

**Regional Disparities and Innovation:  
Conditions for Innovation Capacity Building in China's 'West'**

**Von der Naturwissenschaftlichen Fakultät der  
Gottfried Wilhelm Leibniz Universität Hannover  
zur Erlangung des Grades  
Doktorin der Naturwissenschaften  
Dr. rer. nat.**

**genehmigte Dissertation  
von  
Anna-Barbara Heindl, M.Sc.  
2020**

Referent: Prof. Dr. rer. nat. Ingo Liefner

Korreferent: Prof. Dr. phil. Tobias ten Brink

Tag der Promotion: 08.06.2020

# ABSTRACT

China's leaders have called for a transformation of the Chinese economic system into a knowledge-based economy. To increase total factor productivity for avoiding the middle-income trap subsequent to China's tremendous growth in the last decades, the national government urges its local authorities to build innovation capacities throughout the country. More than that, the national government aims at transforming its innovation model characterised by state-control into an open innovation system, mobilising a multitude of private actors to engage in innovation independently and thus, efficiently. At the same time, China is characterised by huge regional disparities, so that (pre-)conditions for innovation capacity building differ strongly between its regions; it is far from clear how particularly China's lagging regions will (be able to) answer China's leaders' call for making innovation the primary productive force of the national economy. To understand the interdependencies between innovation and regional disparities in China, this dissertation analyses conditions for and processes of local innovation capacity building, policy-making and –implementation in China. By comparing lagging 'Western' regions and advanced 'Eastern' regions, it works out that, first, for understanding regional innovation capacity building and its dynamics in China, it is necessary to extend concepts of regional innovation system research. As this research finds that despite the call for less government intervention, government control remains particularly high in lagging regions, innovation system concepts have to provide for a possibility to critically analyse the (changing) role(s) of the state in China's economy. Second, it further shows that the inclusion of private actors into local innovation capacity building is strongly dependent on local resource endowment, which decisively shapes incentives. Innovation capacity building competes with a range of other, nationally conditioned incentives – such as fast, but not necessarily sustainable growth. The intended shift from the old state-controlled innovation model towards the independent, open regional innovation system is thus hampered by China's political system-inherent incentives, especially in China's lagging regions.

**Keywords:** China; regional disparities; regional innovation systems; innovation policies

# ZUSAMMENFASSUNG

Chinas Staatsführung hat eine Transformation seiner Wirtschaft in eine wissensbasierte Ökonomie ausgerufen. Chinas beachtliches Wachstum in den letzten Jahrzehnten macht es erforderlich, die totale Faktorproduktivität zu erhöhen und damit die „Falle der mittleren Einkommen“ zu umgehen; deshalb fordert die nationale Regierung ihre lokalen Vertretungen auf, landesweit Innovationskapazitäten aufzubauen. Darüber hinaus strebt die Nationalregierung, ihr bisher von Staatskontrolle charakterisiertes Innovationsmodell in ein offenes, regierungsunabhängiges System umzubauen, das die Potentiale einer Vielzahl privater Akteurinnen und Akteure im Innovationsprozess effizient nutzen kann. Gleichzeitig ist China von großen regionalen Disparitäten geprägt, sodass Voraussetzungen und Bedingungen für Innovationskapazitätsaufbau sich stark zwischen den Regionen unterscheiden; es ist deshalb unklar, wie insbesondere Chinas weniger entwickelte Regionen dem Aufruf von Chinas Führung nachkommen können und wird, Innovation als die wesentliche produktive Kraft der Chinesischen Wirtschaft zu etablieren. Um die Interdependenzen zwischen Innovation und regionalen Disparitäten in China zu verstehen, analysiert diese Dissertation die Bedingungen für und Prozesse lokalen Innovationskapazitätsaufbaus, Innovations-Policy-Makings und der -Implementation in China. Indem weniger entwickelte Regionen im „Westen“ Chinas mit stärker entwickelten „Ost“-Regionen verglichen werden, arbeitet die Dissertation heraus, dass erstens, für das Verständnis regionalen Innovationskapazitätsaufbaus und seine Dynamiken in China es nötig ist, die Konzepte regionaler Innovationssystemforschung zu erweitern. Diese Forschung zeigt, dass trotz des Rufes nach weniger Regierungsintervention die Regierungskontrolle in Innovationssystemen besonders in weniger entwickelten Regionen hoch bleibt. Deshalb müssen Innovationssystem-Konzepte insbesondere die Möglichkeit bereitstellen, die (sich wandelenden) Rolle(n) des Chinesischen Staates in Chinas Wirtschaft kritisch zu analysieren. Zweitens zeigt die Forschung, dass der Einbezug privater Akteurinnen und Akteure in den lokalen Innovationskapazitätsaufbau stark von der lokalen Ressourcenausstattung abhängt, die wiederum entscheidend Anreize für lokales Policy-Making schafft. Innovationskapazitätsaufbau tritt somit in Wettbewerb mit einer Reihe anderer, national bedingter Anreize – solche wie schnelles, jedoch nicht notwendigerweise nachhaltiges Wachstum. Die beabsichtigte Änderung von staatlich kontrolliertem Innovationsmodell hin zu unabhängigen, offenen regionalen Innovationssystemen wird daher von Anreizen, die dem

autoritären politischen System entstammen, behindert, insbesondere in Chinas weniger entwickelten Regionen.

**Schlagworte:** China; regionale Disparitäten; regionale Innovationssysteme; Innovations-Policies

## ACKNOWLEDGEMENTS

*“Dass Forschung eine Gemeinschaftsproduktion ist, widerspricht fundamental der immer noch vorherrschenden ‘Initiationsritus’-Kultur von wissenschaftlichen Qualifizierungsarbeiten. Diese müssen als genau jener einsame Kampf inszeniert werden, der sie keinesfalls sein können”*  
– Kruse et al. 2012, 37.

*“That research is a co-production fundamentally contradicts the still prevalent ‘initiation rite’ culture of scientific dissertations. These must be staged as exactly this lonely fight that they can actually never be”* – translated from Kruse et al. 2012, 37.

To help overcoming the need to stage dissertations as lonely fights, I would like to name and thank here a multitude of people who have contributed to this dissertation in various ways. First of all, I would like to thank my research team, which put a lot of effort into collecting data across China with me. Su Can, Gao Minyu, Dr. Zou Lin, Mi Zefeng, Dr. Zhu Yiwen and Professor Zeng Gang from East China Normal University, Shanghai, and Dr. Henning Kroll from ISI Fraunhofer, Karlsruhe, prepared field access for me, and greatly supported data collection by participating in and translating during the interviews. At Leibniz University Hannover I received great support from my colleagues Sebastian Losacker, Tatjana Bennat, Dr. Leonie Tuitjer, Elena Hubner, Johannes von Bloh, and Professor Ingo Liefner through their input into my research work in progress. No less valuably, all research fellows from the Institute of Economic and Cultural Geography contributed greatly through critical discussions in our institute’s brown bag lunches, PhD student discussion sessions, and coffee breaks. A further special thanks goes to Stephan Pohl who authored all the maps in this dissertation. I would further like to express my gratitude to my student assistants Kaiwen Florian Schneider and Li Boshu who made up for my Chinese language deficits in policy research, Chinese literature review and interview data translation. Maybe most importantly, however, I thank my colleague and dear friend Chris Teichert for his unmet moral support and loyalty during my time at the Institute of Economic and Cultural Geography.

# TABLE OF CONTENTS

ABSTRACT.....	i
ZUSAMMENFASSUNG.....	ii
ACKNOWLEDGEMENTS.....	iv
TABLE OF CONTENTS.....	v
LIST OF FIGURES.....	vii
LIST OF TABLES.....	viii
CHAPTER 1.....	1
1.1 Motivation.....	1
1.2 Theory and research gaps.....	3
1.3 The study.....	7
1.3.1 Study areas.....	8
1.3.2 Methods and data.....	11
1.4 Overview.....	14
CHAPTER 2.....	16
CHAPTER 3.....	17
3.1 Introduction.....	18
3.2 Regional innovation system research in China.....	19
3.3 Data and methodology.....	22
3.3.1 Sample.....	24
3.3.2 Analytical framework.....	25
3.3.3 Approach to analysis.....	26
3.4 Results.....	26
3.4.1 Regional innovation system 1.....	27
3.4.2 Regional innovation system 2.....	28
3.4.3 Obstacles to RIS integration.....	30
3.5 Discussion.....	31
3.6 Conclusion.....	33
CHAPTER 4.....	35
4.1 Introduction.....	36
4.2 China's Innovation Strategy Development.....	38
4.3 Policy and Innovation Research on China.....	40
4.4 Data and Methodology.....	42
4.4.1 Method of Analysis.....	43
4.4.2 Sample.....	44
4.5 Results.....	45
4.5.1 Innovation Policies.....	45

4.5.2	Qualitative Content Analysis .....	46
4.6	Case Comparison .....	57
4.7	Conclusion .....	59
CHAPTER 5	.....	62
5.1	Introduction .....	63
5.2	Regional development, regional innovation and discourses in China.....	64
5.3	Method of analysis and data .....	66
5.3.1	Research areas .....	66
5.3.2	Sample .....	69
5.3.3	Articulation analysis.....	70
5.4	Results .....	71
5.4.1	Yunnan .....	72
5.4.2	Chongqing .....	75
5.5	Case comparison.....	78
5.6	Conclusion .....	80
CHAPTER 6	.....	81
6.1	Summary.....	81
6.2	Main findings.....	83
6.3	Limitations and future research .....	86
BIBLIOGRAPHY	.....	88
APPENDIX	.....	103



## LIST OF FIGURES

Figure 1: Study areas according to the discursive division of the ‘West’ .....	8
Figure 2: GDP per Capita 1990-2017 of the four study areas.....	9
Figure 3: The four study areas according to their localisation in the 'West' and the 'East'. ....	11
Figure 4: Methodological approaches in the articles .....	11
Figure 5: Chongqing located in ‘Western’ China along the Yangtze River .....	23
Figure 6: Exploration-exploitation approach acc. to March 1991. Own elaboration.....	25
Figure 7: Results: Regional innovation systems in Chongqing. Own elaboration.....	27
Figure 8: Obstacles to RIS integration. ....	30
Figure 9: Research areas in the 'West' and the 'East' of China as defined by 'Go West'. ....	42
Figure 10: Chongqing and Yunnan in the ‘West’ of China as in WDS.....	67
Figure 11: Argumentation pattern on the context of innovation and regional development in Yunnan. ....	75
Figure 12: Argumentation pattern on the context of innovation and regional development in Chongqing. ....	78

## LIST OF TABLES

Table 1: Overview of dissertation articles.....	15
Table 2: Research case characteristics. Sources.....	24
Table 3: Knowledge typology generated from empirical data. ....	26
Table 4: Characteristics of innovation guidelines .....	39
Table 5: Regional innovation resources. ....	43
Table 6: Sample structure and interview labels. ....	45
Table 7: Policy content analysis.....	46
Table 8: Significance of old and new strategy elements per region.....	58
Table 9: Quality of innovation resources in Chongqing and Yunnan.....	68
Table 10: Sample structure.....	69
Table 11: Narrative patterns and their link to global discourses.....	79

# CHAPTER 1

## Introduction

### 1.1 Motivation

Departing from Schumpeter's 'theory of economic development' (Schumpeter 1934) at the beginning of the 20<sup>th</sup> century, economic sciences nowadays widely acknowledge innovation as an important driver of economic development: New combinations of existing knowledge are temporarily exclusive to their creators, increasing returns on inputs, and thus provide for competitive advantage. The re-combination of knowledge, however, requires certain resources and capabilities, such as – in the traditional conception of innovation – science and technology and skilled workforce, which are foremost available in advanced economies. Innovation is consequently considered the backbone of developed economies in particular (cf. Lazonick et al. 2016; Liefner and Wei 2014b).

