to the relational capital accumulated by lower tier actors when they sacrifice immediate profits, creating expectations for future preferential treatment. Conversely, "*guanxi debit*" represents the obligations generated by upper tier actors through practices, such as payment postponement, establishing continuing bonds that ensure future cooperation. This deliberate imbalance between credit and debit serves as a key stabilising force in network relationships. Through Deliberate Profit Sacrifice, lower-tier participants accumulate *guanxi credit* that they expect to redeem in future interactions. Through Strategic Payment Postponement, upper-tier participants generate *guanxi debit* that binds lower-tier participants to continued cooperation. The balance between these credits and debits is carefully managed to ensure relationship continuity, which full settlement would paradoxically terminate the relationship rather than strengthen it. This credit-debit exchange operates within a broader institutional context that includes government participation.

Government as Active Network Participant

The third characteristic requires re-conceptualisation of the government's role in logistics networks. The government, particularly local government, is not merely as an external rule-maker and regulator but as an active participant in the network itself, establishing *guanxi*-

based connections with other participants. As Nee et al. (2007) describe, Chinese firms maintain close cooperative *guanxi* with some local governments, with local governments themselves being active market participants who create supportive business environments to attract and retain private capital and promote local economic growth. This perspective recognises how government entities actively participate in *guanxi* exchange mechanism through policy implementation, resource allocation, and regulatory enforcement. Specifically, non-compliance may result in the loss of *guanxi* credit, which may impact the existing *guanxi* or the construction of *guanxi* in the future. Instead, if firms take actions before regulations are enforced or if they follow the aims or spirit of state organisations without regulatory compulsion, they could gain *guanxi* credit. For example, when enterprises engage in practices like Deliberate Profit Sacrifice to comply with government initiatives, such as adopting environmentally friendly technologies despite their economic disadvantages. They will accumulate *guanxi* credit with government entities that may later translate into preferential treatment in land allocation, permit approvals, or other areas of government discretion (see Section 6.5.3).

With these key characteristics of the hybrid governance framework established, the following sections examine each mechanism in detail. Section 6.3 analyses how Deliberate Profit Sacrifice operates as a bottom-up strategy through which lower-tier participants attempt to establish relationships with upper-tier participants. Section 6.4 explores how Strategic Payment Postponement functions as a top-down mechanism through which upper-tier participants maintain control while ensuring relationship continuity. These mechanisms operate simultaneously within the network dynamics, with actors often engage in both practices depending according to specific situation and positional context.

6.3 Bottom-Up Governance: Deliberate Profit Sacrifice

Digital freight platforms have reshaped network dynamics in China's logistics industry, as discussed in Section 5.4. While these platforms were designed to improve matching efficiency, ensure transportation security, and strengthen tax compliance, their greatest impact has been dramatically increasing industry transparency. This transparency has intensified

competition among participants and catalysed a distinctive bottom-up governance mechanism that I term Deliberate Profit Sacrifice. I define Deliberate Profit Sacrifice as:

a bottom-up strategy whereby lower-tier participants willingly accept suboptimal economic conditions as a means of building *guanxi* with potential clients or partners. Through this strategy, subordinate parties in the logistics network initially accept unfavourable economic terms to establish a relational foundation with potential clients or partners. This is not merely about being "friendly" but rather a calculated investment in future opportunities. By demonstrating a willingness to prioritize *guanxi* over immediate interests, subordinate parties signal long-term commitment and reliability, effectively converting economic capital into social capital with expectations of future returns. This practice demonstrates how participants strategically navigate formal institutional constraints through sophisticated *guanxi*-building strategies, trading immediate financial losses for longer-term benefits beyond the immediate transaction.

This mechanism originates at the lower tiers of the network and propagates upward, creating industry-wide price compression. Driven by the imperative to maintain continuous operation of both equipment and cash flow, which are two of key elements in logistics operations. Deliberate Profit Sacrifice has evolved into a core governance mechanism that shapes network dynamics across the sector.

6.3.1 Development Path

The rapid development of China's logistics industry has been significantly driven by the financial deregulations. While this deregulation has greatly expanded the number of industry participants, it has simultaneously placed considerable loan pressure on many lorry drivers (see Section 5.2.2). This has created a debt-driven operational mode within the logistics network. Lorry drivers must secure orders continuously to service their monthly loan payments. Simultaneously, the rapid expansion of the logistics sector has produced a "vehicle surplus, cargo shortage" phenomenon that fundamentally altered supply-demand dynamics. Unlike manufacturing industries, logistics operations exhibit a radiating pattern of territorial

embeddedness, extending outward from a base location with transport distance as the radius (See Section 4.6.1). This creates the distinction between outbound and backhaul trips. In this highly competitive environment, to secure orders and generate income, lorry drivers often accept reduced revenue on single trips to ensure overall profitability across the round trip and increase the efficiency. As one lorry driver explained during our conversation about backhaul freight pricing:

"Backhaul freight prices are extremely low. For example, when I reach Chongqing, our outbound shipping fee is more than 10,000 yuan. For the backhaul order, just breaking even is considered good. But the situation is, often the one-way freight doesn't even difficult to cover my fuel and toll costs [...] Like this current shipment, the outbound fee is around 14,000 yuan, but the backhaul is only about 5,000 yuan. So basically, in many of my orders, I earn enough on the one-way trip, and for the other direction, as long as I don't lose too much, I can accept it." (E8, 24.07.2023)

This willingness to sacrifice profit on backhaul journeys enables drivers to avoid additional costs associated with extended waiting periods for higher-paying cargo, including accommodation, subsistence expenses and so forth. By accepting lower-priced backhaul orders, drivers can optimise their overall vehicle utilisation rates and maintain continuous revenue flow, thereby offsetting the reduced per-trip income through improved operational efficiency. This low-price acquisition strategy, whilst employed by part of drivers (others reject such orders, characterising them as "malicious price compression"), has nonetheless demonstrated effectiveness in securing contracts, particularly for drivers experiencing loan pressure. This practice has perpetuated a systemic cycle of price compression throughout the logistics market by demonstrating to shippers that transportation services can be obtained at lower rates, subsequently pressuring all market participants to lower their pricing to remain competitive. Furthermore, this bottom-up strategy propagates upward through the network hierarchy. When shippers or logistics companies consistently identify carriers willing to accept reduced-rate contracts, they become conditioned to these lower pricing structures and increasingly resistant to paying premium rates for transport services. As one subsidiary logistics company manager explained:

"For the same route, my lowest cost might be 0.35 yuan, but some companies can do it for 0.27 yuan. For the demand side, 0.27 yuan is certainly more economical. I definitely

can't operate at 0.27 yuan, but they can. They might have backhauled freight resources in that location, or they might be local vehicles that need to backhaul to that area anyway. Unlike me, who might need to dispatch personnel to that location and establish a presence there, which creates additional costs they don't have. Some are simply looking for backhaul freight resources." (D17, 13.09.2023)

This creates a form of price advantage that transmits upward through the logistics network. This development path demonstrates how financial pressures at the driver tier cascade through the entire network, creating systematic downward pressure on pricing. Moreover, this low-price cycle is not confined to the lorry driver community but extends upward to commercial transactions between logistics companies and upper-tier shippers. As he described, some companies can offer lower prices because they already have outbound resources on particular routes, allowing them to cover backhaul journeys at merely break-even rates or even at a small loss.

6.3.2 Establishing Guanxi

Deliberate Profit Sacrifice operates through institutional mechanisms that transcend simple cost considerations. Beyond functioning as an order acquisition strategy, it serves as a strategic investment in social capital. Through cooperation with upper-tier actors, lower-tier actors attempt to establish *guanxi* and leverage this social capital for greater benefits in future cooperation. This preference highlights the advantages of *guanxi*-based connections, which purely market-based platforms cannot easily replicate.

For lorry drivers, accepting lower rates provides the chance to entry into "private capability pools" of logistics companies. As described in Section 5.5.2, through this "private capability pool", it could secure privileged access to freight information beyond the information on digital platforms. As one logistics company manager said, "If you want to secure stable cargo sources, maintaining good *guanxi* with shippers and logistics companies is key" (B3, 27.11.2022). Compartmenting the obtain the orders on the digital freight platform, in this way of establishing *guanxi* with the logistics company, the lorry drivers could avoid the homogenised competition in some degrees.

This *guanxi*-based dimension also exists in company-to-company interactions, particularly in bidding processes. In the logistics bidding processes, since participants do not possess significant differentiation advantages, price advantage appears to become the standard for distinguishing different bidders. However, for upper-tier participants, this low-price model does not seem to be their primary criterion for selecting outsourcing suppliers. Research findings indicate that supplier selection is more primary based on a multi-factor evaluation logic that spans a long time-dimension, rather than being limited to price preference confined within the formal contractual framework (See Section 6.4). A logistics company manager offered a revealing description of this dynamic:

"In many cases, the cooperation partner has actually been determined before the bidding process begins. Bidding is just a formality. Just like when we participate in other companies' bidding processes. Even if we already know before bidding who they intend to select, we still submit our bid with pricing below market rates, especially for smaller projects that constitute a small portion of the overall investment portfolio. If we don't win, we consider it market disruption. If we win, losing some money is normal. [...] For orders from certain major clients, winning the bid, even at a loss, enhances our credibility as a supplier. Because in our service industry, experience and brand building are crucial. Usually, these certifications (such as the social credit) can't be bought with money. Once your secure orders from major clients, small and medium clients in related industries also recognize our qualifications. Since in the service industry, service differentiation isn't significant, this service experience represents our professional level to some extent. [...] Therefore, even if we might lose money on individual orders, overall, we may still be profitable." (B8, 15.10.2023)

This dynamic reveals how prestigious client relationships being shaped through informal quality certifications in the Chinese business sector. Similar to how institutional certification marks like the BSI Kitemark in the UK serve as trusted quality indicators in formal markets. Securing contracts with major clients creates a form of market-based credibility that signals competence and reliability to other potential customers. As the interviewee noted, these reputational "certifications" through client relationships cannot simply be purchased but must be earned through demonstrated performance, making them valuable assets for differentiation within industry. Once established, these client-based credentials create a cascading that facilitates access to broader market segments.

Three points are particularly noteworthy in this account. First, in many cases, cooperation partners appear predetermined before bidding processes, with the bidding itself serving primarily as a procedural demonstration of "fairness". Second, while accepting economic losses to secure orders appears suboptimal from an isolate transaction-level perspective, it represents a strategically rational investment in long-term organisational development. Third, the exchange within business cooperation extends beyond contractual goods movement and monetary compensation, which further including reputation, experience, and *guanxi* establishment. Although those elements not explicitly specified in contracts, they are central to business operations. These three observations collectively demonstrate how Deliberate Profit Sacrifice functions as a *guanxi*-establish mechanism rather than merely a pricing strategy. They reveal that *guanxi* perspective considerations supersede transaction-based logic (point 1); apparent economic irrationality becomes strategic when viewed through a *guanxi* lens (point 2); the value exchange encompasses intangible social capital beyond formal contractual terms (point 3).

Moreover, this low-price strategy for securing orders appears more oriented toward investing in future uncertainties, emphasising a process of accumulating social capital through economic sacrifice. As the international freight forwarder mentioned earlier (Section 6.1.2), maintaining a decade-long relationship with a major manufacturing client despite operating at near-breakeven serves as a strategic "benchmark" that strengthens bargaining position with other potential clients. Similar, a steel logistics subsidiary manager described:

"And if you think from another angle, for example, if I'm now discussing transport business with some external companies—let's say I already have 1 million tons of coal being transported—they'll think, you're already in the coal business, so at least from a transport logistics perspective, I have no concerns about your capability. It's just a matter of price negotiation. They won't question my service capacity." (D13, 07.09.2023)

Therefore, logistics participants view accepting moderate profit sacrifice as an effective strategy for securing stable orders and building industry reputation and experience. By forgoing immediate economic returns, lower-tier participants can accumulate social capital, establishing competitive advantages for long-term industry development.

6.3.3 Creating a "Low-Price Cycle"

The widespread adoption of Deliberate Profit Sacrifice has intensified what industry participants describe as a "vicious competitive cycle". This phenomenon is driven by two interconnected factors. First, the strategy's high replicability means any participant can easily adopt price reduction tactics, causing the differentiating advantage to diminish as adoption spreads. Second, this proliferation has generated sector-wide price compression, with outbound prices converging toward traditionally lower backhaul rates, creating downward pressure across all routes. The resulting price erosion steadily reduces the survival space for logistics participants, particularly lorry drivers. This competitive dynamic is further complicated by the inherently ambiguous distinction between outbound and backhaul journeys—what constitutes a backhaul journey for one driver may represent an outbound journey for another. One lorry driver expressed frustration with this ambiguity:

"It depends on how you define it [...] For instance, if I'm currently running from Chongqing to Hubei, I could be classified as a backhaul vehicle or not [...] So, when freight platforms now define backhaul freight, they've driven down our prices too. For example, going to Hubei and back to Chongqing—what's called 'backhaul transportation'—the purpose is simply to drive prices down. As an example, for our vehicles running only between Hubei and Chongqing, previously earning 20-30 thousand yuan monthly wasn't very difficult [...] Now, earning 20 thousand monthly has become extremely challenging because everyone has pushed prices too low." (E6, 24.07.2023)

He resents being labelled as a "backhaul vehicle" even when returning from distant locations, as this classification typically implies accepting lower prices. This practice has driven down overall freight rates across the industry. This downward price pressure created by the ambiguous definition of "backhaul" freight cascades upward through the network hierarchy. This industry-wide price compression has altered strategies at upper-tier participants as well. As one lorry driver described:

"These third-party logistics companies also have to bid. [...] Sometimes, for routes that are difficult to operate or have fewer backhaul freight opportunities, they set higher prices. For routes with backhaul freight, they set lower prices... For example, when these logistics companies bid for the *Luzhou* (泸州 city in Sichuan Province) route, they can operate at 50+ yuan per ton-kilometre because there are mines and coal there, allowing them to bring cargo back. Some companies wanting to bid 70 or 80 yuan can't win. With so many

transport companies, competition is fierce, and after getting these low-price orders, they similarly offer us very low prices." (E1, 30.12.2022)

Another driver added:

"They give us backhaul freight orders, they barely make any profit themselves, so don't expect them to share much with us. But in this era of scarce orders, having any order is already quite good. [...] They look at which routes are profitable for drivers, and they'll reduce your freight fee for those. If profitability is low, they'll increase it a bit. The logistics company's rates for us aren't fixed. Because fuel prices and other factors fluctuate. Companies calculate everything before paying us, keeping us neither starving nor getting any advantage. What we can do is just hanging on." (E2, 05.04.2023)

As mentioned in Section 6.2.3, the roles that network participants possess are ambiguous, which could simultaneously function as both suppliers and clients. Therefore, for logistics companies at intermediate tiers, price pressure transmits both upward and downward. They must offer competitive rates to upper-tier clients while simultaneously securing lower-priced transport capacity from drivers. This creates what participants describe as a "low-price cycle" throughout the industry, with participants at all tiers experiencing diminishing profit margins. This situation is particularly challenging for lorry drivers, whose working conditions become increasingly difficult. This creates a seemingly paradoxical situation where these harsh survival conditions actually increase the value of *guanxi*. Unlike price reductions, which any competitor can replicate, *guanxi* represents a form of non-replicable competitive advantage. When multiple suppliers offer similar low prices, those with established *guanxi* gain preferential access to orders due to process familiarity and demonstrated reliability from previous cooperation. Thus, as market competition intensifies, the channel of finding cargo through *guanxi* becomes increasingly valuable precisely because it offers an escape from pure price competition.

Through this bottom-up mechanism of Deliberate Profit Sacrifice, lower-tier participants create a distinctive pattern of network dynamics that transmits upward through China's logistics industry. Meanwhile, upper-tier participants also develop their own strategic responses to these pressures. As the next section shows, they respond through the top-down

Strategic Payment Postponement mechanism, creating a dynamic interplay between bottom-up and top-down governance forces.

6.4 Top-Down Governance: Strategic Payment Postponement

While lower-tier participants engage in Deliberate Profit Sacrifice to secure orders and establish *guanxi*, upper-tier actors face a different but equally complex challenge: how to select reliable partners from an oversupplied market while maintaining control over their outsourced operations. Their solution is Strategic Payment Postponement.

I define the Strategic Payment Postponement as:

A top-down mechanism that goes beyond simple payment delays which aims to function as a *guanxi*-building strategy. In the context of Chinese business networks, it represents a systematic approach where more powerful entities deliberately extend payment terms to maintain influence over lower-tier participants while simultaneously strengthening relational bonds. This creates both financial dependency and *guanxi* obligations beyond the transactional relationship, allowing the paying party to exert ongoing influence over suppliers' operations and decisions without explicit demands. By converting immediate financial obligations into long-term relational debts, this mechanism ensures network stability through the implicit promise of future settlement. It reflects how formal contractual arrangements are informally modified through cultural institutional practices to create enduring *guanxi* connections that conventional market mechanisms cannot replicate. This subtle form of power assertion enables upper-tier actors to maintain control over the network while paradoxically deepening cooperative relationships through strategic indebtedness.

By converting immediate financial obligations into long-term *guanxi*-debts, upper-tier participants can exert ongoing influence over suppliers' operations without explicit demands while ensuring network stability through implicit promises of future settlement. As one steel subsidiary company manager explained: "In logistics, three main things we consider are: efficiency, cost, and safety" (D2, 27.04.2023). This mechanism enables participants to achieve other two objectives without additional costs.

6.4.1 Development Path

Strategic payment postponement in steel logistics networks can be traced to the cooperative relationship between steel plants and government entities because these relationships create cascading payment delays throughout the supply chain. Steel plants frequently engage in large-scale projects with government-related enterprises, such as infrastructure construction and building projects, with a significant portion of their final consumption channels flowing toward government-related projects. These government-related projects typically operate on extended payment schedules, creating payment timing mismatches that ripple through steel plants' supply chains and ultimately affect the entire logistics network. As a steel plant manager explained regarding the extended payment periods for construction projects:

"Often, after completing a project, they might only pay 30% or 40%, especially for government projects. And there's always a final 5%-20% called quality assurance deposits. This is because what you've built might appear fine now, but two or three months later, I don't know if you've cut corners somewhere. For instance, if I asked you to make something 40 centimetres thick, but you only made it 38 centimetres, it might not cause problems initially, but those missing 2 centimetres could lead to issues later. A road that was supposed to last three years before requiring maintenance might need repairs after just three months. [...] What funds would I use to cover this? If I had paid you in full, I might not be able to find my contractor anymore. But with quality assurance deposits, I can simply deduct from that. So future maintenance costs can be directly deducted from these deposits until they're depleted." (C4, 19.09.2023)

Additionally, state-owned enterprises typically have longer business-related procedural processes compared to private enterprises. Sometimes, these payment timeframes can even extend to several years. This delays the accounts receivable collection cycle for steel plants at upstream end of the supply chain. This financial pressure is then transmitted downstream, leading to delayed payments between steel plant logistics subsidiaries and 3PL companies, then to the lorry drivers. Its cascading effect throughout the logistics network, which create significant pressure on individual drivers who operate with different financial. As one lorry driver complained:

"XX [a major steel plant] doesn't settle transport fees for half a year. Nevertheless, when we engaged orders in other channels, we normally get paid immediately. For example,

when we find cargo through *Huo Che Bang* (货车帮) [a digital freight platform]. As soon as goods are delivered, we send the receipts through the platform, and they immediately transfer the transport fee to us." (E1, 30.12.2022)

Due to this reason, some drivers are reluctant to accept orders from large steel. This stems from the mismatch between lorry drivers' preferred settlement cycles and the payment timeframes of steel logistics subsidiaries. Even when logistics companies attempt to bridge this gap through loan asymmetric payment periods persist in steel plant logistics networks. However, despite these extended payment terms, the main advantage of large steel plants is that they can provide stable cargo sources. Moreover, for these major shippers, bad debts are rare. The payments may be slow, but drivers know they will eventually be paid. In contrast, smaller shippers sometimes indefinitely extend payment periods due to the broken of capital chains, leaving logistics companies unable to settle with drivers. One driver described his experience with small shipper:

"Until now, I have at least 100,000 yuan in transport fees that I haven't collected [...] About 10 years ago when I was driving more frequently, the boss who hired me to transport goods disappeared [...] And since they weren't receiving their own payments, they couldn't even feed themselves, so how could I ask them for money?" (E12, 25.09.2023)

Despite the extended payment cycles associated with steel plant operations, the reliability of eventual payment from large steel plants represents a crucial advantage over smaller shippers. This payment security, despite temporal delays, ensures a steady stream of lorry drivers continue to enter their logistics networks. This creates a top-down chain of delayed payments anchored by steel plants, which influenced by upstream project settlement cycles, strategically implement downward payment delays throughout the chain. This mechanism has become a tacit rule in the steel logistics sector. To maintain ongoing business relationships and reputation, logistics participants comply with this informal rule even when it creates financial pressure. As an auto parts company owner stated:

"[...] After all, we still need to cooperate and continue doing business [...] And payment collection issues can't really be taken to court. It's not that they won't pay you; it might be that their upstream hasn't paid them. Moreover, if it actually went to court, your industry

reputation would suffer. I might get my money, but others might be unwilling to cooperate with me in the future." (A2, 20.11.2022)

As he emphasised, the business cooperation extends beyond isolated transactions, which also encompass longer-term business relationships. To maintain these relationships and preserve industry reputation, participants have to accept this payment mechanism, despite the financial pressure it creates. Upper-tier participants have thus established an informal debt structure beyond formal institutional frameworks through Strategic Payment Postponement. This mechanism allows them to effectively control lower-tier participants while protecting their own interests, becoming an accepted informal institution built upon formal contractual relationships.

6.4.2 Self-Protection and Power Extension

Having established how Strategic Payment Postponement emerged as an institutionalised practice, this section examines how upper-tier participants strategically deploy this mechanism to achieve two interconnected objectives: protecting themselves against supplier risks while extending their influence beyond formal contractual boundaries.