Emerging economies, in contrast, have long been providing low value-added goods and services to the global value chain. However, in the course of economic development, emerging economies' low value-added activities are increasingly challenged by less developed countries, which are able to offer lower production costs. To avoid the middle-income trap, emerging economies thus invest into the construction of innovation capacities to increase their added value in production and catch up with developed economies (cf. Hu et al. 2018, 15). The People's Republic of China is a remarkable case in this regard: more than 'catching-up', the state's leaders aim at establishing China as a globally leading innovation nation in the close future (Lazonick et al. 2016, 2). Therein, China's authoritarian political system (Heilmann 2008) provides the state with a central role for directing this innovation capacity building process.

Research on China's catch-up has highlighted how external factors decisively support innovation capacity building, such as access to global production networks and the absorption of technology from advanced economies (cf. Zhou and Liu 2016; Liefner et al. 2013; Fu 2008; Chen 2007; Liefner and Zeng 2008; Liefner 2006). Reinforced by the financial crisis, however, China's national government has renewed its call for building endogenous innovation capacities to sustain economic development in the era of the 'Chinese New Normal'; domestic science and technology (S&T) is set to become 'the primary productive force' (Hu et al. 2018, 22) of China's economy. The renewed strategy for endogenous innovation capacity building further

aims to transform China's hitherto largely state-controlled innovation model into an open innovation system (Chen and Guan 2012, 14): such an open system shall make use of and mobilise a multitude of private actors to engage independently in innovation (cf. Liu et al. 2017; Zhou and Liu 2016). Reports on China's progress in transforming into a knowledge-based economy indeed acknowledge the success in increasing investments in infrastructure, domestic R&D and in filing patents (Lee 2016a) – these assessments are, however, usually restricted to input and output indicators, while it remains unclear how they are related (cf. Lee 2016b; Kroll and Frietsch 2014, 41). Research thus does not yet sufficiently explain *how* these processes of transformation take place (ibid). Therefore, China's efforts to achieve a top rank among the 'innovative nations' in the near future (Lazonick et al. 2016, 2) are indeed difficult to judge. To date, case studies on China's endogenous efforts of innovation capacity building still lack a profound theoretical implication. Yet, understanding China's progress in developing 'indigenous innovation' (*zizhu chuangxin*, Cao et al. 2006, 40) capacities is of crucial concern for a globalised world; China increasingly integrates into the global economy, causing complex global economic interdependencies (cf. ibid).

Furthermore, the progress in establishing domestic innovation capabilities is strongly concentrated in China's advanced regions along the East coast (Huggins et al. 2014). Regional disparities are huge, amounting to a GINI coefficient of over 40 in 2015 (Zhuang and Li 2016); consequently, the effort to construct domestic innovation capacities meets highly diverse regional conditions (Kroll 2016; Liefner and Wei 2014b). Research on innovation is likewise mainly concentrated on 'best practice' cases in China's 'frontier regions' (Huggins et al. 2014). It thus remains unclear, how regional disparities affect China's efforts to construct a *national* innovation-based economy (Liefner and Wei 2014b, 2). To understand these interdependencies, is, however, crucial: it is far from clear that local innovation development indeed positively affects an overall local economic development (Shearmur 2016); therefore, the Chinese government's efforts to provide 'common prosperity for all regions' (Yu 2018, 185), and to establish a knowledge economy, do not necessarily go hand in hand; it might thus be well possible that both endeavours cause contradicting incentives for China's local development strategies. Understanding innovation (capacity building) in China from a regional perspective is hence crucial to critically assess the feasibility of the national government's aim to become a leading innovation nation by the mid-21<sup>st</sup> century (Lazonick et al. 2016).

This dissertation hence focuses on the context of regional disparities and innovation capacity building in China. More detailed, it analyses conditions for and processes of local innovation

capacity building, policy-making and –implementation in China’s less developed ‘West’: the comparison of Chongqing and Yunnan as ‘Western’ regions and Beijing and Shanghai as China’s leading economies on the East coast aims at working out, which political, social and economic conditions explain innovation capacity building and regional innovation processes in the context of regional disparities.

## **1.2 Theory and research gaps**

This dissertation is embedded in the field of economic geography and draws more closely on the topics discussed in the geography of innovation literature (Feldman 1994). The geography of innovation departs from Schumpeter’s idea of innovation being central to economic development. In 1985, Lundvall established the term ‘systems of innovation’ to describe a new notion of innovation processes; since the hitherto established neoclassical approach to innovation in the economy could not sufficiently explain its occurrence or absence via equilibrium models, he argued that innovation must be understood as emergent of complex organisational processes. Drawing on institutionalism, Lundvall developed the notion of innovation systems organising these complex processes driven by a multitude of different actors recombining knowledge in a non-linear way (Kline and Rosenberg 2010) [1986]; Nelson and Winter 1977; Dosi 1988). His work thus established the institutional system framework and its governance as explanatory for the occurrence and absence of innovative activities. At about the same time, Freeman 1987 introduced the term of ‘National Innovation Systems’ (NIS) to emphasise the role of national institutions in the innovation system framework. Etzkowitz and Leydesdorff 1995 further established the widely accepted notion that particularly the interaction between universities and industries governed by official bodies constitutes a ‘Triple Helix’ for successful (high-tech) innovation.

The observation that the distribution of innovation activities does not only differ between, but also within countries, urged scholars to establish a regional innovation systems (RIS) perspective (Cooke 1992; Cooke and Morgan 1998). This RIS perspective explains the emergence of innovation via the exchange and re-combination of knowledge in a spatially confined area, drawing on the advantage of geographical proximity for actors to cooperate. The governance of this cooperation through regional institutions was further seen as decisive for successful innovation. The focus on regional institutions has subsequently rendered the RIS perspective interesting for regional development authorities: the concept emphasised regional governance in particular, so that researchers and policy-makers since draw on ‘best practice’ cases to design regional innovation policies accordingly (Bathelt and Henn 2017, 457-458). At

the same time, the fields of geography of innovation and innovation studies (Martin 2012) draw on RIS as an analytical tool to understand and compare regional conditions of innovation activities.

Insights leading to the NIS and RIS concepts, however, are based on the research of ‘best practice’ cases – Freeman examined the successful development of Japan’s NIS in 1987, while Cooke (1992) and Cooke and Morgan (1994, 1998) observed innovative activities in Baden-Württemberg, Germany, and Japan and France to explain the emergence of innovation through regional institutions. Furthermore, research on systems of innovation has mainly focused on technological innovations (Martin 2016, 434) in developed economies (Moulaert and Sekia 2003, 291). Both the NIS and the RIS concept are consequently restricted to similar cases – that is, regions in developed, capitalist market economies, successfully producing technological innovations. RIS must consequently be considered as *ex ante* structures in cases deviating from ‘best practice’ cases (Padilla-Pérez et al. 2009, 143). To which extent these concepts are thus capable of explaining geographical innovation patterns in developing, non-‘Western’ regions, is at least questionable (Liu and White 2001; Liefner 2014). Studies, which dedicate to analysing contexts deviating from ‘best practice’ ‘Western’ cases usually build on these analytical RIS frameworks ‘recalibrated’ for developing countries (Crescenzi and Rodríguez-Pose 2012, 51). Such a framework presupposes quite general conditions and does not take country specificities into account; these, however, might even have a stronger explanatory value than system functionalities derived from ‘best practice’ cases.

The observation of innovation activities in less developed countries and regions has further led to sharpening the concept of innovation: frugal innovations (Zeschky et al. 2011), low-tech innovations (Hirsch-Kreinsen 2008), or good-enough innovations (Gadiesh et al. 2007) suggest that innovations are not restricted to the field of (high-)technology only. ‘Other’ types of innovation involving different actors and processes in their production (Jensen et al. 2007; Warnke et al. 2016) might be equally market relevant and thus, relevant for economic development. In China, particularly the ‘Shanzhai’-phenomenon in the Pearl River Delta has demonstrated, how frugal innovations contribute to regional economic growth (Dong and Flowers 2016; Keane and Zhao 2012; Zhu and Shi 2010). Dong and Flowers 2016 further show how Shanzhai-innovations follow different innovation system functionalities than S&T-innovations. (High-)technology can thus not be considered as a necessary precondition to, nor result of innovation.

The RIS literature in China, however, hardly takes these ‘other’ types of innovation into account. This might be the case, because their relevance is hard to assess with indicator-based research (Martin 2016, 434; Bennat and Sternberg 2020). Still, Simula et al. (2015, 1567) hold that frugal innovations constitute the prevalent type of innovation in China. To understand regional innovation and development in China better, it is thus necessary to extend the RIS perspective to other types of innovation. The consideration of non-S&T innovations allows for a more comprehensive view on innovation and regional development in China. Particularly regions, where S&T resources are less abundant thus get back into focus of the geography of innovation: it re-opens the debate on which conditions explain the emergence of innovation, and how different innovation types are interdependent with regional development. This is particularly relevant, since we still lack a profound understanding of how regional development and innovation condition each other (Shearmur 2016; Doloreux and Porto Gomez 2017). China constitutes a particularly suitable case to research the interdependencies of innovation and regional development for three major reasons:

***(1) China is characterised by huge regional disparities.***

The literature considers the East of China – that is mainly the Bohai region around Beijing and Tianjin, the Yangtze River Delta including Shanghai, and the Pearl River Delta around Guangdong province – as strongly emerging regions, which have already developed innovation capacities close to that of developed countries (Huggins et al. 2014). Contrastingly, regardless of its exact geographical location, China’s ‘West’ is considered a ‘developmental’ zone, lagging behind the successful ‘East’ in terms of socio-economic development (Yeh and Wharton 2016). While the coastal provinces had early profited from the ‘get rich first’ policy from 1978, the development of the ‘West’ was only refocused in 1999 in an attempt to level strongly grown regional disparities (‘Go West’-Strategy 1999, Guo 2017); Plan for the Rise of the Central Region (2002); Revitalization Plan for the North-Eastern Region (2003, Yu 2018). ‘Western’ regions thus exhibit quite different preconditions with regard to economic and innovation resources and institutions. A comparison of less developed with advanced regions within the same national innovation system context consequently allows to differentiate between regional and national system conditions for innovation. In return, a more detailed knowledge on regional conditions allows for a refined understanding of China’s national innovation system and how it affects different regions, actors and processes.

*(2) China faces a ‘new normal’ subsequent to the financial crisis.*

The Chinese government wants to increase the total factor productivity of its economic system by transforming into a knowledge economy. The drop in growth rates subsequent to the financial crisis made the Chinese national government re-emphasise the need to construct ‘indigenous innovation’ capacities to upgrade from labour intensive to more sustainable knowledge intensive industries. In this upgrading process, China’s national government strongly emphasises the role of science and technology for economic upgrading (cf. Crescenzi and Rodríguez-Pose 2012). In China’s political system, the national government develops guiding principles for the whole country, which every local government has to comply with (Zhong 2003, 130 ff.). Even the least developed regions in China have to adapt national policies on innovation capacity building, regardless of their economic and institutional preconditions. The case of China thus currently exhibits a particular dynamic with regard to innovation capacity building. This provides a good opportunity to observe innovation dynamics and conditions and a chance to assess China’s efforts to build an encompassing knowledge economy in a regionally diversified perspective.