As discussed in Section 5.3.3, logistics intermediaries function as buffer zones within industry, with different participants exhibiting varying degrees of sensitivity to payment delays. Typically, lower-tier participants, such as lorry drivers, show higher time-sensitivity to payment. This differential sensitivity to payment cycles, combined with deliberate delay mechanisms, form a key factor in the effectiveness of Strategic Payment Postponement. A steel plant manager detailed this process:

"[...] it's a matter of payment periods. Transport definitely incurs costs that flow with time. [...] I'm referring to variable costs, mainly labour and fuel consumption. Theoretically, if someone has worked for you for a month, you should settle a month's payment; vehicles on the road consume fuel. But your upstream won't pay you according to this timeframe, which is usually monthly settlements. Moreover, monthly settlements rarely, it's often current month settlement with payment the following month. [...] In this way, I always hold accounts payable for my downstream suppliers, giving me better leverage over my contractors. Otherwise, I'd be concerned. For instance, if they're

handling an important route for transportation, and I have no leverage over these downstream companies. If I immediately paid them, say 1 million yuan for 1 million yuan of work that wouldn't happen. [...] Because without any other interactions between us, they would control the route through their transportation services. If someday they encountered problems, whether slow efficiency or cargo theft. Those situations requiring contractor compensation, if I had paid everything, my suppliers could take a hard stance against me and simply quit. This would leave us without any constraints to our logistics contractors " (C4, 19.09.2023)

This explanation reveals the strategic logic behind delayed payments as a control mechanism. By creating sustained financial pressure on suppliers, upper-tier participants effectively ensure that subordinates remain committed to predetermined plans, enhancing the efficiency and security of logistics process without incurring additional costs. Furthermore, this manager elaborated on how this financial dependency creates leverage that extends far beyond the immediate contract value:

"Deposits are actually minimal, especially when your issue might cause impacts far exceeding the deposit amount. [...] Particularly for critical projects that I outsource to logistics companies—for instance, if I'm selling 200 million yuan of steel annually and due to your transportation problems, errors occur in my entire process or affect my cooperation with my client—your 200,000- or 500,000-yuan deposit is merely a drop in the bucket, unable to compensate for 200 million in sales. But for the transportation company, they don't consider this; once they've caused trouble, even if the compensation exceeds 50,000 yuan on a 200,000-yuan deposit, they might simply abandon the project. [...But] If I'm continuously holding my downstream transportation company's accounts payable, it could be one- or two-months' worth, potentially several hundred thousand or even million yuan. So that, they wouldn't easily withdraw from the contract. When compensation is necessary, they must comply." (C4, 19.09.2023)

This comparison between security deposits and delayed payments reveals a distinction in how upper-tier participants conceptualise control within logistics networks. Security deposits operate within formal contractual boundaries, which represent predetermined, quantified protections that function as isolated risk management tools. However, Strategic Payment Postponement transforms the entire relationship structure by creating ongoing financial dependencies that extend far beyond any single contract. As he demonstrates, when potential business impacts vastly exceed available formal protections, upper-tier participants must develop alternative mechanisms to ensure compliance and prevent opportunistic behaviour. By maintaining substantial accounts payable, upper-tier participants create an interdependent

network where suppliers would face economic devastation if they abandoned the relationship. Moreover, this mechanism operates as a deliberate strategy rather than merely a response to cash flow issues. The systematic nature of this approach becomes evident when examining how it functions independently of actual financial capacity, as a subsidiary logistics company manager confirmed:

"Typically, we support the entire system through a debt model. So regardless of whether my funds are sufficient, I'll try to slow down payments to downstream partners. For example, when I'm short on funds, I might pay after 45 days, or two months or longer. When I have money on hand, I still pay them according to this rhythm. When they consider ending the *guanxi*, they still have to weigh the cost of default, as part of their money remains with me. Of course, my partners might apply the same measures to me."
(D13, 07.09.2023)

As he said, when suppliers contemplate inappropriate actions, they must weigh both current project payments and accumulated receivables across extended time periods, which potentially representing months or years of financial exposure. This transforms discrete transactions into continuous relationships where control suppliers through accumulated obligations rather than formal penalties. Thus, Strategic Payment Postponement operates as more than a self-protection mechanism; it has evolved into a fundamental governance institution that shapes behavioural expectations throughout China's logistics networks. It creates a distinctive form of *guanxi*-based control that complements and extends formal contractual arrangements.

6.4.3 Influencing Partner Selection

Regarding to the supplier selection processes, this debt-based *guanxi* chain creates distinctive patterns in how logistics partnerships form and persist. As mentioned in Chapter 4, in the original logistics market characterised by information asymmetry, logistics operations exhibited strong territorial and societal embeddedness. From the perspective of lorry drivers, they preferred operating on familiar routes where knowledge of local conditions improved transport efficiency and reduced costs, particularly in complex mountainous regions, such as Sichuan and Chongqing. Consequently, regional monopolies emerged in branch-line transportation during periods of limited information transparency. As the case described in

section 6.1.1, which a steel enterprise logistics subsidiary manager refers about the “regional logistics monopoly” phenomenon. This "regional logistics monopoly" primarily referred to shippers' preference for fixed logistics partners in branch-line transportation rather than conducting extensive searches. As he described, the primary reason was information asymmetry and relatively few participants, limiting choice for all the logistics participants. Transaction parties for logistics resources and transport capacity maintained relative balance in this context.

Along with the competition intensified within logistics sector. The increase in participants gradually eliminate the regional logistics monopolies phenomena. In this market-oriented competitive environment, the outsourcing process shifted from company pricing model to a mixed online/offline bidding model. Under the original pricing model, for fixed routes and cargo transportation, costs were relatively standardised after a period of operation. Companies would provide fix prices for specific routes or add reasonable adjustment mechanisms based on fixed prices, then select familiar suppliers for transport outsourcing. As a logistics subsidiary manager described:

"Theoretically, as transportation locations increased, we will eventually coverer all routes under a company pricing model. And then, we would select logistics partners with whom we had extensive cooperation." (D2, 27.04.2023)

However, this pricing model required high control ability over logistics operations and was typically only available to large enterprises with long-term sustainable and stable cargo sources. With price fluctuations across different routes, combined with business expansion or operational changes, enterprises struggled to maintain price information for all routes. Simultaneously, competition in market economy provided more diverse options for participants. Consequently, bidding processes gradually became mainstream operation model for clients selecting logistics outsourcing partners. Through bidding, clients could search for potential logistics partners in the broader market and chasing for economic efficiency. Similarly, bidding process also offers suppliers opportunities to participate in large shippers' supply chains. As a logistics company manager who involved in steel-related transportation described this change as:

"Unlike before, when transport prices were uniformly set by steel plants, with companies competing to obtain orders based on their capabilities, which for some branch transportation amounted to monopoly, requiring logistics companies to have certain *guanxi* to obtain orders. Now everything is open, all suppliers can sit at the same table for price negotiations. If Company A can operate at 48 yuan per ton-kilometre and Company B at 40 yuan per ton-kilometre, the order naturally goes to Company B. The entire process has become more transparent." (B5, 21.03.2023)

As he described, under this bidding model, the market appeared to move toward greater fairness and transparency, to some extent eliminating *guanxi*-based order acquisition. However, in practice, this bidding model did not become a transparent institution but rather a cost-reduction tool for shippers. Since logistics essentially involves matching capacity with cargo, it concerns supply-demand balance. In an environment of "vehicle surplus, cargo shortage" and intense competition, partner selection became increasingly unidirectional, determined by cargo owners rather than capacity owners. While Deliberate Profit Sacrifice created price differentials that facilitate suppliers to secure orders, the simplex price factors alone were not decisive for clients in determining cooperation relationships. They have to conduct more comprehensive assessments, as a steel plant manager explained the process supplier selection:

"Sometimes when signing a contract, we consider that no contract is without risk, no matter how stable a business appears. So how do we theoretically minimize risk? Sometimes we're willing to sign contracts with almost no security measures. The reason is that we might have other larger cooperation with this company that already constrains it. For example, it could be the same company, the same legal beneficiary, or other existing relationships between them, we will consider all these factors [...] Sometimes when new transportation companies approach us, even if they offer lower costs, I might not entrust major projects to them because I have weaker constraints over these companies. To be frank, I owe them less money, so they can more easily fall out with me [...] So cooperation relationship establishment, in my understanding, it's not about *guanxi* or sentiment, it's more about financial managing issues." (C1, 07.09.2023)

Evidently, as he said, simplex low prices strategic are insufficient to secure orders, especially bulk orders from major enterprises, who primary focus is overall logistics efficiency. shippers prefer partners with whom they have already established cooperation relationship. At least, based on previous cooperation, they still hold a portion of the suppliers' accounts payable,

providing certain guarantees for future cooperation. These minor price differentials created through Deliberate Profit Sacrifice appear less significant compared to the overall efficiency and security guarantees of the entire project. However, cost concerns remain a vital consideration for participants. To simultaneously satisfy cost, efficiency, and security requirements, their approach involves using bidding processes to explore market floor prices, then requiring the suppliers who already established cooperation relationships to match these prices. A steel plant manager explained this process:

"We often conduct bidding process to probe the market's floor price, which aims to find out what the lowest price in this market, to explore the bottom line between these companies. As each company has different bottom lines. Our bidding purpose is to reach the most suitable prices to reduce our costs. So, we might already decide who will get the contract, but we need bidding as a means to pressure prices down." (C4, 19.09.2023)

In this description, bidding process functions as a market intelligence collection tool rather than a supplier selection process. As mentioned in previous sections, some companies can offer extremely low prices due to backhaul freight resources, allowing them to significantly undercut average logistics costs comparing to other suppliers. Through bidding, clients can demand lower prices from their logistics suppliers based on established cooperation relationship that ensure efficiency and security.

Similar process is also conduct during logistics companies select lorry drivers, which through established private capacity pools to make choices instead of selecting through digital freight platforms. Whether through bidding or pricing models, they establish cooperation relationship with suppliers and select them based on these already existing one Through this approach, Clients choose to establish their own logistics networks through carefully screen rather than extensive search. With the same time, this process satisfies low-cost requirements while ensuring operational efficiency. This systematic approach on partner selection reveals how Strategic Payment Postponement operates as more than a financial tool, which is comprehensive network architecture strategy. Through deliberate debt management and cooperation relationship cultivation, upper-tier participants create stable, controllable logistics ecosystems that insulate them from market volatility while maintaining competitive advantages. The prevalence of this practice across China's logistics industry demonstrates

how informal governance mechanisms can fundamentally reshape market dynamics, even in highly competitive sectors.

6.5 Hybrid Governance in Action: Network Dynamics Outcomes

Having examined the two key mechanisms separately, I now return to the hybrid governance framework introduced earlier to demonstrate how these mechanisms collectively produce unique network dynamics in China's steel logistics industry. As established in section 6.1, traditional transaction-based analysis fails to fully explain observed phenomena in highly homogenised and competitive markets, while the integration of *guanxi* as a complementary institution offers greater explanatory power. The empirical evidence from both Deliberate Profit Sacrifice and Strategic Payment Postponement confirms the U-shaped trajectory of *guanxi*'s importance proposed in section 6.2.2, particularly its resurgence in intensely competitive environments characterised by service homogeneity and high information transparency.

This section integrates these findings to analyse how the interaction between formal and informal governance mechanisms creates distinctive network outcomes. Rather than viewing these mechanisms as separate strategies, it examines how they function as complementary elements of a hybrid governance system that maintains network stability while allowing adaptation to changing market conditions.

6.5.1 Maintaining Network Dynamic Continuity

Having examined how Strategic Payment Postponement and Deliberate Profit Sacrifice operate as distinct mechanisms, this section analyses one of the key underlying drivers that makes both strategies necessary: the requirement for network continuity. While previous sections have addressed continuity, such as in Section 6.4.3 where upper-tier participants employ deliberate payment postponement to maintain operational efficiency. This section provides a systematic analysis of how continuity functions as the fundamental driver underlying both key mechanisms. This systematic examination reveals why certain

participant behaviours may appear economically irrational from a transactional-based perspective yet prove strategically sound within the hybrid governance framework.