*(3) China’s political and societal system differs strongly from ‘Western’ countries’ systems.*

China’s authoritarian political and economic system is characterised in large parts by state intervention rather than liberal market principles, while the decision making power is strongly concentrated with the national government (Zhong 2003). At the same time, decentralisation of administration causes heavy interregional competition (Guo 2017, 316), so that local authorities often follow particular agendas, challenging the local coordination of national policies and strategies (cf. Li and Wu 2013; Liu et al. 2017). In general, China’s political system largely lacks formal institutionalisation (Breznitz and Murphree 2011, 11), causing not only economic, but also institutional disparities throughout the country. Private actors in the economy are often marginalised (Alqahtani 2016). Consequently, regional innovation governance in China is likely to follow quite different logics than regions in ‘Western’ economies.

It is thus necessary to reconsider conditions and functionalities of regional innovation in China as a case strongly deviating from ‘Western’ cases: research on conditions for regional innovation in China helps to critically revisit the explanatory value of established concepts: the ‘most different case’ of less developed regions in China may lead to a dismissal or extension and thus the re-examination of the range of validity of ‘Western’ concepts in the geography of innovation literature. Such a critical probing is vital for the development of any scientific field



(cf. Barnes et al. 2007). In order to critically treat instead of adopting ‘Western’ concepts, it is important to apply methods, which provide the opportunity to question those (see chapter 1.3.2). Therefore, this dissertation draws on qualitative and interpretive methods to address the question, which conditions explain regional innovation in China, particularly in China’s ‘West’?

To examine these political, societal and economic conditions of innovation from a regional perspective, this dissertation thus analyses processes of local innovation (capacity building), policy-making and –implementation in Chinese regions. To further elaborate on the interdependencies of innovation and regional disparities in China, it compares regions in the ‘West’ (Chongqing and Yunnan), and in the ‘East’ (Shanghai and Beijing). Composed of four articles, this cumulative dissertation approaches to answer the general research question by addressing the following more detailed research questions:

- How to systematically compare regional innovation system qualities across China?
- How can regional innovation systems in China’s less developed regions be conceptualised, and what are their specificities in driving regional innovation processes?
- Which local and national conditions are relevant for local innovation policy-making and –implementation?
- Which knowledge reservoirs do policy-consultants and –makers draw upon to negotiate innovation with regional development in China’s ‘West’?

### **1.3 The study**

To explore conditions explaining regional innovation in China, and particularly, in China’s ‘West’, this dissertation applies a comparative research design. The division of China into ‘West’ and ‘East’ is not based on the country’s geography, but is a discursive construct to differentiate China’s advanced regions from those lagging behind. The definition of the less developed ‘West’ has changed throughout the decades, and is currently defined by the national government’s ‘Go West’-Strategy (*xibu da kaifa*, Yeh and Wharton 2016, 286; Figure 1). The ‘Go West’-strategy dedicates to the internal catch-up of these regions with China’s ‘East’ (Yeh and Wharton 2016, 289).



Figure 1: Study areas according to the discursive division of the ‘West’. Based on Yeh & Wharton 2016, 289. Cartography: Stephan Pohl.

### 1.3.1 Study areas

To contrast conditions between the ‘West’ and the ‘East’ of China, the areas of research thus include two city provinces in China’s ‘East’, Shanghai and Beijing, and two less developed provinces (resp. city) in China’s ‘West’, Yunnan (Kunming) and Chongqing (Figure 2). Since this research is particularly interested in roles of (informal, but also formal) institutions for regional innovation, the research units constitute provinces, resp. city provinces. The methods applied in this dissertation, however, guarantee for a critical openness towards the significance of administrative boundaries for the research issue. The following paragraph will discuss the selection of study areas.

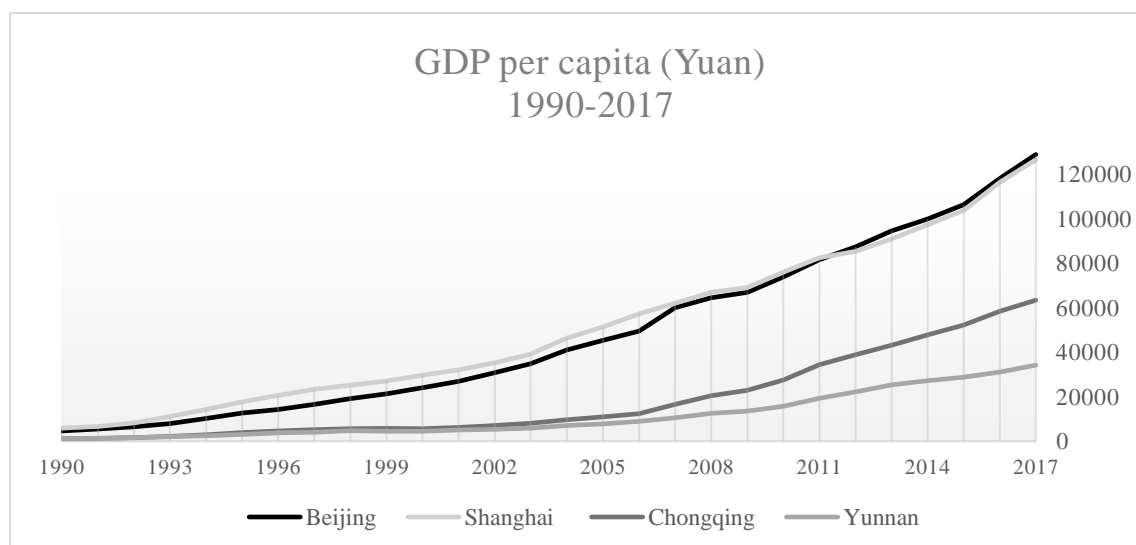


Figure 2: GDP per Capita 1990-2017 of the four study areas. Own elaboration. Source: China Data Online 2020.

### **Beijing**

Beijing city province is strongly influenced by its status as the capital city of the People's Republic of China: the former 'Soviet-style' hierarchic economic and innovation system strongly accumulated R&D capacities in the main cities, foremost Beijing. Today, Beijing has the best S&T-innovation resources in the country available, such as talent and university research. Innovation processes are strongly driven by universities and research institutes (Lyu and Liefner 2018; Liefner and Zeng 2008), while high- technology companies constitute the driving force of economic development (Chen and Kenney 2007, 1064). The inclusion of Beijing in the sample provides a region for comparison, which is first, close to China's national government as the capital city of the People's Republic of China, and second, leading in science and technology innovation.

### **Shanghai**

Shanghai city province was ranked in top positions with regard to innovation performance, innovation environment and enterprise innovation in 2017 (Liu et al. 2018, 131). Shanghai was designated to become the leading region for the economic development of the entire Yangtze River Belt with opening reforms from 1978 onwards. Thus, Shanghai received special treatment to 'get rich first' (Liefner and Wei 2014b, 4); in the course of opening up, Shanghai strongly drew on internationalisation to develop and is thus well embedded in the global economy (Chen 2006). Among the study area, Shanghai constitutes a case, which has strong science and technology resources and innovation capabilities (Liefner and Zeng 2008), but is the same time

closely integrated with the global economy. It is thus more outward oriented than the capital Beijing.

### ***Chongqing***

After the development of China's 'West' had been largely neglected, the central government promoted Chongqing to a city directly under central government in 1997. Made independent from Sichuan province, the municipality of Chongqing is supposed to act as a growth pole for Western China (Li and Wu 2012, 68), receiving particular support from the central government. With the new administrative status, Chongqing's city area was extended to 22,341 square kilometres (Summers 2018, 64), now encompassing several big cities, and rural areas, amounting to a total population of 31.02 Mio in 2018 (National Bureau of Statistics in China 2020). Due to the relocation of industries during the Sino-Japanese war 1937-45, Chongqing's economy has a better industrial basis to provide for economic growth than other 'Western' provinces. Within China's 'West', Chongqing is leading in economic terms (Summers 2018, 65). This study includes Chongqing as a province exhibiting a particular dynamic development (Figure 2), at the intersection between the economic performance of the 'East' and the 'West' (Figure 3).

### ***Yunnan and Kunming***

Yunnan is a frontier province to Myanmar, Laos and Vietnam in the Southwest of China, with Kunming as its capital city. With regard to socio-economic development, Yunnan lags behind both the 'East' and Chongqing as the leading city in the 'West' (cf. Liu et al. 2018). Even though Yunnan experienced a period of industry relocation from the East coast, it did not develop a thorough industrialisation. Agriculture, the exploitation of natural resources and tourism dominate the provincial economy (Su 2014, 91). In contrast to Chongqing, the province has been less central to national government development efforts (Summers 2013, 55). Yunnan and Kunming are included in this study to represent a 'least' developed case in the 'West' of China (Figure 3), which, however, has prospects to receive developmental impulses from the Belt and Road Initiative (BRI) in the near future due to its strategic position as a 'bridgehead' to Southeast Asia (cf. *ibid*). In the standardised approach in the first article, this research draws on Kunming as a research unit to ensure comparability (for a detailed discussion, see chapter 2).

The four studies constituting this dissertation draw on the four presented regions in different constellations (Figure 3) to approach the research question, which conditions explain regional innovation in (the ‘West’ of) China.

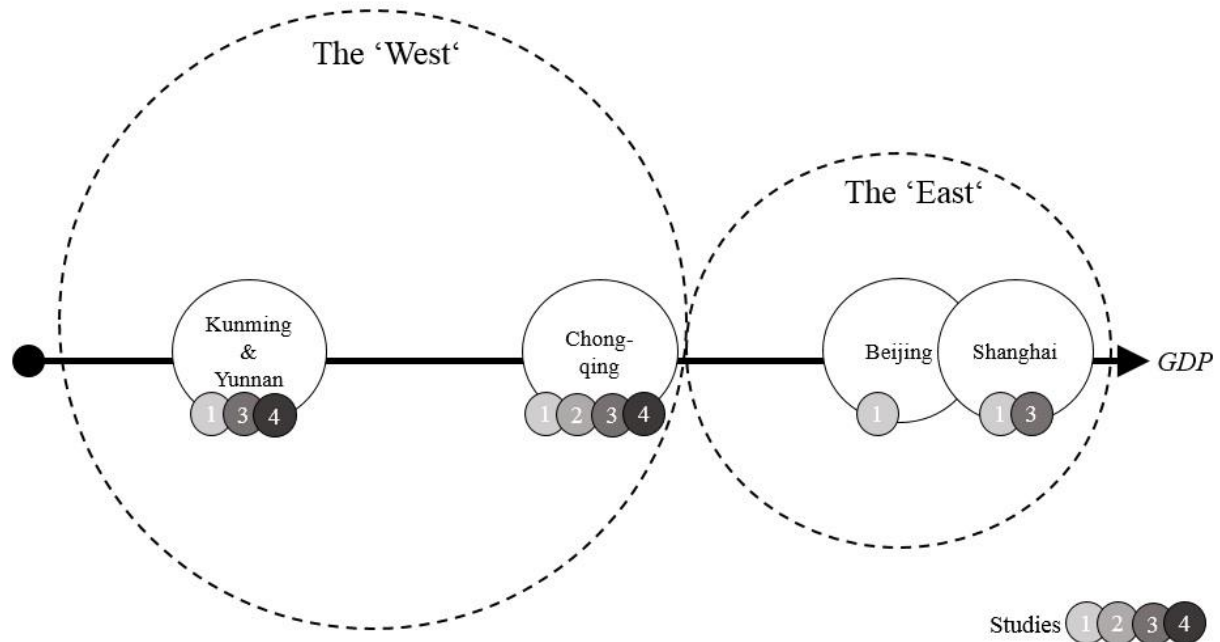


Figure 3: The four study areas according to their localisation in the 'West' and the 'East'. Own elaboration based on (National Bureau of Statistics in China 2020).