The continuity requirement operates across three interconnected levels: operational, financial, and *guanxi*-based. At the operational level, both steel production processes and logistics network operations demand the uninterrupted functioning of production equipment and transportation assets. As one subsidiary logistics company technical director explained:

"High-furnace steel plants cannot shut down for even a day of the year. Once shut down, the restart costs could reach tens of millions of yuan. Even in regions with production limitations, to protect the entire equipment and prevent oxidation-reduction reactions in the furnace walls, 'idling furnaces' must be maintained with fires burning, waiting to resume production." (D16, 12.09.2023)

Furthermore, this operational imperative extends beyond production facilities to encompass the entire logistics network that supports them. Transportation vehicles face parallel continuity pressures, which they also have to maintain continuous operation to remain economically viable. A lorry driver described this operational reality:

"Even if you don't drive the vehicle, you're still spending money on various inputs. While you save on fuel by not driving, keeping vehicles idle for extended periods can lead to even higher maintenance costs. Tires may deteriorate and need replacement. Insurance must be maintained continuously [...] for example, if your vehicle is stationary for six months and then you suddenly want to use it, you can't operate without insurance. In addition, from the financial perspective, depreciation is calculated daily." (E5, 24.07.2023)

This account demonstrates that extended operational interruptions may generate higher costs than continuous operation. Moreover, these vehicle-related constraints create financial burdens that extend beyond immediate operational concerns. As he said, operational continuity is inextricably linked to financial pressures. The daily depreciation costs and continuous insurance requirements operational imperatives create ongoing financial obligations. Thus, this leads to the second level of continuity, financial continuity. For individual drivers, particularly those with vehicle loans, continuous income is necessary to

meet monthly debt obligations. This financial pressure helps explain why drivers willing to accept below-cost backhaul trips, as maintaining cash flow takes precedence over profit maximisation on individual transactions. Similar, for logistics companies, financial continuity often necessitates maintaining business operations even during unprofitable periods. As one logistics company manager explained:

"When doing business at scale, especially with multiple business lines rather than a single operation, you might continue operating even during economic downturns when you're losing money. This is because a company's normal operation requires ensuring certain cash flow. When your capital stops flowing and all commercial operations cease, the consequences can be much more severe than losing a little money." (B7, 23.09.2023)

This manager's emphasis on maintaining operations "even during economic downturns" reveals how financial continuity often requires decisions that appear economically irrational in the short term. As discussed in previous chapters, suppliers often engage in deliberate profit sacrifice to enter major shippers' logistics networks, enabling them to secure stable cargo sources and differentiate themselves in highly competitive environments. The fundamental logic behind these behaviours lies in their desire to establish *guanxi* with upper-tier participants through strategic economic investment. This logic extends to the third and most crucial level of continuity: *guanxi*-based maintenance. The *guanxi* continuity imperative operates as the foundational mechanism linking operational and financial pressures to relationship preservation. Since *guanxi* represents accumulated social capital that cannot be easily reconstructed once severed, participants prioritise continuous engagement over short-term economic optimisation to preserve these valuable network connections. As one logistics company chairman stated:

"When the client is experiencing difficulties, if you don't step up, you won't get a turn when there's money to be made. Everyone is looking for this compromise balance point." (B4, 01.01.2023)

This sentiment was echoed by a steel plant manager who emphasized the importance of *guanxi* continuity:

"These transportation companies may be operating at a loss on some routes, but they still run them because they need to maintain the continuous cooperation bond with us. The bond cannot be broken. If they refuse to operate today because the price causes them to lose money, it will be difficult for them to re-enter in the future. As we commonly say: When there's meat, you eat meat; when there's soup, you must also drink it; sometimes you might even have to gnaw on bones or spit something out [...] You need to weigh this *guanxi*." (C1, 07.09.2023)

This perspective illustrates how *guanxi* continuity operates as a strategic imperative where *guanxi* preservation takes precedence over immediate economic rationality. Participants recognise that temporary losses are acceptable costs for maintaining long-term network positioning, as *guanxi* disruption creates far greater barriers to future opportunities than short-term financial sacrifices.

These three levels of continuity imperatives—operational, financial, and *guanxi*-based—demonstrate the interconnected nature of network stability requirements. Whether avoiding costly equipment shutdowns, maintaining cash flow during unprofitable periods, or preserving valuable business relationships, the continuity imperative consistently outweighs short-term economic optimization. This reveals a fundamental characteristic of the hybrid governance system: network stability depends not on maximizing individual transaction efficiency, but on maintaining the continuous flow of operations, capital, and *guanxi* that sustain the entire network dynamic. The strategic value of this continuity imperative becomes even more apparent when examining how participants deliberately create and manage imbalanced obligations, as explored in the following section.

6.5.2 The Strategic Value of Imbalance in *Guanxi*

Based on the discussion former section, it raises a fundamental theoretical puzzle: how do participants maintain network dynamic continuity when market transactions completion and closure? The empirical evidence from Chinese logistics networks reveals a system, which participants strategically avoid the balanced exchanges, instead deliberately maintaining imbalances of *guanxi* to ensure ongoing interdependence. As demonstrated through Strategic Payment Postponement, upper-tier participants create temporal misalignments that establish continuous relationships transcending individual contractual boundaries, while lower-tier

participants accept sustained disadvantages through Deliberate Profit Sacrifice to preserve access to future opportunities. This deliberately cultivated imbalance between parties shows that rather than viewing delayed payments and accepted losses as market inefficiencies, these mechanisms function as essential mechanisms for relationship maintenance and network stability.

Traditional Western theories of exchange, from Mauss's (1967) classic work on gift economies to Blau's (2017) social exchange theory, typically emphasise reciprocity as the foundation of stable social relationships. These frameworks suggest that balance, reciprocal exchanges strengthen social bonds, with each party fulfilling obligations to maintain relationship equilibrium. Similarly, transaction cost economics (Williamson, 2008) assumes that economic actors seek to minimise uncertainties through clearly defined contractual arrangements with comprehensive settlement terms. Even relational contract theory (Macneil, 1982), which recognises the importance of ongoing relationships beyond formal contracts, still assumes that exchanges ultimately seek balanced states of mutual obligation. Chinese *guanxi* networks operate according to a different logic. The core principle is not balanced reciprocity but rather the deliberate construction of ongoing interdependence through time-mismatched obligations. This fundamental difference extends beyond merely delaying reciprocation. It represents a qualitatively different approach to relationship formation and maintenance. Unlike Western reciprocity models where balanced exchanges signal healthy relationships, in Chinese business networks, complete settlement often signals relationship termination.

To conceptualise how this system operates, I propose a framework based on *guanxi* credit and *guanxi* debit that extends beyond traditional economic conceptions of debt. In conventional economic theory, debt represents a clearly defined financial obligation to be settled according to specified terms, with full settlement marking successful completion of the transaction. Nevertheless, the *guanxi* credit/debit system fundamentally differs in several ways:

1. It encompasses multi-dimensional value beyond monetary terms, including future access, preferential treatment, flexibility, reputation, and other intangible benefits.
2. It deliberately avoids precise quantification, maintaining strategic ambiguity about the exact value of obligations.
3. It operates across extended timeframes without definite settlement deadlines.
4. Most critically, it functions as a relationship maintenance mechanism where continued indebtedness preserves the relationship rather than threatening it.

Within this framework, the two mechanisms identified earlier create complementary forms of relational capital. Deliberate Profit Sacrifice represents lower-tier participants' strategic creation of *guanxi credit*, which investing economic capital to generate expectations of future preferential treatment. By accepting suboptimal economic terms, suppliers demonstrate commitment beyond transactional relationships, signalling their reliability as long-term partners. This establishes a claim on future opportunities that transcends formal contractual arrangements. Simultaneously, Strategic Payment Postponement represents higher-tier participants' generation of *guanxi debit*, strategic obligations that bind parties together across time scale. As one steel plant manager explained:

"In many cases, these routine delay payment terms are actually a good way to maintain *guanxi*. As I jokingly said, my suppliers may press me very hard for payment, but they still call me casually, saying things like: Do you have any funds to send over? We can't operate anymore without those funds. Then I respond accordingly. [...] But what do they fear most? Two things: first, I never pay them; second, I suddenly pay them everything at once. Essentially, if I never pay them, no one can advance that much money because everyone has financial pressures. But if I pay them all at once, they'll worry that they might be out of the game which means I might not cooperate with them anymore [...] Sometimes, we even joke that not paying you might actually be better protection for you. This idea that not paying you is good for you wouldn't exist abroad. You rarely hear of such a model, but in China, this is very normal. So, if I'm very proactive about paying you, it might not necessarily be a good thing." (C1, 07.09.2023)

This quote vividly illustrates how payment practices that would be considered problematic in Western business contexts are reconceptualised within Chinese networks as effective

relationship maintenance mechanisms. The interviewee explicitly acknowledges the paradoxical nature of this system that not being fully paid can be "better protection" than receiving complete payment. It highlights how radically this diverges from conventional economic thinking. This creates a fundamental paradox: the stability of the network depends on maintaining states of controlled imbalance between participants. This explains why both default (never paying) and immediate settlement (paying everything at once) are equally threatening to relationship continuity. This paradoxical dynamic manifests in how participants discuss their business relationships. As another logistics company manager noted:

"When we have completely settled all accounts with a supplier, it usually means we don't plan to work with them again. As long as we intend to continue cooperation, we always maintain some number of payables" (B8, 15.10.2023).

The value of relationships in this system lies in the potential for continued circulation rather than in accumulated stock (Bourdieu, 2011). The maintenance of *guanxi* requires this continued state of dynamic imbalance, which is a perpetual cycle of creating and managing obligations that are never fully settled. This establishes a bidirectional *guanxi* system, where lower-tier participants accept economic losses to accumulate *guanxi* credit (priority for future cooperation), while upper-tier participants release *guanxi* debit (obligations to be compensated) through extended payment terms.

The system of time-mismatched obligations addresses a fundamental challenge in economic organisation that transcends the Chinese context: how to manage relationships under conditions of "contractual incompleteness" (Grossman and Hart, 1986). All contracts, no matter how detailed, cannot anticipate every contingency or specify responses to all possible future states. This incompleteness creates particular challenges in industries, such as logistics industry, which service quality, reliability, and adaptation to changing circumstances are crucial but difficult to fully specify in contractual terms. Thus, the time-obligation forms the "tacit norms" in Chinese business environment. And this kind of "tacit norms" becomes one

of the essential elements of forming *guanxi*. The *guanxi* credit/debit system can thus be understood as an informal governance mechanism that has evolved to address these limitations of formal contracting. By creating ongoing interdependencies through deliberately imbalanced obligations, participants establish implicit guarantees of future cooperation that formal contracts cannot provide. This connects to broader institutional theories about how informal governance mechanisms evolve to complement formal institutions, particularly in transitional economies where formal institutional frameworks may be underdeveloped or rapidly evolving (North, 1990; Peng, 2003).

The *guanxi* credit/debit system represents a sophisticated solution to contractual incompleteness that embraces strategic ambiguity and managed imbalance rather than seeking comprehensive specification. This approach allows for greater flexibility in relationship management while simultaneously creating stronger bonds between participants than formal contracts alone could establish. By deliberately maintaining unresolved obligations, participants create adaptive mechanisms that can respond to unforeseen circumstances while preserving network dynamic continuity.