### 1.3.2 Methods and data

The necessity to treat established concepts critically in the Chinese context calls for methods, which guarantee for openness. Qualitative approaches aim at understanding complex contexts, and how they are constituted through human (inter-)action. They derive explanation inductively from the case under study, assessing the explanatory value of previous theories along this particular case (Flick 2018, x-xi). Drawing on a range of qualitative methods, this dissertation was able to examine a variety of conditions significant for the regional dimension of innovation in China. The comparison of ‘most different cases’ in the research project provided for a critical examination of the generalisation of results within China.

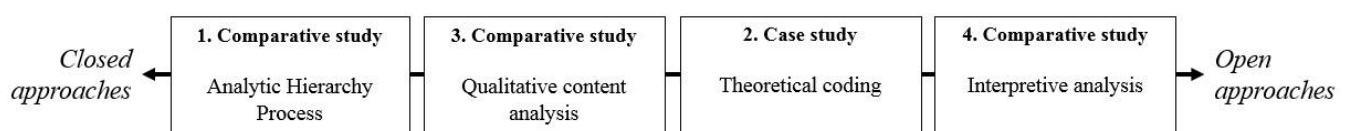


Figure 4: Methodological approaches in the articles. Own elaboration.

The individual case studies thus draw upon four different qualitative methods, ranging from a standardised qualitative approach in the first article to an interpretive approach in article four

(Figure 4). All four articles base on recorded interview data collected between September 2017 and September 2018 in Beijing, Shanghai, Chongqing and Kunming. The interviewees can be categorised in three different groups: company managers, innovation process intermediaries (cf. Howells 2006), policy-makers and -consultants, while the latter two groups possess both processual and contextual knowledge on regional innovation processes according to Meuser and Nagel 2002. The total of 72 (10 in Beijing; 14 in Shanghai, 28 in Chongqing; 20 in Kunming) interviews between one half and two and a half hours duration were held either in Chinese with simultaneous interpretation during the interview, or in English or German, depending on the interviewees' language preference. Article one draws on further 64 standardised questionnaires collected in the four study areas.

Typical for qualitative research projects, this cumulative dissertation did not set up a strictly planned research design in the beginning, as known from quantitative research (Flick 2018, 30). Holding it with Hammersley and Atkinson (1995, 24) that a 'research design should be a reflexive process which operates throughout every stage of the project' (in Flick 2018, 31), a flexible approach to the research issue throughout the four articles guaranteed for the openness, which was particularly important for this project as discussed in chapter 1.2. The research questions and methods in this dissertation thus result from an increasing understanding of the research issue throughout the research process. The following paragraph will summarise the methods applied and how they are linked to the respective research interest in each article.

### ***Article 1: Comparing Beijing, Shanghai, Chongqing and Kunming innovation systems***

The first article makes use of the Analytic Hierarchy Process (AHP; Saaty 2016 [1977]) to compare qualitative features of innovation systems across the 'West' and the 'East' of China. This approach allows for a systematic comparison of particularly qualitative features, such as government intervention, which are hardly measurable by indicator-based approaches. This method is thus not genuinely qualitative; it is rather hybrid in the sense that it aims to systematically compare *qualitative* features in particular. Therefore, the AHP in the first article is drawn upon to provide a general overview as a point of departure for the following more open qualitative and interpretive approaches.

### ***Article 2: Case study of Chongqing's innovation system***

Results from article one indicate that there are hardly any standardised features to innovation systems across China. This insight called for a closer examination of the complexity between localised and supra-local features of innovation systems in China. Therefore, the second article

applies theoretical coding according to Corbin and Strauss 2008. Theoretical coding is an approach to developing theory grounded in the individual case. That means, grounded theory approaches do not only focus on data evaluation, but determine sampling in an iterative process of data collection and data analysis: while in the field, the researcher evaluates his\*her data to decide, which further data need to be incorporated to develop and ground (i.e. support and critically prove) her\*his preliminary theoretical results (ibid). Theoretical coding develops theory inductively from within data collection and the text to guide data analysis, even though it allows an incorporation of initial pre-defined categories to break up the text (Flick 2016, 391).

### ***Article 3: Comparing Shanghai's, Chongqing's and Yunnan's local innovation strategies***

Drawing on this insight from article two that the government is still a decisive force in regional innovation capacity building, article three pursues the question, how local innovation strategy making may explain the lacking shift of innovation process organisation from government to independent actors, particularly in the less developed areas. The third study draws on qualitative content analysis (Mayring 2000). In contrast to theoretical coding, qualitative content analysis applies and refines pre-defined categories derived from theory to structure the data (Flick 2016, 409). In this study's context, the local negotiation of different innovation strategies as posed by China's national government were of particular interest (cf. chapter 4); the national strategies' features thus guided the categorisation of the text. This application of pre-defined categories to approach the text is particularly useful for case comparisons: a category-based approach provides for a framework, which can compare even most different cases systematically. Since this study did not draw on pre-defined theoretical concepts like RIS in article two, it is justifiable to reduce radical openness in favour of a comparative feature.

### ***Article 4: Comparing Chongqing and Yunnan perspectives on innovation for regional development***

The third study indicated that in regions, where economic resources are scarce(r), (S&T) innovation processes are often not necessarily considered an (immediate) promising element for local development. Local policy-making and implementation in China's less developed regions thus does not strictly follow the policy shift towards constructing an open innovation system. Therefore, article four dedicates to the knowledge reservoirs that shape the perspective of local policy-makers and –consultants on how to link innovation (capacity building) and regional development. The study draws on the sociology of knowledge approach to discourse analysis (SKAD) to focus on the interpretive (re-)construction of socially 'pre-typified'

knowledge patterns (Reichert 2016, 36). SKAD follows the logics of the interpretive paradigm, which presupposes that ‘ideas and practice are constitutive of each other’ (Summers 2012, 445) so that in this particular case, narratives are ‘in dialectical relationship with the practice of political economy’ (ibid). Such an analysis requires a radically open approach to *reconstruct* individual ways of ‘making sense’. To get access to these modes of ‘making sense’, article four adopts and develops the discourse analysis approach by Glasze et al. 2009 to conduct an interpretive case study in Chongqing and Yunnan on different knowledge reservoirs and their use to place innovation within regional development. The comparison between two different cases in the ‘West’ of China further provides for a closer distinction of the relevance of local and global knowledge reservoirs for arguing innovation’s role in regional development.

What the applied methods have in common is their critical approach to established (theoretical) concepts. All four articles were able to question and extend pre-existing understandings of regional innovation for the case of China and China’s ‘West’. Even the particularly critical application of the standardised AHP led to a critical discussion of how China’s national innovation system indicators are indeed appropriate to measure regional innovation performance. Further, each method provided a different perspective on innovation and regional development in China. Consequently, the total of four methods finally allows for a comprehensive conclusion on which conditions explain regional innovation in China, and more closely, in China’s ‘West’, which will be discussed in chapter 6.

#### **1.4 Overview**

The following four chapters represent the four studies, which compose this cumulative dissertation. Table 1 gives a short summary of the articles’ content and publication data as of 24 February 2020. All four dissertation articles are conceptualised and authored by me. The first article is co-authored by Ingo Liefner who contributed by bringing in the method and intensively discussing the results with me.



Table 1: Overview of dissertation articles. Own elaboration.

<i>Title and authors</i>	<i>Objective</i>	<i>Data and method</i>	<i>Journal</i>
The Analytic Hierarchy Process as a Methodological Contribution to Improve Regional Innovation System Research: Explored through Comparative Research in China  <i>Heindl, Liefner</i>	Comparison of qualitative features of regional innovation systems across China	Standardised questionnaire for Analytic Hierarchy Process on Beijing, Shanghai, Chongqing and Kunming	Technology in Society  <i>published</i>
Separate Frameworks of Regional Innovation Systems for Analysis in China? Conceptual Developments Based on a Qualitative Case Study in Chongqing  <i>Heindl</i>	Regional innovation system framework conditions in China	Theoretical coding of interview data on Chongqing	Geoforum  <i>major revision</i>
From Government Intervention to Independent Innovation? A Case Comparison on the Implementation of National Innovation Guidelines in Disparate Chinese Regions  <i>Heindl</i>	Comparison of conditions for innovation strategy-making in China	Qualitative content analysis of interview data on Chongqing, Yunnan and Shanghai	Eurasian Geography and Economics  <i>under review</i>
National Innovation Policy Negotiated in the Local Context: Narrative Patterns and Discourses on Innovation and Regional Development in China's 'West'  <i>Heindl</i>	Reconstruction and comparison of knowledge reservoirs shaping the context between innovation and regional development	Interpretive analysis of interview data on Chongqing and Yunnan	Journal of Contemporary China  <i>under review</i>

## CHAPTER 2

# **The Analytic Hierarchy Process as a Methodological Contribution to Improve Regional Innovation System Research: Explored through Comparative Research in China**

**Authors:** Anna-Barbara Heindl, Ingo Liefner

**Status:** Published in *Technology in Society* 59 (2019) 101197, DOI:  
10.1016/j.techsoc.2019.101197

**Available at:** <https://doi.org/10.1016/j.techsoc.2019.101197>

## CHAPTER 3

# **Separate frameworks of regional innovation systems for analysis in China? Conceptual developments based on a qualitative case study in Chongqing**

**Author:** Anna-Barbara Heindl

**Status:** Major revision in *Geoforum* as of 2 January 2020

### **Abstract**

The Regional Innovation System (RIS) is a popular concept for approaching research on geographies of innovation. Political research and innovation studies in emerging economies suggest that there are much different institutional preconditions for and far more types of innovation than hitherto considered. It is thus unlikely that the RIS model as derived from “Western” “best practice” cases has sufficient explanatory power for regional innovation dynamics in less developed regions in China. From an empirical qualitative analysis on Chongqing, China, as a most different case from “best practice” “Western” examples, we find that it is more appropriate to consider separate RIS within one region. The analysis shows that different RIS-frameworks matter for different actors, who engage in different types of innovation. These frameworks are exclusive and do not provide their functions equally to all innovation actors in place. The separation of RIS frameworks acknowledges the co-existence of different structures and trajectories, which is explicitly helpful for understanding regional innovation dynamics in China, where the national government currently aims to transform its innovation model from state-control to an open system of innovation. This paper further discusses how the notion of separate RIS is more appropriate for capturing regional innovation dynamics in the Chinese context in contrast to previous concepts of emerging RIS or fragmented regions.

### 3.1 Introduction

Subsequent to the financial crisis, China's national government has re-emphasised its plans to transform its economic system into a knowledge-based economy, establishing science and technology innovation as its "primary productive force" (Hu et al. 2018). The national government has thus called for a transformation of the innovation model controlled by government into an open innovation system (Chen and Guan 2012, 14), which mobilises a multitude of private actors to engage independently in innovation (cf. Liu et al. 2017; Zhou and Liu 2016). This call for building up innovation systems is uniformly directed to all Chinese regions; however, China's regions are characterised by huge socio-economic disparities (Zhuang and Li 2016) and an uneven distribution of innovation resources (cf. Liu et al. 2018), so that the preconditions for building innovation systems differ strongly. Nevertheless, national plans do not provide for a regional differentiation in their directions, the less developed regions in China must comply with innovation system building, too (Zhong 2003, 130 ff.). Considering the highly diverse preconditions for science and technology (S&T) and other types of innovation (cf. Zeschky et al. 2011), it is unlikely that the individual regional innovation systems in China will be shaped in the same way. Furthermore, the Chinese political and socio-economic system is "persistently uninstitutionalized" (Breznitz and Murphree 2011, 11), causing a quite diversified production of socio-economic processes throughout China's regions. Additionally, China's economic system is characterised by more or less strong government intervention (cf. Zhao et al. 2013), differentiating the Chinese case from most other economic systems.

The regional innovation system (RIS) model, inferred from cases in Germany and UK (Cooke 1992; Cooke and Morgan 1998), is a popular approach to research regional particularities of innovation in China, (cf. Doloreux and Porto Gomez 2017, 377). The RIS model draws on an institutional and cultural framework as the driver of innovation in the regional system (cf. Spigel 2016, 88). Considering the highly different institutional conditions in China, it is, however, questionable, to which extent a "Western" concept based on institutionalism is appropriate for understanding regional innovation dynamics in China (Liu and White 2001; Liefner 2014). Yet, RIS research (on China) hardly scrutinises the role cultural and institutional frameworks play for regional innovation dynamics. A general lack of research on the RIS framework encompassing other contexts, too, might be a result of missing theorisation (Asheim et al. 2015, 275) and difficulties in operationalisation (cf. Spigel 2016).

This research is thus interested in how RIS frameworks in Chinese regions can be conceptualised, and what its institutional specificities are in driving regional innovation processes. This paper conducts a qualitative case study on regional innovation system frameworks in Chongqing to work out how particular local and supra-local conditions shape different types of innovation in the region. Chongqing is a less developed region in the “West” of China, as it lags behind China’s “frontier” regions with regard to innovation and economic development (Huggins et al. 2014; Liu et al. 2018). Yet Chongqing exhibits a strong catching-up dynamic, which provides for a certain degree of innovation activities in the region. It is thus a suitable case to examine, which conditions are decisive for regional innovation and innovation capacity building in China.

The paper is organised as follows: chapter 3.2 provides an introduction to the RIS model and its application in China. Chapter 3.3 introduces to the research case Chongqing before discussing the method of analysis more closely. Chapter 3.4 continues with the results, which are discussed in chapter 3.5. Chapter 3.6 concludes this paper and calls for further research by analysing the limits of this work.

### **3.2 Regional innovation system research in China**

The RIS has gained consistent popularity as a concept for innovation studies dealing with spatial questions (Pino and Ortega 2018; Doloreux and Porto Gomez 2017; Bathelt and Henn 2017, 461; D’Allura et al. 2012). Departing from national innovation systems (Lundvall 1985) the RIS model was developed upon the observation that innovation activities do not only vary between, but also within countries. It generally suggests that innovations concentrate geographically where innovation-related actors, organisations and institutions with particular knowledge are available for interaction (Breschi and Malerba 2001, 818). Innovation is thus understood as an outcome of interactive learning processes involving a variety of actors and their (re-)combination of knowledge embedded in a bounded area (Moulaert and Sekia 2003). The concept postulates that this interaction is shaped by local (cultural, informal and formal) institutions and organisations in a particular place (Cooke 1992), emphasising the significance of innovation process governance within a particular region (Feldman and Lowe 2017). This cultural and institutional RIS framework “driving” regional innovation is thus shaped by both public and private actors, and their interaction (Asheim et al. 2011, 878; Fagerberg 2005, 12).

The RIS concept, however, does not fulfil the requirements of full theory. Instead, it is a concept based on stylised facts (Feldman and Kogler 2011), derived from “best practice” cases in

“Western” capitalist market systems (Moulaert and Sekia 2003, 291). The explanatory value of the RIS concept is thus restricted to similarly structured cases. Yet, the RIS literature has indeed focused on its explanatory value for “deviating” contexts, by “recalibrating” (Crescenzi and Rodríguez-Pose 2012, 519) RIS structures to developing countries’ conditions (Padilla-Pérez et al. 2009). However, due to RIS’ character as a model explaining innovation success, it can merely be understood as an *ex ante* heuristic for detecting emergent structures for (future), not (yet) fully developed RIS, where innovation does not constitute the basis to economic activity (ibid; Fiore et al. 2011; Isaksen 2001). At the same time, it is intuitive that the “recalibrated” RIS frameworks describing general conditions particular to developing countries must miss out on country-specific socio-economic and cultural characteristics. Departing from an institutionalist perspective, however, the RIS concept holds that it is exactly these characteristics, which shape the cultural and institutional framework driving regional innovation. It is thus problematic to draw on pre-defined analytical RIS frameworks for either “best practice” “Western” cases or developing countries if we truly want to understand how innovation processes are shaped by regional innovation systems.

To focus research on the RIS framework for understanding regional innovation systems and their dynamics is particularly important to revisit for the case of China: it deviates strongly from “Western” cases, and it is not certain, how stylised facts on developing countries proposed by Padilla-Pérez et al. 2009 matter for regional innovation China; in China, political and institutional processes (Lieberthal 2004) as well as economic exploitation logics differ substantially from “Western” democratic (cf. Liefner 2014, 29 ff.), and other market systems (Crescenzi and Rodríguez-Pose 2012). China’s authoritarian political and economic system is characterised in large parts by state intervention rather than liberal market principles (cf. Zhao et al. 2013). Therefore, state investment in R&D is more likely to play a prominent role for regional innovation processes than soft institutions like tax incentives (Crescenzi & Rodríguez-Pose 2012, 528). Huge disparities regarding socio-economic development (Zhuang and Li 2016) are accompanied by heavy interregional competition (Guo 2017, 316); local authorities thus follow their own agenda, often challenging the coordination of policies and strategies (cf. Li and Wu 2013; Liu et al. 2017). Breznitz and Murphree explain this development by China being “unique in being persistently uninstitutionalized” (2011, 11). At the same time, China is “still in a process of transition from the linear innovation model to a more systematic innovation model which emphasizes the importance of the framework conditions in the innovation performance” (Chen and Guan 2012, 14). This is mirrored in a remarkable shift in national innovation policy from government guidance aiming towards the construction of an innovation

environment mobilising independent actors to drive innovation processes (Liu et al. 2017). Regarding RIS, Crescenzi and Rodríguez-Pose thus hold that “In particular, the Chinese experience is relatively unique when compared to all other cases“ (2012, 528). Liu and White (2001) and Liefner (2014) have thus raised general doubts about how much Western innovation models can adequately explain regional innovation in China.

Despite these difficulties for both “Western” and “recalibrated” analytical RIS framework application in research on China, quantitative research usually draws on pre-defined frameworks to analyse the performance of RIS in China, mostly in a comparative design (cf. appendix). These studies indeed include indicators particularly relevant for innovation in China, such as the expenditure on the import of technology subsequent to China’s marked strategy to source technology abroad (Chen and Guan 2011). However, the significance of these indicators is derived from a national innovation system perspective and might not hold for an explanation on the subnational scale, especially with regard to China’s huge regional disparities in economic and institutional development: “Analysis treating China as being a monolithic entity misses the nuance in how China innovates“ (Chen and Kenney 2007, 1071). Qualitative research on RIS in China seldom addresses the institutional framework driving regional innovation. It either analyses particular interrelationships within the RIS framework, such as the of role universities (e.g. Su and Sohn 2012; Chen and Kenney 2007; Wu 2007a) or multinational corporations (e.g. Chen 2006), or for particular sectors (e.g. Yang 2015; Zhang 2015). Research, which focuses on the comprehensive RIS framework is so far only available for China’s “best practice” cases in the Pearl River Delta, the Yangtze River Delta and the Bohai region (Huggins et al. 2014; cf. appendix).

Yet, an interest in innovation processes in “developing” regions is currently reinforced by a strand in literature considering innovation and innovation processes outside the realm of science and technology (S&T). This is particularly relevant for research on developing countries and regions, where the level and availability of technological resources is usually lower (Padilla-Pérez et al. 2009). Research on low-tech (Hirsch-Kreinsen 2008), frugal (Zeschky et al. 2011) and good-enough innovations (Gadiesh et al. 2007) suggest that these types of innovation might have a similar positive impact on regional economies like S&T-driven innovations. The literature usually focuses on S&T innovation (cf. appendix), even though frugal innovations most likely constitute the prevalent type of innovation in China<sup>1</sup> Simula et al. (2015, 1567). In

---

<sup>1</sup> See the Shanzhai phenomenon in China (Dong and Flowers 2016; Keane and Zhao 2012; Zhu and Shi 2010), though this literature does not deal with spatial questions in particular.

spite of that, S&T advances constitute an important feature for the construction of China's national innovation system (cf. Crescenzi and Rodríguez-Pose 2012), driven by a technonationalist notion of development (Leadbeater and Wilsdon 2007).

This review implies that it remains unclear how significant the hitherto conceptualisations of RIS in “Western” regions, developing countries and China's “best practice” cases are for its less developed regions. Therefore, this paper draws on a qualitative approach to revisit the framework conditions for regional innovation in China's less developed regions. The research question this paper pursues is thus, how may RIS frameworks in China's less developed regions be conceptualised, and what are its specificities in driving regional innovation processes?

### **3.3 Data and methodology**

To examine the role of RIS frameworks for innovation in cases, which differ from the “Western” and the “successful” cases in China, this research focuses on Chongqing, a city directly under national government in Central China. Within China, Chongqing constitutes a “median” case with respect to innovation performance as measured by S&T indicators (cf. Zhao et al. 2015). From a national perspective, Chongqing may be categorised into China's low performing regions (Table 2). But within the category of less developed regions, Chongqing constitutes a highly dynamic place, which is well connected to the political centre and to the global market (Summers 2018). Chongqing is thus an appropriate case to pursue the research question, since it does not constitute a “best practice” case on China's coast, which profited from the “get rich first” policy subsequent to opening up (Guo 2017). At the same time, it is different from China's least developed regions, where it would be an endeavour in its own right to detect systemic innovation structures in the first place (Heindl and Liefner 2019). A case study on Chongqing thus provides knowledge on cases, which are different to “best practice” cases both in the “Western world”, and in China, but still provides for a minimum of expectable innovation activities.





Figure 5: Chongqing located in 'Western' China along the Yangtze River. Cartography: Stephan Pohl.

Chongqing has received particular attention from the political centre in Beijing since it was designated as a city directly under central government in 1997. This promotion was part of a strategy to establish Chongqing as a “growth pole” for the less developed West of China (Li and Wu 2012, 68). Chongqing fits into this role because it is a relatively well industrialised city in the West of China due to its historical legacy: to protect industrial equipment during the Sino-Japanese war 1937-1945, production plants were relocated from the coast to inland Chongqing, which served as an interim capital during that time (Summers 2018, 63). During the era of the planned economy, Chongqing’s industry was mainly dominated by state-owned enterprises (SOE), which still constitute a large share of the local companies (Table 2). Located along the Yangtze River as an important transportation route, Chongqing’s local economy is integrated into the global market economy (Yang 2017), but also strongly determined by local government controlling the predominant SOE. At the same time, its economy hosts businesses ranging from small, knowledge-extensive, not yet upgraded traditional companies to R&D-intensive, strongly supported large-sized companies targeting a variety of market demands.