This analysis reveals that network dynamic stability in China's steel logistics industry depends not on achieving equilibrium but on maintaining carefully calibrated imbalances that create ongoing interdependencies. The *guanxi* credit/debit framework explains how profit sacrifice and payment postponement, which work together to address the fundamental challenge of contractual incompleteness. Rather than viewing delayed payments and accepted losses as market inefficiencies, this research demonstrates how they function as essential resources for network stability. It explains why stable cooperative relationships persist in highly competitive, homogenized environments where traditional transaction cost theories would predict constant supplier switching frequently.

6.5.3 Government-Enterprise Interactions Through the Hybrid Governance Lens

The strategic imbalance mechanisms identified in logistics networks is also involved in government-enterprise interactions. This demonstrates the broader applicability of the hybrid governance framework across different institutional contexts. When local governments implement industrial policies, enterprises could represent strategic *guanxi* building through deliberate economic sacrifice. This pattern follows the same non-equilibrium logic, where immediate costs are converted into long-term relational capital. This dynamic becomes evident when reconceptualising government's role within the network framework. As Nee et al. (2007) demonstrate, Chinese local governments function as active market participants rather than external regulators, creating supportive business environments to attract private capital and promote economic growth. Within this participatory role, the *guanxi* credit/debit mechanisms also operate between enterprises and government entities.

Taking Southwest steel enterprises' response to new energy vehicle policies as an example, it reveals how this government-enterprise *guanxi* establish operates in practice. Despite hydrogen energy lorries creating doubled operating costs compared to oil-fuelled vehicles, enterprises strategically choose to purchase them as a means of responding to government initiatives and establishing *guanxi* credit. This apparent contradiction between economic rationality and business practice reflects the strategic response to evolving environmental policies. Due to mounting environmental concerns, local governments have actively promoted new energy vehicle adoption through comprehensive policy frameworks. The Sichuan provincial government's approach exemplifies this trend, as outlined in their "Sichuan Province Carbon Peak Implementation Plan" (四川省碳达峰实施方案):

"[...] Accelerate the construction of a transportation powerhouse and implement green and low-carbon actions in transportation. Accelerate the construction of a modern comprehensive transportation system, form green and low-carbon transportation modes, ensure that carbon emissions in the transportation sector remain within a reasonable range, and strive to achieve carbon peaking as soon as possible. [...]"

Promote the low-carbon transformation of transportation tools and equipment. Actively expand the application of new energy and clean energy such as electricity, hydrogen

energy, natural gas, and advanced liquid biofuels in the transportation field. Vigorously promote new energy vehicles, gradually reduce the proportion of traditional fuel vehicles in new vehicle production, sales, and vehicle ownership, and promote the electrification replacement of urban public service and freight delivery vehicles." (The People's Government of Sichuan Province, 2023)

This policy framework creates clear expectations for steel enterprises to adopt new energy vehicles as part of their logistics operations, with implicit compliance requirements for continued favourable treatment in government policies. However, the practical implementation of these policies faces significant regional challenges that vary considerably across China's diverse geographic and economic landscape. The Sichuan-Chongqing region presents a particularly illustrative case of the tensions between policy objectives and operational realities. For steel logistics operations in the Sichuan-Chongqing region, located in mountainous areas with generally longer transportation distances, electric lorries cannot comprehensively cover charging stations. For hydrogen energy vehicles, the Sichuan-Chongqing region itself does not produce hydrogen, making the operating costs of hydrogen energy vehicles higher than conventional fuel vehicles. As one steel plant manager discussed:

"For places like our Southwest, especially in the mountains, resources are not concentrated. For example, if I want to use electric lorries from the mining area back to our factory, I need to layout 4-5 charging stations in between. But calculate how much volume would be needed to support four or five charging stations? [...] And hydrogen energy is the same, it's also a cost issue [...] In Chengdu, hydrogen is 65 yuan per litter, with a government subsidy of 20, leaving 45, but my comprehensive oil and gas costs would need to drop to 24-25 to break even with my fuel vehicles. This means that in the Southwest region, the cost of using hydrogen is twice as expensive as using fuel vehicles or electric vehicles, and energy consumption is also twice as high." (C1, 07.09.2023)

In this situation, from individual cost-benefit analysis perspective, the economic incentives for enterprises to adopt new energy vehicles are minimal. Nevertheless, empirical evidence reveals that numerous large enterprises in the Southwest region continue to procure new energy vehicles in response to government policy initiatives. Undeniably, by purchasing new energy vehicles, enterprises can obtain certain "energy conservation and emission reduction indicators." This is also one of the main reasons for steel plants to maintain the continuous operation of their steelmaking equipment. Although direct data cannot be obtained online, according to officially released policies, such as the "Several Measures for the Promotion and

Application of New Energy Medium and Heavy Commercial Vehicles in Sichuan Province (2024-2027)," (四川省新能源中重型商用车推广应用若干办法(2024-2027年)). It shows that:

"Combined with the management requirements of transportation vehicles in key industry enterprises, accelerate the promotion of new energy medium and heavy-duty lorries in industries such as thermal power, steel, coal, education and chemical, non-ferrous metals, cement, and logistics parks [...] Relevant vehicle-using enterprises may be included in the emergency white list management for heavily polluted weather according to procedures [...]" (Department of Economic and Information Technology of Sichuan Province, 2024)

While purchasing new energy vehicles enables enterprises to obtain certain preferential indicators for energy conservation and emission reduction, the economic calculus remains unfavourable. From an enterprise economic perspective, the policy benefits derived from these purchases are insufficient to offset, and even fall far short of compensating for the financial losses incurred through new energy vehicle procurement. Consequently, for enterprises that purchase new energy vehicles, the primary objective extends beyond immediate the policy preferences. Its emphasis on strategic *guanxi* establishment with government entities through deliberate profit sacrifice. This mirrors the bottom-up mechanism observed in commercial logistics networks, where economic losses are converted into relational capital. As one steel plant manager articulated:

"For places where hydrogen energy prices are relatively high, I can buy (new energy vehicles). But after buying them, I wouldn't dare use them for transportation. Because the extreme higher operation fees (comparing to oil-fuelled vehicles) [...] So, I would call it a political statement." (C2, 07.09.2023)

For steel plants, they also adapt the deliberate profit sacrifice as a strategic mechanism to invest in *guanxi credit* within their cooperation with the government. As he continued:

"So, if I buy these vehicles, I might theoretically cause a loss of 1 million yuan if I buy 100 of them. But in reality, the municipal government might issue a policy at any time. Even in the next land allocation, they might be more inclined to let us be designated steel

traders or something similar, which could have an effect far beyond these 1 million yuan. So, making a commitment is often a political-economic characteristic. Foreign countries are actually the same. Why sometimes when a president takes office, there are some finances supporting him behind the scenes? He has to provide some benefits after that, right?" (C2, 7.9.2023)

This case reveals the credit exchange rules of government-enterprise *guanxi*: for enterprises, accepting losses represents accumulating government *guanxi* credit (policy protection options). For the government, it means accumulating enterprise *guanxi* debit (future compliance obligations) by allowing inefficient investments. This interaction forms an implicit contract that both parties maintain relationship flexibility through delayed settlement, allowing economic efficiency to give way to the establishment of *guanxi*. This process of enterprises responding to policies to favour the government can be regarded as an effective means to establish *guanxi*-based imbalance. Thus, compared to the similar competitors in future government-related projects, they can establish a unique competitive advantage beyond a formal contract.

This government-enterprise dynamic demonstrates the broader applicability of the hybrid governance framework. It indicates how the same mechanisms of strategic imbalance creation, time-mismatched obligations, and *guanxi* credit/debit exchanges operate across different institutional contexts within Chinese business environments. By recognising government as an active network participant rather than an external regulator, the framework reveals how formal policy compliance and informal relationship building interact to produce distinctive governance outcomes. This extension validates the theoretical proposition that hybrid governance represents a fundamental characteristic of the Chinese economic context, transcending specific industry boundaries to shape broader patterns of institutional interaction.

Through the case study of new energy vehicle policies and enterprise responses, this government-enterprise dynamic demonstrates the broader applicability of the hybrid governance framework beyond commercial logistics networks. The same mechanisms of strategic imbalance creation, time-mismatched obligations, and *guanxi* credit/debit exchanges operate across different institutional contexts within Chinese business environments. By

reconceptualising government as an active network participant rather than an external regulator, the framework reveals how formal policy compliance and informal *guanxi*-based interact to produce distinctive governance outcomes. This extension validates the theoretical proposition that hybrid governance represents a fundamental characteristic of Chinese economic organization, transcending specific industry boundaries to shape broader patterns of institutional interaction. The government-enterprise case thus strengthens the argument that *guanxi*-based governance complements rather than competes with formal institutions, creating distinctive network dynamics that maintain network dynamic stability through strategic imbalance across multiple domains of Chinese economic life.

6.5.4 The Dynamic Equilibrium of the Hybrid Governance System

The mechanisms examined reveal that all those *guanxi*-based network dynamic operate according to a fundamental principle of mutual benefit which also serves as the essential foundation of *guanxi*. In economic activities, this mutual benefit manifests through the surface logic of financial transactions, while operating through deeper, informal and unwritten mechanisms. The unique advantage mutual benefit system lies in its dynamic adjustment capability, which includes two key mechanisms.

First is the risk hedging mechanism. Through the non-immediacy characteristic of *guanxi* obligations, actors adjust the form of returns according to scenarios. For example, through the economic losses under the current contract framework, lower-tier participants aim to obtain future cooperation opportunities or related policy compensations from upper-tier participants. Second is the power penetration mechanism. Upper-tier participants consolidate their position advantages by controlling the settlement structure. For example, through delayed payments, upper-tier participants make contractors more dependent on network relationships, or governments reinforce enterprise compliance through delayed policy dividends. This institutional design forms the mixed network governance characteristics of the Chinese market, where formal rules and *guanxi* networks together constitute a "dual track" transaction framework. When contracts cannot cover long-term uncertainties, the non-equilibrium dynamic system fills institutional gaps through continuous obligation cycles.

Therefore, *guanxi* strengthens business cooperation through time-delayed reciprocity, binding giving and receiving to ongoing transactions while deliberately separating them across time rather than settling them immediately. Specifically, in this fiercely competitive and highly homogenised industry environment, a key factor in maintaining competitiveness is maintaining good *guanxi* between participants, which forms a *guanxi* cycle in network dynamics. Within this cycle, maintenance strategies differ by network position: upper-tier participants provide continuous orders and cooperation opportunities while using delayed payments to indicate ongoing commitment, whereas lower-tier participants build *guanxi* through profit sacrifice and accept continuous losses to maintain strong ties with upper-tier enterprises' interests. This arrangement produces complementary benefits: upper-tier participants establish trustworthy logistics networks that maintain efficiency and safety at relatively economic cost, while lower-tier participants secure stable orders that support capital turnover, enable reputation building, and avoid fierce external competition. This dynamic ultimately creates the unique network dynamics characteristic of Chinese business environments.

6.6 Conclusion

This chapter addresses a fundamental theoretical puzzle in network governance: how do networks comprised of highly substitutable service providers maintain stability and coordination in increasingly competitive environments? Building upon the demonstrated limitations of transaction-based theoretical frameworks (Section 6.1). This chapter proposes that *guanxi* operates as a complementary governance mechanism built upon formal market structures, they jointly govern network dynamics. Building upon this institutional complementarity, the chapter theorises the temporal dynamics of *guanxi*'s significance, proposing a U-shaped curve of *guanxi* in Chinese business context (Section 6.2). Through empirical analysis of China's steel logistics networks, it then examines how network dynamic is established on the trajectory of both formal transactions and informal *guanxi*.