Table 2: Research case characteristics. Sources: National Bureau of Statistics in China 2018; Chongqing Municipal Bureau of Statistics 2017; Kroll 2016; Liu et al. 2018.

<i>Economic characteristics</i>	<i>Chongqing</i>
<i>Administrative status</i>	City with provincial status
<i>“Role” in the national economy</i>	Growth pole for Western development
<i>GPD 2017 (Mio Yuan) I rank of 31 provinces (2017)</i>	19,425 I 17
<i>GDP growth rate 2015</i>	10%
<i>Main industries</i>	Manufacturing
<i>Dominance of company types/ output</i>	Large-scale enterprises; SOE
<i>No. of companies in “Top 1000 innovative enterprises list 2016”</i>	3
<i>National innovation capability rank of 31 provinces (2017)</i>	8

### 3.3.1 Sample

For this paper, interview data with two different groups were produced: firstly, the group of intermediaries in the innovation process, including industry park managers, innovation researchers, policy advisers, incubation managers, FDI managers, technology traders as well as staff of local science and technology (S&T) departments. Intermediaries constitute a group of actors, regional institutions and service organisations which perform „a variety of tasks within the innovation process“ (Howells 2006, 715), such as knowledge and technology brokerage and fostering cooperation between innovation actors (ibid 718; Warnke et al. 2016, 18). These intermediaries have an overview of innovation processes in their region, which is not restricted to a particular industry or business (context knowledge acc. to Meuser and Nagel 2002).

To both contrast and add to their perspective, interviews were conducted with a second group, the companies. The interviewed companies range from SOE over large private to private small and medium enterprises (SME) performing product development. The companies interviewed belong to a variety of different sectors. Company interviews delivered information closer to the innovation production processes and their preconditions (operational knowledge acc. to Meuser and Nagel 2002). Contrasting and similar representations of the local innovation situation delivered by the two sample groups refine the results: drawing data from groups with different perspectives allows to identify and compare narratives that determine their position regarding the interview topic.

The 30 semi-structured interviews (0.5-2.5 hrs) were conducted between September 2017 and July 2018, centring around the topics of the local innovation situation, innovation actors and governmental as well as company-specific innovation and upgrading strategies and types of

innovation in Chongqing. Data collection followed the principle of snowball sampling until theoretical saturation with regard to regional innovation conditions was reached. In the course of interviewing, the interview guideline was iteratively adapted to the current state of knowledge. The interview partners generally seemed free to speak their mind; the research team was not accompanied by governmental clerks, which is often the case in interview situations in China (e.g. Lauer and Liefner 2019, 9).

### 3.3.2 Analytical framework

The cultural and institutional framework driving regional innovation remains an under-theorised “black box” in the geography of innovation literature to date (Spigel 2016; Asheim et al. 2015, 275). Therefore, there is no common approach to analysis, which this paper could have drawn upon. However, the “exploration-exploitation” approach by (March 1991), provides a useful perspective to access the “black box” via qualitative methodology. The differentiation of basic fields of action, knowledge exploration and knowledge exploitation, allows for a focus on agents and their interrelationships on a micro scale (Figure 6): this approach sees the interaction between knowledge explorers and exploiters as coordinated and fostered by an organisational and institutional framework. The exploration-exploitation approach thus provides a useful layout for regional innovation systems without presupposing the type and direction of relevant interactive processes. The interviewed intermediaries play a role between innovation sub-systems 1 and 2, and are thus part of the institutional framework. The interviewed companies belong to sub-system 2 (Figure 6).

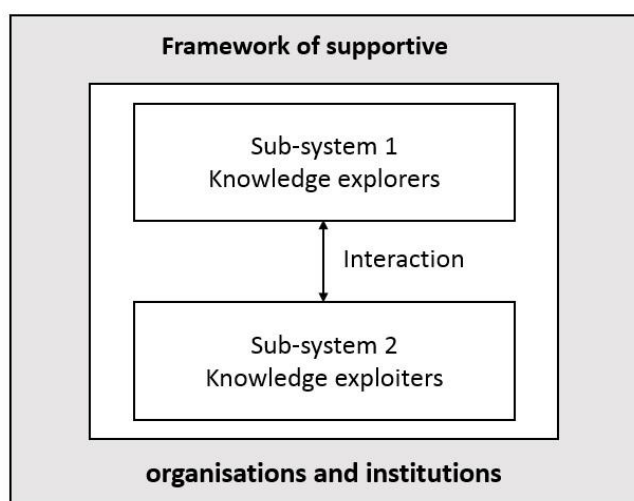


Figure 6: Exploration-exploitation approach acc. to March 1991. Own elaboration.

### 3.3.3 Approach to analysis

The analysis applied theoretical coding according to Corbin and Strauss 2008. Both constructed and in-vivo codes were used to access and abstract the material. The constructed codes were derived from the literature on regional innovation in China and Chongqing in particular. The in-vivo codes were developed not only while conducting text analysis, but already in the field during interviewing as the understanding of the phenomenon of innovation in the local context increased. Data collection and analysis were not strictly separated. The analysis hence conforms to a circular theory-building approach.

To avoid a too narrow, i.e. preconditioned approach to the text regarding RIS parameters, private and governmental “resources” necessary for exploration and exploitation, which in turn produce innovation, were inductively produced. Since governmental actors strongly intervene in the Chinese economy, private resources were distinguished from governmental resources to focus more closely on the particular roles they play in the innovation system. The subsequent analysis of the resource codes then revealed different conditions for their acquisition, mobilisation and utilisation, which in turn allowed for a reconstruction of the framework for regional innovation.

### 3.4 Results

The open, theoretical coding revealed that the type of knowledge explored and exploited differs strongly between actor types (Table 3): Soft R&D and R&D are types of knowledge production applied in companies, while soft S&T and hard S&T are produced in research institutes, mostly public universities and government-financed research institutes in Chongqing. Such a differentiation further allows a distinction between different technological levels of innovation, which are especially relevant in the context of developing regions. The analysis has shown that the differentiation of the actor and type of knowledge production is decisive for understanding RIS in the case of Chongqing.

Table 3: Knowledge typology generated from empirical data. Own elaboration.

<i>Soft R&amp;D</i>	<i>R&amp;D</i>	<i>Soft S&amp;T</i>	<i>Hard S&amp;T</i>
Generated or used by companies, which perform technology-extensive <i>product adaptations</i> .	Knowledge production, which particular companies generate for <i>product development</i> (“ <i>utility models</i> ”)	<i>Applied research</i> performed by universities and research institutes.	<i>Basic</i> research performed by universities and research institutes.

Further analysis showed that it is furthermore appropriate to differentiate not only between sub-systems of innovation, i.e. innovation actors, but also between framework conditions, which enable or foster innovation in a particular region. The empirical qualitative analysis demonstrates that these different framework conditions for innovation do not only co-exist (Figure 7), but explicitly challenge actors of RIS 1 to access and benefit from RIS 2 (Figure 8). The following sections introduce to the specific framework conditions of RIS 1 and 2, before discussing the obstacles for RIS integration.

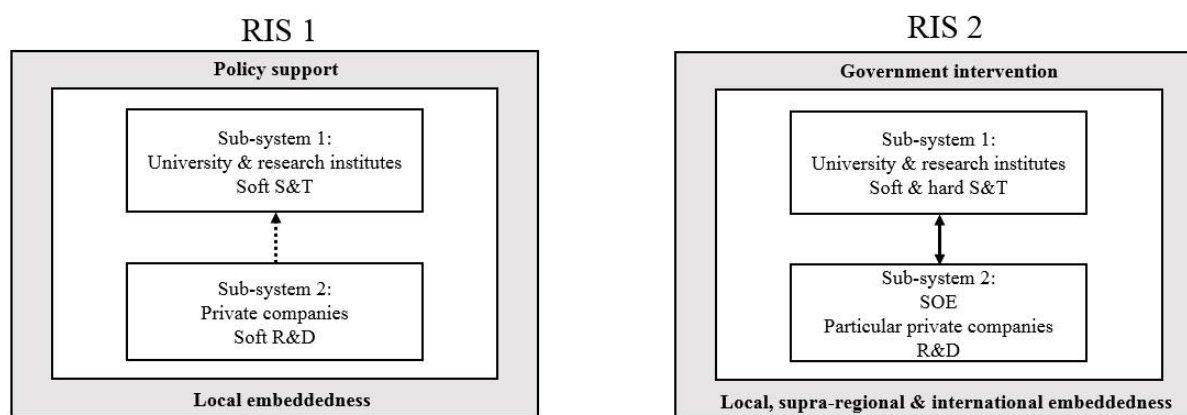


Figure 7: Results: Regional innovation systems in Chongqing. Own elaboration.

### 3.4.1 Regional innovation system 1

The innovation actors of RIS 1 comprise SME and other private companies on the exploitation side with quite low knowledge input into their production processes (soft R&D). On the exploration side, universities and research institutes provide soft S&T upon company demand (*company* → *research institutes*). The demand for S&T in companies, however, seems rather low, since knowledge absorption capacities are limited. The grade of private companies' product novelty is quite low and includes product adaptations. This is treated innovative, and local innovation policies provide funding for this kind of product adaptation (cf. Baark 2007, 31).

#### *RIS 1 framework*

Regarding the framework enabling and fostering innovation, private companies in RIS 1 receive only little support from the state. Even though the threshold for receiving innovation funding seems quite low in Chongqing, intermediaries assess the volume of funding as too small to enable private companies, especially SME, to sustainably develop technological innovation capacities. Private companies of RIS 1 thus receive indirect support through innovation policies, which is, however, not as effective as direct government intervention (as in RIS 2, see below). As a consequence, private companies in RIS 1 have to rely on market opportunities for

upgrading and innovation production. At the same time, however, sourcing capital for (technological) innovation is difficult for them in Chongqing, where the mass of large (state-owned) companies constitutes a more promising investment opportunity.

The framework is embedded in the local scale. Since the private companies' absorption capacity for hard S&T is limited, local resources are sufficient for running their businesses. Local universities can provide soft S&T if necessary for product adaptation, and the Chongqing market is often big enough for private companies, which are mostly SME, to operate; there is often no pressure to look for markets beyond Chongqing or China. Furthermore, it is the local government which supports product adaptation via innovation funds – the national government is less involved here, because it is interested in hi-tech and large-scale enterprises (cf. author under review). The technological level of innovations from RIS 1 is much lower and driven by local market demands rather than government intervention. It is thus intuitive to think of innovation types other than S&T innovations that may be produced through RIS 1, such as low-tech or frugal innovations.

### 3.4.2 Regional innovation system 2

SOE are the main knowledge exploiters in RIS 2, constituting the dominant form of companies in Chongqing (Table 2). The SOE use R&D to develop new products with a level that is often more advanced than that of private SMEs. On the exploration side, universities and research institutes provide both hard and soft S&T for SOEs' innovation processes. Due to the fact that both SOE and universities are controlled by the Chinese government, the interaction between the sub-systems is driven by both sides; since the national agenda on innovation emphasises the role of S&T for fostering innovation, universities constitute an important source for local S&T absorption. The local government has direct access to SOE for transforming hard and soft S&T from universities into product innovation ( $SOE \leftrightarrow research\ institutes$ ). Yet at the same time, the local government has a particular interest in increasing Chongqing's GDP to extend its budget, which is why the SOE have a high orientation towards the market if compared to Beijing's SOE for instance<sup>2</sup>.

---

<sup>2</sup> In Beijing and partly Shanghai, the national government strongly finances S&T for radical innovation regardless of immediate market success, since conditions to achieve "breakthrough" S&T and basic research are best in these places (Kroll and Liefner 2008, 308).