I conceptualise two key mechanisms—Deliberate Profit Sacrifice (Section 6.3) and Strategic Payment Postponement (Section 6.4)—that support the network dynamic between actors. These mechanisms encompass *guanxi* debts and credits that are accumulated, exchanged, and

strategically deployed throughout the network to constitute the foundation of network dynamics. Integrating these mechanisms, the chapter examines the operational logic of network dynamics, revealing that network stability operates through a dynamic model based on deliberate *guanxi* imbalances requiring continuous maintenance (Section 6.5). This analysis illuminates the nature of hybrid governance in Chinese business context, demonstrating how formal and informal institutions interact through specific operational mechanisms.

Four key insights from this analysis are worth emphasising. First, the analysis confirms that logistics network dynamics comprise both formal transactions and *guanxi* operating as complementary rather than alternative governance mechanisms. The mechanisms of Strategic Payment Postponement and Deliberate Profit Sacrifice both operate upon and alongside formal contractual arrangements. This hierarchical relationship, where formal transactions provide the foundation upon which *guanxi* is constructed, in return participants leverage *guanxi* to create strategic advantages.

Second, I propose the U-shaped trajectory of *guanxi*'s importance throughout market development, building upon the empirical foundations established in Chapters 4 and 5. In early industry phases characterised by incomplete markets and uneven resource distribution, *guanxi* served as a crucial mechanism for accessing scarce resources. During market developing phases, as quality, price, and efficiency emerged as differentiating factors, *guanxi*'s relative importance temporarily declined. However, as the industry evolved toward intensify competition with homogenised services and transparent pricing—particularly accelerated by digital freight platforms—*guanxi* re-emerges as a crucial differentiating factor precisely.

Third, network dynamics require continuous maintenance through deliberate imbalance creation, with *guanxi* sustained through strategic time-mismatched obligations. The empirical evidence reveals that participants deliberately avoid equilibrium states of *guanxi*, as immediate settlement would terminate the relational bonds that ensure future cooperation. Instead, they create dynamic imbalances to extend obligations across time: lower-tier

participants accept economic losses to accumulate *guanxi* credit, while upper-tier participants strategically postpone payments to maintain *guanxi* debit.

Fourth, the re-conceptualisation of government's role extends the theoretical framework beyond commercial networks to demonstrate its broader applicability across different institutional contexts. The framework positions local government as an active network participant that establishes *guanxi* with enterprises through similar mechanisms of strategic imbalance creation. The case study of new energy vehicle policies and enterprise responses reveals how government-enterprise interactions operate through the same *guanxi* credit/debit mechanisms observed in commercial networks. This extension validates the theoretical proposition that hybrid governance represents a fundamental characteristic of Chinese economic organisation, transcending specific industry boundaries to shape broader patterns of institutional interaction.

Furthermore, rather than viewing market development as a linear progression toward purely formal coordination, this analysis suggests that relationship-based mechanisms may become more sophisticated and strategically important as markets mature. Thus, this framework provides a foundation for examining how cultural institutions adapt to serve contemporary market functions while retaining their distinctive characteristics. It suggests that economic modernisation should not eliminate traditional governance mechanisms, but rather requires careful examination of how these institutional legacies generate persistent effects and shape contemporary network dynamics.

Chapter 7: Conclusion

China's logistics industry transformation provides an valuable research case: from the 1990s' "self-sufficient" internalised logistics structures under the planned economy system; through the early 2000s' transition to market economy with state-owned enterprise privatisation, as well as the rise of third-party logistics companies, and policy guidance that collectively triggered the outsourcing trend in the logistics industry; to the mid-2010s emergence of digital freight platforms that further reshaped logistics network configurations. Over the past thirty years, China's logistics industry has transformed from its original internalised logistics structure into today's multi-tiered outsourcing arrangements. However, research reflecting this transformation was fragmented. As a key industry supporting local supply chains and GPNs, there was a lack of comprehensive research exploring the evolutionary pathways of logistics industries. Therefore, this thesis aims to understand: *How do logistics networks evolve from internalised structures to multi-tiered outsourcing arrangements?*

Consequently, this thesis conducted theoretical framework design (Chapter 2), research case selection and methodology design (Chapter 3), and three empirical analysis chapters (Chapters 4, 5, and 6) to address this core question.

This chapter is structured as follows. Section 7.1 first integrates the three analytical chapters to review the complete evolutionary pathway of China's steel logistics networks, demonstrating how these three chapters collectively address the thesis's main research aim. Section 7.2 turns to the synthesised research framework to explore how the industrial network evolution framework constructed in this thesis can be applied more broadly in economic geography research. Based on research framework and empirical case analysis, Section 7.3 highlights two core theoretical contributions of this thesis. Finally, research limitations and potential future research directions are presented in Section 7.4.

7.1 Connecting the Analytical Chapters: The Evolutionary Pathway of China's Steel Logistics Networks

In the analytical chapters, for better presenting analysis based on specific analytical themes, this thesis deconstructed the entire evolutionary pathway from overall industrial landscape

evolution to the emergence of specific key industrial participants, and then to the analysis of industrial dynamics. From the network perspective, these analytical chapters form a complete cycle for industrial evolutionary pathway research. In this conclusion chapter, to better demonstrate how this thesis addresses the research aim, I review the entire steel logistics industry evolution process as a complete entirety.

In the late 1990s, under the original planned economy and *Danwei* system, steel logistics networks operated in completely internalised structures. This is characterised by steel plants directly purchasing transport vehicles and employing drivers, and these transport resources served exclusively specific steel plant operations. At that time, logistics efficiency and economic factors were not core assessment indicators. For the steel logistics sector, its priority was maintaining normal circulation of materials required for steel plant production and sales (Section 4.2). With China's rapid macroeconomic development in the early 2000s and the transition from planned to market economy, steel plants' rapid expansion led to increased logistics demand. Steel plant logistics networks attempted expansion and introducing external transport vehicles. However, due to limited market transport vehicle ownership at the time, expansion faced certain obstacles in this initial stages.

The rapid expansion of steel logistics was driven by two key policy categories. First, in the early 2000s, a package of financial deregulation policies was released, followed by the emergence of unofficial financial institutions, dramatically lowering the barriers to freight vehicle acquisition. The rapid increase of private freight vehicle ownership catalysed significant expansion within the logistics industry, driving accelerated sectoral development (Section 5.2.2). Second, as the increasingly stringent of national-level road transport safety regulations, the advantage of light-asset operational models gained prominence. These arrangements allowed manufacturing enterprises to minimise logistics investment costs and operational management burdens whilst shifting transport safety regulatory compliance from asset-heavy manufacturers to 3PL providers (Section 5.2.1). Therefore, while abundant market transport capacity provided enterprises with sufficient transportation resources, the combination of available external capacity and operational advantages of light-asset enable manufacturing companies to achieve greater transport efficiency compared to the previous internalised logistics structures. This convergence of market capacity abundance and

operational flexibility accelerated the shift from internalised to outsourcing arrangements in steel logistics sectors.

During this transformation process, three key logistics participants (intermediaries) emerged. As remnants of the original internalised logistics sectors, *steel logistics subsidiaries* inherit the functions of the original steel logistics departments, responsible for all logistics-related operations of steel plants. Compared to the original logistics departments, logistics subsidiaries possess independent legal entities, enabling certain risk isolation from their parent steel companies. *Third-party logistics companies* are responsible for providing transport capacities to steel logistics subsidiaries and coordinating related operations between steel logistics subsidiaries and actual carriers (lorry drivers and transportation fleets). The number of third-party logistics partnerships maintained by each steel logistics subsidiary varies according to the size of the steel plant, ranging from several to several dozen collaborative relationships. Then there are *fleets*. Fleets operate as informal intermediaries usually comprising several to dozens of transport vehicles, which coordinate through alliance methods to obtain better quality transport resources. Compared to individual transport vehicles, fleets can better coordinate internally and provide mutual assistance between lorry drivers (Section 5.3). This forms a pyramid structure of steel logistics networks under the outsourcing structure, with steel logistics subsidiaries at the top, third-party logistics companies in the middle tier, and actual carriers at the bottom, including lorry drivers and transport fleets (**Figure 4.3** Pyramid structure of logistics participants). Transport capacity management primarily relies on top-down transmission through the steel logistics pyramid structure (Section 5.3.2). Risk management first transfers from steel logistics subsidiaries to third-party logistics companies through outsourcing structures, then third-party logistics companies transfer to specific affiliated logistics companies through *Guakao* mechanisms, and finally affiliated logistics companies transfer to actual carriers based on specific clauses within *Guakao* mechanisms (Section 5.3.1). This formed the unique operational structure within China's logistics outsourcing networks.

Building upon this outsourcing framework, the informal information-matching system, which was originally known as the 'small blackboard' model, underwent significant transformation as it facilitated information connections between actual carriers and cargo owners. Due to

internet and related information technology development, and as government developed policy frameworks for this kind of information intermediary, the regulatory systems for capital, cargo, and workers' safety became more specified and formalised. Additionally, this internet-based operational model aligned with government macro tax reforms of replacing business tax with VAT in the logistics industry. This led to the emergence of formal digital freight platforms and their growing importance as intermediaries in the logistics industry (Section 5.4).

Under the VAT regulatory framework, logistics companies identified novel revenue opportunities through establishing collaborative arrangements with financial institutions to facilitate vehicle sales and subsequent affiliation agreements with designated logistics enterprises. This mechanism further relaxed constraints on logistics vehicle procurement, consequently inducing an additional growth cycle within the logistics sector and creating 'supply-demand imbalance' conditions within the sector (Section 5.5.1).

Furthermore, the development of digital freight platforms reduced information asymmetries, which intensified price competition, subsequently compressing the spaces of survival for actual carriers in the bottom tier of the network hierarchy. Additionally, the significant expansion of participant numbers in the logistics transport sector led to the increasing number of irregular transport operations. Therefore, traditional information matching mechanism through established *guanxi* gradually became the preferred choice for logistics participants, as they were deemed more reliable than digital freight platforms. Through this approach, actual carriers could avoid intensify competition from digital freight platforms in certain degrees. Furthermore, for all the logistics participants, this trust-based mechanism is also a more "secure" choice, capable of reducing uncertainties within logistics process whilst eliminating repetitive procedural introductions and other tedious procedures. Therefore, establishing "private capacity pools" for information matching became mainstream operational models in the logistics sector (Section 5.5.2). Nevertheless, digital freight platforms remained the most convenient channel for connecting tax information between natural persons and legal entities under the VAT regulatory framework. The logistics sector operational models became as such: logistics participants would conduct information matching through "private capacity pools", then processed tax invoices through digital freight platforms. The information

matching functions of digital freight platforms were weakened, gradually transforming them into tools for issuing transport invoices instead (Section 5.5.3).

This preference for *guanxi*-based information matching over digital platforms reflects a broader network dynamic in the logistics sector, especially in the currently homogenised, intensely competitive, and multi-tiered outsourcing business environment. It forms a *guanxi*-based network dynamic that runs parallel with transaction-based models. This network dynamic operates through two key mechanisms: top-down Strategic Payment Postponement and bottom-up Deliberate Profit Sacrifice. Through top-down Strategic Payment Postponement, upper-tier participants can obtain control over lower-tier participants beyond formal contracts, whilst this is also viewed as a way of signalling continued cooperation to lower-tier participants (Section 6.4). Through bottom-up Deliberate Profit Sacrifice, lower-tier participants attempt to distinguish themselves within intensely competitive commercial environments through short-term losses whilst signalling to upper-tier participants of their desire to establish stable long-term cooperative relationships (Section 6.3).