*RIS 2 framework*

In RIS 2, government intervention plays a decisive role for innovation processes. Since the government controls both the exploration as well as the exploitation side, it is necessary to guide innovation processes. The national agenda for innovation and thus the local government mainly operates with S&T to build innovation capacities, while having the means to source S&T supra-regionally from specialised hard S&T institutions and international partners, for instance through innovation mega projects.

Local governments in China have to negotiate different interests, such as the implementation of the national agenda, as well as the balancing of their local budget. Subsequent to decentralisation and opening up in 1978, they have been responsible for generating their local budget through tax revenues (Lieberthal 2004, 180-182). Additionally, politicians are usually appointed for a period of three years (Teets et al. 2017), 506), conflicting with an interest in long-term, sustainable projects, which the construction of an institutional framework for innovation requires. Therefore, the local Chongqing government selects particular promising or already consolidated companies for direct support: Consolidated companies with R&D departments are usually of medium or large size in Chongqing. However, the government may also foster SME; in this case, personal relationships with local officials are a decisive factor for participation in the RIS 2 framework. SME with thus relationships may receive direct government support to participate in innovation processes. This is different from RIS 1, where private actors usually receive only little and indirect formal policy support, which is not sufficient for participating in S&T-innovation in the current market environment. Particular private companies thus benefit from personal relations to politicians, which are crucial, as an interviewee illustrated to the question whether they had received governmental support for their S&T-upgrading: *“It's China, we need support from the government (laughs)”* (CQ-C1).

The local level is important in RIS 2, similarly to RIS 1, but for different reasons. Local politicians and private companies are embedded in local relationship networks: as an interviewee expressed, *“the national government or the provincial government cannot do much”* (CQ-I3), local decision-makers are more crucial for integrating particular private companies into the innovation framework. Furthermore, the demand for soft S&T can mostly be provided for by local universities, especially if the companies belong to the dominating automotive cluster in Chongqing. At the same time, however, local politicians are embedded in national networks, especially since Chongqing has received particular support to become a growth pole for the West, resulting in a closer cooperation between national government and local cadres.

In general, the strong government participation in the innovation system draws on supra-regional and international S&T resources, which are decisive for advanced innovations in Chongqing's RIS 2.

### 3.4.3 Obstacles to RIS integration

For RIS 1, the market is the decisive factor to determine private companies' participation in innovation processes. The government resources, which dominate the RIS 2 framework in Chongqing, are not accessible for private companies, especially SME, without particular relationships. Therefore, the integration of regular private companies into a common regional innovation system is hampered by the local government focusing on particular companies to achieve (immediate) economic growth, which has to be negotiated with costly S&T innovation. Company ownership and personal relationship networks are thus decisive factors for RIS integration in Chongqing.

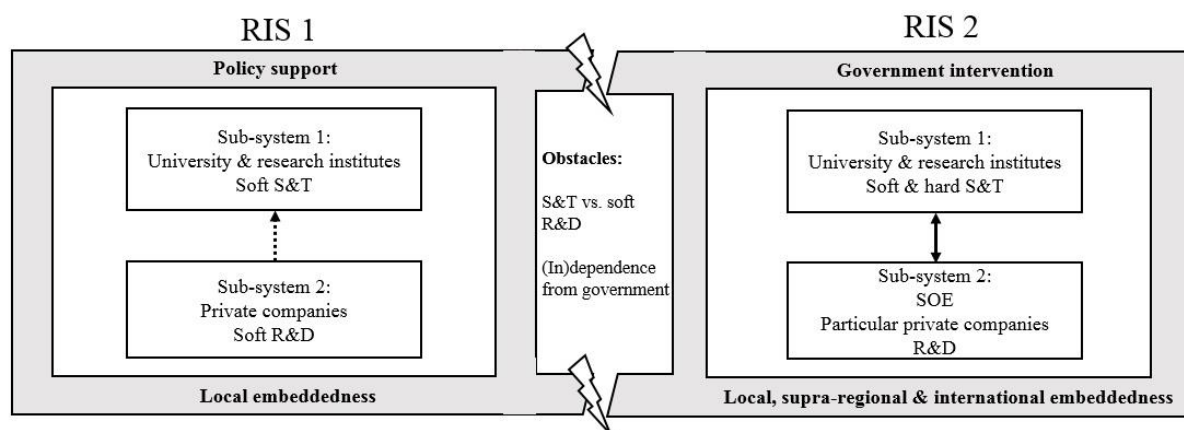


Figure 8: Obstacles to RIS integration. Own elaboration.

#### *Type of knowledge*

RIS 2 strongly focuses on S&T to support innovation and innovation capacity building. Hard and soft S&T, however, is not an optimal source for supporting innovation processes in Chongqing. Government-led S&T projects usually orientate along scientific needs, but do not necessarily take market opportunities into account (Kroll and Liefner 2008, 308). In Chongqing as a less developed region, however, the government has to take care of balancing its local budget and is thus foremost interested in increasing growth. The support of S&T innovation is thus often rather a separate compliance with the national innovation agenda rather than a careful integration of innovation capacity building into regional development strategies (cf. author under review). Private companies, however, do not have the technological level to absorb hard or – often even – soft S&T, meaning that the institutional provision of S&T does not correspond



to private companies' needs. The logic behind governmental and private company action is thus quite different: while the local government focuses on S&T provision as part of "planned" innovation, private companies have to rely more on market demand for product upgrading. As a consequence, private companies from RIS 1 cannot take advantage of the framework that RIS 2 offers.

### ***Independence from vs. dependence on government***

Private companies in Chongqing often mention that governmental support is not necessarily positive, since it provides grounds for the government to intervene into business management, blurring the boundary between the public and the private. Due to this danger, private companies may not seek governmental support or cooperation offers as actively, which is, however, crucial for most companies to be able to invest in S&T innovation. In Chongqing, these companies often stick to original design manufacturing with soft R&D to upgrade or change their products, which does not correspond to S&T innovation in a stricter sense. Thus, RIS 1, which is only indirectly supported by the state through general policies, has a much lower (S&T) innovation level than those with a strong government support.

To access RIS 2 is thus not necessarily attractive for companies from RIS 1. The fact that (small) private companies rely on market demand much more than companies of other ownership types thus distinguishes the RIS frameworks along government (in)dependence. It is thus not only the lack of absorptive capacities that prevents RIS 1 companies from accessing RIS 2, but also their own innovation strategy.

## **3.5 Discussion**

This research has shown that the framework conditions for innovation are not equal for all actors in the region. Instead, the framework conditions also hamper cooperation in innovation processes and thus establish quite different realities for different groups of actors. The following section will compare these results with conditions for innovation in other Chinese cases to work out the particularities of Chongqing as a less developed region in comparison to "frontier" regions in China.

### ***Particularities and general conditions for innovation***

Like in the Chongqing case, SMEs in China often cannot profit from governmental innovation support, because they miss necessary relationships with government officials (cf. Peighambari et al. 2014, 64), or respective hard S&T absorptive capacities (Liefner et al. 2012, 180). In more

advanced regions, SMEs might manage to upgrade their R&D towards hard S&T absorption capabilities due to more diversified regional innovation system framework (cf. Cooke 2014) – profiting from access to other than governmental resources, such as international partners (Liefner 2006; Liefner et al. 2006), top talents (Zhao and Richards 2012), and growing domestic markets (Peighambari et al. 2014). Chongqing, however, misses such diversified innovation resources (cf. Kroll 2016).

Chongqing’s relative innovation resource scarcity might render it less attractive for local governments to include private SME into their S&T innovation capacity building efforts – SME do not deliver fast and substantial economic growth as big private and state-owned enterprises promise to. In this regard, Chongqing might differ from Chinese regions, where SME constitute a more important role for the local economy, like in Shenzhen (cf. Yang 2015). The missing integration of private SME into a common RIS in Chongqing might thus be a consequence of SOE dominance in Chongqing’s industries, which incentivise a stronger government control of innovation processes and capacity building. At the same time, government investment into S&T innovation (capacities) seems furthermore necessary to bridge the relative lack of innovation resources, which private entrepreneurs might not have the means to source from other places. In this regard, Chongqing might exhibit structures and incentives similar to other “less” developed regions in China.

### ***Separate RIS frameworks to understand regional innovation in China***

In the S&T perspective, Chongqing exhibits conditions similar to less developed regions in China. This would suggest a categorisation of Chongqing’s innovation framework into a “fragmented” region (Isaksen 2001), or an “emerging” (but joint) RIS (Fiore et al. 2011). As discussed in chapter 3.2, this literature considers less developed regions with less resources and fragmented relationships (RIS separation, in this case) for innovation as *ex ante* regions, which eventually may develop a more comprehensive regional innovation system. Such a consideration of a “not yet” comprehensive innovation framework would render the analytical separation of RIS in Chongqing unnecessary: the notion of fragmented regions or emerging RIS implicitly suggests that respective policy support would help to eventually construct a common framework for innovation in the region. However, due to uneven state support and intervention, the lack of policy coordination as a result of “uninstitutionalization” in China, it is far from clear, whether Chongqing’s fragmented RIS will eventually converge towards a comprehensive RIS. Furthermore, the consideration of separate RIS within one region helps to frame the dynamic in China’s regional innovation processes: the Chongqing case suggests that the

separation of RIS 1 and RIS 2 mirrors the co-existence of a trajectory of China's linear S&T-innovation model (RIS 2), and the simultaneous development of an independent innovation system based on low R&D subsequent to opening up and growing domestic markets (RIS 1). The government remains a decisive factor for S&T-innovation in Chongqing, where S&T innovation resources are mainly concentrated with and issued through the state (cf. Wei 2004, 100). In Chongqing, private actors are currently (still) neglected in RIS 1, where the government does not provide sufficiently for an independent environment. Therefore, the hardly permeable separation between RIS 1 and RIS 2 can be interpreted as a legacy of China's previous national innovation strategies, which emphasised government control of innovation processes via SOE and other government resources for a directed technological catch-up (Zhou and Liu 2016). Due to "uninstitutionalization" (Breznitz and Murphree 2011, 11) it is, at the same time, far from clear if and how these two systems may eventually converge into an interactive common RIS framework – especially since it is not easy to assess how state intervention will further develop under Xi Jinping (Tanaka 2015; Teets et al. 2017).

### 3.6 Conclusion

The research on Chongqing has shown that the notion of separate RIS is a helpful tool to focus more closely on the difference of regional innovation conditions for different actors and actor groups, which might elude with the notion of "emerging" RIS: currently there is indeed a barrier between RIS 1 and RIS 2, which is hard to overcome considering the government's predominant interest in S&T and fast economic growth in Chongqing. That RIS 2 is strongly dominated by government control whereas RIS 1 is not, makes it necessary to examine more closely the roles national and local governments do play in RIS frameworks – and particularly, the realms outside of state control. Understanding Chongqing as a fragmented region or "emergent" RIS would thus mean to ignore particular pathways to development of RIS 1 in an analytical way. The separate RIS heuristic instead allows considering state intervention more critically, because it disentangles state intervention and independent processes analytically. This disentanglement is particularly necessary, when RIS analyses extend their interest to other forms of innovation in China, where government-controlled resources regarding S&T might matter less. Furthermore, it provides an analytical interface to focus on innovation system dynamics in particular, since the interaction between state and non-state actors is supposed to change with the transformation of China's innovation model. If we remain open for the possibility that several RIS may co-exist within one region, the RIS concept provides for Doloreux and Porto Gomez' current call to link back RIS (models) more closely to the empirical

world, where “new actors can emerge and/or the roles of ‘traditional’ actors can mutate [...]” (2017, 385).