A key characteristic of the network dynamic formed by these two mechanisms is the requirement to maintain continuity, which comprises three interconnected elements: operational, financial, and *guanxi*-based continuity (Section 6.5.1). This continuity requires participants to deliberately maintain *guanxi* imbalances through Deliberate Profit Sacrifice and Strategic Payment Postponement. Because once the *guanxi* tend toward balance, there is a risk of breaking this continuity (Section 6.5.2). Moreover, these two mechanisms and network dynamics are similarly applied in enterprise-government cooperation processes (Section 6.5.3).

Therefore, these elements collectively constitute the evolutionary pathway of steel logistics networks from internalised structure to the current multi-tiered outsourcing structures and form the unique network dynamics of China's logistics industry, there by answering this thesis's main research question.

7.2 Applicability of the Synthesised Framework

Beyond addressing this thesis's main research questions, another contribution lies in designing a synthesised analytical framework for industrial evolutionary pathway analysis. In this section, I reflect on the broader applicability of the research framework applied in this thesis.

As discussed in Chapter 2. For the industry evolution research, whilst GPN and EEG possess complementary advantages, in which GPN provides network-based relational analysis and EEG offers dynamic evolutionary perspectives. Although the majority of studies mention the concept of "institutional context", these studies tend to treat institutions as background factors rather than analysing them as core analytical mechanisms. To address the limitations, this thesis incorporates institutional approach as a third analytical dimension, creating a synthesised framework. By adapting institutional approach as a research lens, it can systematically examine and understand actors' behavioural logics within specific temporal and spatial dimensions, and thereby explore co-evolutionary pathways between institutions and participants.

This research framework has been effectively applied throughout the thesis's empirical analysis chapters. For example, by providing institutional backgrounds for specific periods during China's economic development, Chapter 4 explained the formation and transformation processes of participants' embeddedness states. Particularly through detailed examination of the *Danwei* system under the planned economy, I conceptualised "Multi-Dimensional Over-Embeddedness" as a unique characteristic of Chinese SOEs during the planned economy period (Section 4.2). Based on this foundation, I explored the subsequent evolutionary process through which logistics industries transformed from this over-embedded state to an "optimal embeddedness" state during the transition to a market economy. Similarly, in Chapter 5, through this synthesised analytical framework, this thesis explored the mutual influence processes between institutional evolution and the formation of key participants. This is particularly evident in the transformation of digital freight platforms from the informal "small blackboard" model to formal information-matching intermediaries (Section 5.4), and subsequently, due to participants' informal behavioural strategies, their ultimate transformation into tax invoice issuance tools. Additionally, in Chapter 6's network dynamics

analysis, based on analysis of Chinese cultural institutional backgrounds, I proposed hybrid network dynamic that combine transactions-based formal institution with informal *guanxi*-based mechanism under Chinese business contexts, as well as the U-shaped developmental curve of *guanxi*'s importance alongside economic development and industrial evolution processes (Section 6.2.2). This evidence collectively demonstrates the feasibility of exploring industrial network evolutionary pathway analysis through this research framework and shows how institutional approaches could shed light on understanding participants' economic behavioural logic. Furthermore, in the practical application of this synthesised research framework has three specific contributions, as laid out below.

7.2.1 Incorporating Individual Participants and Role-Based Analysis

The first contribution of this research framework lies in incorporating individual participants into analytical frameworks and conducting analysis based on individual participants' specific roles. In the entire thesis structural design, one of the key questions is: how to provide a comprehensive regional industrial evolutionary pathway approach? Literature review indicates analysis that rely solely on incorporating "multi-dimensional participants", which include enterprises, government, or non-governmental organisations, is insufficient to satisfy the requirements of this thesis. The fundamental reason is that such analytical framework overlooks the role of individual participants within regional economic research. Especially in the labour-intensive industries, such as logistics networks, with large numbers of the bottom-tier workers (i.e., lorry drivers in logistics sector). As noted by Abdelnour et al. (2017), it is difficult to address agency and institutional issues without ultimately confronting how individuals connect with and work within organisations. Moreover, scholars emphasise that research on individuals cannot be placed within organisational frameworks, and organisations cannot be viewed as collections of individuals. These two types of participants should be viewed as different types of independent regional economic actors (ibid., 2017). Therefore, beyond organisational actors, it is essential to recognise individual participants as equally important drivers of regional economic development, and to identify them as independent economic actors whose roles and relationships fundamentally shape evolutionary pathways. Furthermore, the integration of individual participants into the analytical framework represents a key justification for adopting an institutional approach in this synthesised framework (Section 2.4.3).

However, this leads to another question: how do we examine individual participants' impacts, when incorporating individual participants within the research framework? Comparing to the organisational level analysis, which have fixed roles in regional economic development. Individual participants own relatively ambiguous roles. When incorporating individual participants, it is necessary not only to understand their various behaviours within specific organisations or industries; individual participants' social relationships, including living backgrounds, also have impacts on their subjective decision-making, thereby shaping their economic behaviours. Therefore, based on Sennett's (1977) perspective of adapting the method that focus on the "roles" that individuals assume within organisations, this thesis believes that an effective approach for incorporating individual participants into economic analytical frameworks is through analysing the roles that they assume within specific temporal and spatial configurations. Reviewing this thesis's research, this role-specific analytical approach effectively resolved the question of how to incorporate individual participants into analytical frameworks by adopting a dynamic approach that is attuned to temporal and geographical nuances of individual participants and their economic behaviour.

This individual role-based analytical approach is systematically applied throughout the empirical chapters of this thesis. Chapter 4's examination of T Steel's logistics department transformation exemplifies this methodology. During the initial transition phase from planned to market economy, individual participants strategically exploited their role ambiguity, by simultaneously functioning as external logistics operators and internal company employees, to secure preferential contracts through informal channels. This behaviour generated informal institutional arrangements that privileged established company networks over formal procurement processes (Section 4.3.2). Similarly, Chapter 6's analysis of *guanxi* demonstrates the centrality of individual-level roles in economic processes. Since *guanxi* is fundamentally constructed at the individual participant level rather than the organizational level, inter-firm cooperative relationships can be regarded as the extensions of personal *guanxi* which crosses organizational boundaries. As demonstrated in the empirical analysis, business cooperation prefers to collaborate with the partner who has 'pre-established relationship'. This network dynamic can be conceptualised as individual participants' social relationship and roles influencing their decision-making processes as corporate employees, particularly when

occupying managerial positions. In essence, the ambiguity between individuals' personal and professional roles significantly affects inter-firm cooperation, whereby *guanxi* established through individuals' social relationship roles becomes a critical factor enabling organisational-level collaboration in certain degrees. Therefore, incorporating individual participants into analytical frameworks and analysing them based on specific roles proves both necessary and effective. This approach provides a nuanced understanding of regional industrial economic development processes.

7.2.2 Dual-directional Analytical Perspectives

Incorporating both individual and organisational participants into analytical frameworks necessitates a more sophisticated methodological approach to examining regional economic transformation, which raises a second methodological consideration: the analytical perspective required for examining regional economic development. This research deliberately avoided adopting singular directional approaches, whether exclusively top-down or bottom-up orientations. Such unidirectional analytical structures prove insufficient for capturing the complex dynamics that characterise regional economic development processes. Instead, this thesis argues that comprehensive analysis of regional economic development necessitates the simultaneous employment of both top-down and bottom-up analytical perspectives, with particular attention to understanding how their dynamic interactions fundamentally shape regional economic trajectories.

This dual-directional analytical approach is systematically implemented throughout the empirical analysis. Chapter 6's examination of network dynamics provides the most explicit demonstration of this methodology, illustrating how top-down and bottom-up mechanisms interact to constitute the operational logic of logistics network dynamics. In addition, Chapter 5's investigation of participant formation pathways and Chapter 4's analysis of steel logistics network evolution both demonstrate how this dual-direction analysis operates with each other. The top-down forces, such as macroeconomic development trajectories and institutional frameworks, establish the structural parameters and formal regulations within logistics sector. Simultaneously, bottom-up dynamics emerge as participants engage in heterodox practices within these industries, generating upward influences. These bottom-up and top-down dynamics interact with each other that subsequently reshape institutional

environments, impacting both the industry evolutionary pathway and the emerging of key participants.

This empirical evidence demonstrates that regional economic development processes emerge from the complex interplay of dual-directional forces and reciprocal influences between different analytical levels. While acknowledging that such dual-directional analytical perspectives demand more comprehensive and detailed examination of diverse regional participants, which includes nuanced analysis of their economic behaviours, decision-making processes, and institutional interactions. This methodological approach yields significantly more robust analytical frameworks for understanding regional economic dynamics. Critically, this dual-directional perspective mitigates the theoretical limitations associated with "institutional determinism" that characterises unidirectional analytical approaches, thereby providing more balanced and comprehensive insights into the mechanisms driving regional economic development.

7.2.3 Emphasising Informality in Social Economy

Building upon the incorporation of individual participants and dual-directional analytical perspectives, a third methodological contribution of this synthesised framework lies in emphasising the role of informality within economic development processes. This research demonstrates that informal and formal institutions exist simultaneously and operate symbiotically to support regional economic development. Chapter 6's analysis of *guanxi* institutions exemplifies this dynamic most clearly, revealing how informal *guanxi*-based practices function alongside formal transaction mechanisms to constitute the complete operational logic of logistics networks.

The significance of informal institutions becomes particularly evident when analytical perspectives emphasize incorporating individual participants. Within the logistics sector, it is characterised by extensive informal institutional arrangements, including risk transfer mechanisms embedded within *Guakao* models, fleet operational structures, and participants strategically utilise their role ambiguity to secure preferential contracts through informal channels. The prevalence of such informal practices stems from the differential regulatory

environments faced by individual versus organisational participants. The prevalence of such informal practices reflects the asymmetric regulatory environments experienced by different participant types. Whereas organisational participants operate within comprehensive regulatory frameworks that mandate formal compliance, individual participants benefit from greater operational autonomy and reduced institutional oversight. This regulatory differential enables individual participants to realise lower transaction costs, reduced compliance risks, and minimal detection probability through strategic adoption of informal practices. Critically, these informal institutions frequently serve as catalysts for broader industrial transformation processes. For example, the evolution of digital freight platforms illustrates this dynamic effectively. This evolutionary trajectory demonstrates how informal practices can both precede and succeed formal institutional arrangements.

Formality and informality exist simultaneously and the boundaries between the two are blurred. Stepping outside the formal-informal binary framework, it demonstrates that both types of institutions operate according to socially constructed rules that govern economic behaviours and organisational practices. Therefore, for comprehensive economic analysis, it is necessary to include these informal impacts on regional economies and view them as regional development factors that are just as important as formal institutional regulations.

7.3 Core Theoretical Contributions

Finally, based on this thesis's synthesised research framework and empirical analysis of China's steel logistics networks, there are two theoretical contributions from the research process need to be emphasised.

7.3.1 Refined Definition of Embeddedness

The first theoretical contribution concerns refining the concept of embeddedness, which can be viewed as an extension of emphasising individual participants in this thesis's synthesised analytical framework. During the research process, I discovered that the original embeddedness concept appeared unable to explain the China logistics evolution. This phenomenon stems from two conceptual ambiguities. First, existing embeddedness research

concentrates on firms, primarily examining embeddedness from organisational perspectives whilst neglecting how individual participants' embeddedness influences broader economic environments. This analytical approach has the risks of overlooking the multiple roles that individual participants play in industrial economies, thereby reducing the explanatory power of embeddedness. Furthermore, it leads to blurred boundaries between different types of embeddedness. I contend that this conceptual blurring stems from analytical subject ambiguity, which causes unclear interactions between different embeddedness types, when researchers conflate individual and organisational participants. Therefore, building upon Hess's (2004) categorisation of embeddedness into societal, network, and territorial, this thesis further refined the three embeddedness types by distinguishing them into individual and organisational dimensions.

Based on Hess's (2004) metaphorical description of societal embeddedness as "genetic code," I argue that the analytical attention should focus on individual participants rather than organisations themselves. Individuals are embedded in society, whilst organisations' societal embeddedness is influenced by the "genetic code" carried by individual embeddedness within organisations. Thus, organizational decisions are made by leaders and key decision-makers, their collective "genetic code" shapes organisational strategic directions. Network embeddedness presents a different configuration. The entities participating in economic network construction are typically enterprises rather than individuals. As network embeddedness is directly related to economic activities, emphasising embeddedness formed by economic cooperative relationships between different participants. Therefore, for network embeddedness, it aligns more align with Hess's (2004) emphasised embeddedness concept, primarily focusing on organisational dimensions. It represents company behaviour in economic and non-economic, formal and informal, intra-organisational and inter-organisational relationships. For territorial embeddedness, it emphasises participants' spatial attributes, representing how (individuals/organisations) become anchored in specific locations. This embeddedness emerges through formal and informal interactions with physical space and its participants. For individuals, territorial embeddedness involves entanglement with local geographical environments, including personal property, family relationships, and social relationships in specific locations. For organisations, it includes fixed asset investments, relationships with local institutions, and connections with local economic ecosystems (Section 4.1).

Through these detailed and specific embeddedness definitions, Chapter 4 demonstrated how different participants' (organisational/individual) three types of embeddedness influenced industrial evolutionary pathways. One important insight is how organisations transform from multi-dimensional over-embedded states into optimal embeddedness states. Prior to 1997, under the *Danwei* system, societal, network, and territorial embeddedness intertwined together, mutually reinforcing organisational closure and rigidity, creating a highly stable but inflexible system. During initial market transition (1997-2004), this multi-dimensional over-embeddedness caused boundaries blurred between individual and organisational. Despite formal organisational changes, individual relationships continued to influence the formal organisational strategies. Due to individual participants' role ambiguity, which simultaneously serving as external logistics company participants and internal company employees, individuals could exploit their positions for personal interests. Therefore, in the third stage (2004-2008), T Steel undertook strategic reconfiguration by requiring participants to choose singular roles, which strategically separated different embeddedness types and severed direct influence pathways from individual societal embeddedness to organisational network embeddedness. This achieved an "optimal embeddedness" state.

By clarifying analytical subjects, this refined embeddedness framework offers systematically examination of how different embeddedness types interact during institutional transitions. In addition, it incorporates individual participants as independent economic agents whilst maintaining analytical clarity about how individual and organisational embeddedness interact. This approach provides more nuanced understanding of how embedded relationships operate at different scales, and how they evolve with institutional changes. Future research should systematically examine how this refined embeddedness framework applies across different industrial sectors and cultural contexts, particularly in understanding how individual and organisational embeddedness interact during rapid economic transformation periods.

7.3.2 Clarifying *Guanxi* Concept in China Business Context

The second theoretical contribution of this thesis lies in clarifying the concept of *guanxi* in contemporary Chinese business contexts and establishing its role as a core governance

mechanism. This contribution addresses a gap in existing literature: while *guanxi* is widely acknowledged as pervasive in Chinese business networks, theoretical understanding of how *guanxi* operates in modern market environments, particularly in highly competitive, homogenised industries, remains insufficient. For the concept of *guanxi*, three points merit emphasis.

First, *guanxi* operates as a competitive differentiation mechanism built upon formal transaction institutions. Rather than deliberately avoiding the importance of *guanxi* in business system operations or treating it as an unfair competitive mechanism, this research argues that the significance of *guanxi* needs to be properly recognised. As demonstrated in highly homogenised and intensely competitive business environments, relying solely on formal factors, such as price and service quality, are insufficient for participants to achieve competitive differentiation. Therefore, *guanxi* can be regarded as one of the key additional factors for industry participants to form competitive advantages on the basis of satisfying formal transactional institutional factors. Through this hybrid mechanism based on both formal transactions and *guanxi*, both customers and suppliers can maximise the stability of their business while ensuring their interests and reducing risks that market uncertainties might bring.

Second, *guanxi* serves as a critical factor in maintaining network dynamic stability through the principle of deliberate imbalance (Section 6.5.2). Participants need to maintain imbalance to preserve the continuity of *guanxi*. This imbalance is primarily manifested through the construction of formal transaction processes. To conceptualise how this *guanxi* imbalance operates, I propose a conceptual differentiation based on *guanxi* debit and *guanxi* credit. Specifically, as demonstrated in the two main mechanisms in network dynamics, top-down Strategic Payment Postponement represents upper-tier participants' attempts to establish *guanxi* debit by creating accounts payable to lower-tier participants, while bottom-up Deliberate Profit Sacrifice represents lower-tier participants' efforts to create *guanxi* credit through economic losses in hopes of gaining advantages in future cooperation with upper-tier participants. Crucially, participants do not pursue immediate redemption of these debits and credits, but rather ensure *guanxi* continuity by maintaining the persistent existence of unbalanced debit-credit relationships. Once these transactions tend toward balance, it

signifies the end of the relationship. Through this *guanxi* imbalance mechanism, participants can obtain multi-dimensional value that transcends monetary conditions, including future access, preferential treatment, flexibility, and reputation. By deliberately creating unbalanced obligations, they establish continuous interdependence. Furthermore, through this *guanxi* management approach, participants can maintain network stability while retaining the flexibility necessary to adapt to constantly changing market conditions.

Third, I propose the U-shaped curve of *guanxi*'s importance in Chinese business environments (Section 6.2.2). Under the planned economy system and early stages of market economy, due to uneven resource allocation, centralised control mechanisms, and limited market choices, *guanxi* exhibited high importance. As China's market economy gradually developed, market imbalance expansion led to differentiation among participants based on formal transaction factors, such as price, quality, and efficiency. Based on diversified market choices, participants could pursue profits through broader market competition rather than *guanxi*-based access. Therefore, during this stage, the importance of *guanxi* showed a gradually declining trend. However, as industries evolved toward intense competition characterised by service homogenisation, price convergence, and minimal differentiation opportunities, factors participants unable to obtain differentiated competitive advantages based on formal transaction frameworks. *Guanxi* re-emerged as a key mechanism for establishing competitive advantages. This U-shaped development trajectory indicates that as markets mature, *guanxi*-based governance mechanisms may become more sophisticated and strategically important.

The findings suggest that hybrid governance models combining formal institutions with *guanxi*-based coordination represents a distinctive and enduring characteristic of Chinese business practice. Through clarifying the concept of *guanxi* and its operational mechanisms, this research calls for greater attention to *guanxi*-based governance in broader Chinese business network and economic development studies.

7.4 Research Limitations and Future Directions

Although this thesis provides valuable insights into China's logistics network evolution and contributes to economic geography theory, several limitations should be acknowledged, which also point to promising directions for future research.

First, research domain limitations. This research particularly focuses on China's steel logistics networks. However, logistics include different sectors with fundamentally different operational logic, posing the significant limitations for broader applicability. Steel logistics is a traditional bulk commodity industry characterised by large transport volumes and relatively standardised transport requirements. These characteristics may not fully capture dynamics of rapidly developing logistics sectors increasingly defining modern supply chains. For example, e-commerce logistics emphasises speed, flexibility, and last-mile delivery optimisation, operating under completely different institutional pressures from bulk steel transport. Similarly, fresh produce cold-chain logistics require specialised infrastructure and regulatory compliance, creating unique network dynamics. Future research could systematically examine the feasibility of those findings represent in broader developmental trajectories or sector-specific phenomena, such as institutional co-evolution patterns, embeddedness transformations, and formal-informal hybridisations. Through such cross-logistics sector comparative research, the applicability of theoretical frameworks proposed in this research can be enhanced, revealing how different commodity characteristics shape network evolution patterns.

Second, cross-cultural conceptual extension. This research focuses on commercial characteristics within Chinese cultural contexts, particularly the network dynamic mechanism centred on the *guanxi* concept presented in Chapter 6. However, this thesis mainly emphasis on industrial evolution per se, it does not examine the extension of these *guanxi*-based concepts in broader cultural backgrounds. For example, this research identified network dynamics characterised by formal transaction-based parallel with informal *guanxi*-based practices, supported by two core mechanisms: deliberate profit sacrifice and strategic payment postponement. To what extent do these dynamics retain their applicability beyond Chinese cultural contexts? Or do other forms of *guanxi* mechanisms emerge in other cultural

contexts? Furthermore, reviewing the concept of societal embeddedness in Chapter 4 and the *guanxi* concept in Chapter 6, I believe these two concepts are very closely aligned. Their core concepts both encompass the role of specific interpersonal relationships in regional economic development, as well as notions of mutual influence and continuity. However, to what extent these two concepts are transferable was not incorporated into this research scope. Therefore, future research could conduct more systematic cross-cultural comparative analysis to understand how relationship-based commercial practices operate within different institutional and cultural environments. This requires more detailed examination combined with specific cultural backgrounds to fully understand the similarities and differences between these cultural variations and comparable concepts. This includes not only applying Chinese concepts to other contexts but also developing more culturally sensitive analytical frameworks that capture similar phenomena across different backgrounds whilst respecting local institutional logic.

Finally, the examination of critical junctures during evolutionary processes. This research provided a comprehensive review of China's logistics industry evolutionary pathways over nearly 30 years and summarised main developmental trends. However, it has the risk of overlooking counter-trend impacts caused by some milestone events that have happened more recently, thus neglecting some evolutionary process details. For example, given the timeline of research for this thesis, there is no substantive data collected regarding the impact of COVID-19 on logistics industry supply chain disruptions and related network vulnerabilities. This thesis did not refer to the impact of COVID-19 on logistics network development, especially the interruptions to offline contact and communication. These disruptions to offline transaction model interruption might accelerate digitalisation trends, change formal-informal institutional balances, or create new embedded configurations that significantly differ from historical patterns. Therefore, future research could conduct more in-depth analysis of specific temporal impacts within specific temporal-scales to verify broader applicability of network dynamics and specific evolutionary pathway exploration proposed in this thesis.

Despite these limitations, this thesis provides insight into how logistics networks evolve in the regional development process, revealing the critical role of institutional co-evolution and hybrid formal-informal arrangements in shaping industrial transformation. The synthesised

analytical framework developed here, which integrates EEG, GPN, and institutional approaches, provides a valuable tool for examining regional industrial change that extends beyond China's logistics sector. By demonstrating how individual participants, cultural practices like *guanxi*, and multi-layer institutional pressures jointly drive network evolution, this thesis offers important insights for policymakers, industry participants, and researchers grappling with economic transformation in other cultural contexts. These findings illuminate not merely how industry evolved, but also how the complex interplay between formal institutions and informal practices shapes the fundamental architecture of economic development in rapidly changing societies. Future research building on this foundation promises to deepen the understanding of how industrial networks adapt, survive, and thrive amid the institutional shifts that define the modern global economy.

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