The conceptual reconsiderations thus exceed the initial interest of understanding regional innovation in China’s less developed regions: the volatile role of government and the existence of paths alternative to S&T-innovation capacity building may be characteristic to all regions in China. The degree of separation between the frameworks and their individual shape may though indeed depend on regional conditions. The relative lack of innovation resources in Chongqing and the “West” may indeed provoke a stronger separation of RIS frameworks between the state-controlled RIS 2 and the independent private entrepreneurs in RIS 1. The task to deliver fast economic growth is particularly important for the regions lagging behind the East of China; long-term returns on innovation capacity building do not incentivise the construction of an innovation system with independent actors, but rather the control of scarce(r) resources for control of success. Diversified innovation resources in advanced Chinese regions might back the development of actors in RIS 1, which in turn made them more attractive to governments, which are interested in creating returns – obstacles for RIS integration there might be reduced, or of a completely different kind, depending on particular regional conditions.

### ***Limitations and further research***

Due to the lack of data and indicators to measure innovation other than S&T (Bennat and Sternberg 2020) in RIS 1, this paper relies on qualitative methodology to differentiate between these types. Yet this also implies that the existence of low-tech, frugal and good-enough innovations in Chongqing is reduced to anecdotal evidence gathered in interviews, while its widespread existence cannot be thoroughly mapped to date. Therefore, this research can only be understood as an explorative endeavour, which tries to understand preconditions and dynamics to regional innovation when these types of innovation are considered. Here, research was able to provide a general idea on why system frameworks may differ and how they relate to largely state-controlled S&T innovation frameworks. It remains open, however, how actors in RIS 1 do and will contribute to economic growth and stability in Chinese regional economies. This paper thus argues for a closer examination of non-S&T innovation processes and relevant system frameworks in China. To date, it remains unknown, how these frameworks may evolve – which pathways they will find to upgrade independent of government, or if they will eventually (have to) access government-dominated frameworks.

## CHAPTER 4

# **From Government Intervention to Independent Innovation? A Case Comparison on the Implementation of National Innovation Guidelines in Disparate Chinese Regions**

**Author:** Anna-Barbara Heindl

**Status:** under review in Eurasian Geography and Economics as of 11 December 2019

### **Abstract**

To transform into a high-income country, China aims to base its economy on innovation. Therefore, the national government increasingly issues innovation guidelines which aim to construct an innovation environment to mobilize a wide variety of economic actors, especially private entrepreneurs. Fostering independent innovation marks a shift from previous guidelines, which mostly draw on government resources to guide innovation processes. Although innovation capacity development is issued through the Chinese top-down political system, local governments are assigned to set up policies according to local needs. Due to huge social and economic disparities within the country, the consideration of the local context may be decisive for successfully developing innovation capacities throughout the country. This qualitative comparative study on local innovation strategies in Shanghai, Chongqing and Yunnan based on interviews with local experts asks which role the local and the national contexts play for the implementation of the two different innovation strategy types (government-interventionist and independent innovation) in highly disparate Chinese regions. Results show that resource endowment as well as local interests and the wider regional development planning in all three regions are responsible for the continuous implementation of government-interventionist innovation strategies, which at the same time constitute an obstacle to the mobilization of independent innovation actors, which is but seen as necessary for China's development in the global economy.

## 4.1 Introduction

As a legacy from the planned economy, China's innovation system has been characterized by labor division between research institutes, responsible for technological development, and industries, which had the task of turning technologies into marketable products. The transfer between these agents was mainly organized by the state. However, as the government liberalized and decentralized the Chinese economy, Chinese leaders started recognizing the role of private entrepreneurs and the market (Kroll and Liefner 2008, 305). Subsequently, the government could not further rely on direct intervention only to foster innovation production, but resorted to building up an additional framework intended to mobilize all kinds of economic actors to innovate independently from government intervention. Such an approach promises a more efficient use of resources to increase knowledge-based profits in the total economic output.

This agenda has been mirrored in the national policies, which the government has released to increase productivity (Liu et al. 2017; Zhou and Liu 2016; Pang and Plucker 2012; Liu and Cheng 2011; Liu et al. 2011). While in the 1950s, the improvement of science and technology (S&T) capacities through accessing foreign technological knowledge led by government was seen as decisive for enhancing the nation's technological and industrial basis, only in the mid-2000s did the perspective on "indigenous innovation" pay heed to China's various internal resources for innovation (Wolfe 2011; Pang and Plucker 2012, 248, 254). Liu et al. 2017; Liu and Cheng 2011 trace a development of national innovation guidelines from a strongly top-down interventionist character to creating bottom-up favorable environments for a broader contribution by a diverse set of Chinese actors. The bottom-up innovation guideline, however, has so far not succeeded in establishing innovation environments, which also enable private actors to innovate, while top-down interventionism is maintained (Liu et al. 2017, 11).

Decentralization after China's opening reforms starting in 1978 has made local governments decisive players in the implementation of national guidelines. While national guidelines present a particular goal, they remain vague regarding implementation measures. Local governments (provincial and sub-provincial governments) design their own policies and strategies to realize the nationally determined task (Zhong 2003, 130 ff.). The decentralized decision-making is to improve government efficiency in China's significantly disparate regions – not all policies that fit the well-developed local economy of Shanghai, for instance, are appropriate for the much less developed province of Yunnan in China's "West"<sup>3</sup>. It is thus system-inherent that a change

---

<sup>3</sup> For an analysis of the significance that the discourse on China's underdeveloped West vs. China's leading East (Coast) produces, see Yeh and Wharton 2016.

in national guidelines does not necessarily nor immediately lead to a one-to-one strategy change in China's locally administered regions. Therefore, the work by Liu et al. 2017, Zhou and Liu 2016, Pang and Plucker 2012, Liu and Peng Cheng 2011, and Liu et al. on *national* innovation guidelines leaves open as to how any such guideline or its alteration may be dealt with in China's local politics and economy – since to date there is a gap in research on how individual local contexts, especially in China's West, are positioned to fulfil the national innovation task.

This paper thus analyses which role the local context plays for the local innovation strategy development. It asks, which conditions are decisive for the adaptation of the new bottom-up strategy, and/ or to the maintenance of the old, top-down strategies to fulfil the national goal of increasing innovation-based profits in the overall economic output. A qualitative comparison between Yunnan/ Kunming<sup>4</sup>, Chongqing and Shanghai, allows to work out the significance the local context and its resource endowment plays: these regions range from a low developed region (Yunnan) over an emerging economy in China's West (Chongqing) to a fairly well developed economy on the East Coast (Shanghai).

The paper is organized as follows: it will first introduce the research phenomenon, innovation strategies in Chinese regions and the theoretical approaches that help understanding the research interest from the perspective of policy analysis, policy research and geography of innovation (4.2). Chapter 4.3 provides a literature review to highlight the research gap. Chapter 4.4 introduces to the research areas, the empirical data and mode of analysis. Results from both policy content analysis as well as the individual case studies based on a qualitative content analysis of expert interviews are presented in chapter 4.5. I will further discuss the results in a case comparison in chapter 4.6, and then conclude to reflect on their relevance for the wider research context on innovation in China in chapter 4.7.

---

<sup>4</sup> It must be noted here that even though I intended to center the interviews around Kunming, the majority of interviewees did not differentiate between Yunnan and Kunming, since they attest both the province and the city the same preconditions for innovation: "*Because she mentioned Kunming is just a city of the Yunnan province and it cannot have the power to push the switch of the economical structure*" (KM-S1, interpreter). Therefore, I will only differentiate between Yunnan and Kunming in the interview analysis where interviewees made the difference explicit. In the policy content analysis, however, I will include both Kunming and Yunnan, since provincial government are closer to designing guidelines, while municipal governments are closer to adaptation and implementation of policies and thus may enact distinct roles (cf. Lauer and Liefner 2019).

## 4.2 China's Innovation Strategy Development

Since the mid-1990s, the concept of innovation as central to stable growth has gained importance for Chinese economic development strategies (Fischer 2016). While China's leaders had previously attempted to develop the national economy by heavily absorbing technology and knowledge from foreign sources as an endeavor strongly determined by the state (Liu and Cheng 2011, IX-X), "indigenous innovation" (*zizhu chuangxin*) has become a powerful buzzword since the mid-2000s (Zhou and Liu 2016; Lazonick et al. 2016, 2); state intervention for technology absorption was not as successful as expected for constructing internal innovation capacities within China, partly because the targeted technologies were too sensitive to be shared with China. Eventually, to keep up with global development and to avoid the middle-income trap (Breznitz and Murphree 2011; Hu et al. 2018, 15), the Chinese government had to increase their country's total factor productivity by developing technologies and innovative products on their own (Yang 2015, 679; Zhou and Liu 2016). To meet the goal of mainstreaming innovation in the Chinese economy (Hu et al. 2018, 19-22), China's strategies now also have to aim at mobilizing a multitude of (private) actors to engage in innovation (Figure 9 Table 4). However, it is still unclear how Chinese private actors react to the national call for indigenous innovation (Liefner and Losacker 2019), leaving scope of action for local policies to affect firm strategies.

Liu et al. 2017; Zhou and Liu 2016; Pang and Plucker 2012; Liu and Cheng 2011; Liu et al. 2011 find that national strategies for increasing productivity have shifted from absorbing technologies to focusing on China-internal capacity-building for "indigenous innovation" (also Zhou and Liu 2016; Yang 2015, 679). At the same time, the government interventionist approach to innovation is still prevalent in many strategic emerging industries (SEI) and national key industries (cf. Lauer and Liefner 2019; Gao 2015; State Council of the People's Republic of China 2015; Central Committee of the Communist Party of China 2016). A chronological account of national innovation guidelines is thus not sufficient to discuss China's current and future pathway of innovation. Additionally, policies in China have different characteristics with regard to their degree of government interventionism or support (Lauer and Liefner 2019, 439). Therefore, it is necessary to define the characteristics of the new and old national innovation guideline elements more closely:



Table 4: Characteristics of innovation guidelines based on the analyses by Liu et al. 2017; Zhou and Liu 2016; Pang and Plucker 2012; Liu and Cheng 2011; Liu et al. 2011.

<i>Old innovation guideline</i>	<i>New innovation guideline</i>
Government intervention	Enabling independent cooperation
Preference of government-controlled resources	Preference of private resources
Mega-projects	Grassroots support
Support of state-owned enterprises	Support of private entrepreneurs
Government procurement as driver	Market as driver
S&T innovation/ Strategic Emerging Industries	Diverse types of innovation
Direction of innovation process: university → company	Direction of innovation process: company → university

At the same time, national guidelines constitute visions rather than directly implementable measures. In the Chinese political system, the central government delegates the implementation of national guidelines to lower levels of government, which is necessary to organize such a huge country more efficiently. Subnational government units are responsible for adapting and implementing national guidelines to their local economy (Lieberthal 2004, 181-183) and deciding over the concrete measures and instruments. They are, however, restricted to remain within a framework given by the central government (Donaldson 2016). That means, on the one hand, local governments across China are obliged to take up the national guidelines on economic planning; on the other hand, it may be assumed that innovation process improvement or capacity building may not suit all Chinese regions, because there are strong disparities between the development levels with a GINI-coefficient of over 40 since about 1999 (Zhuang and Li 2016; Table 5), thus resulting in a vastly different resource endowment for innovation activities (such as science and technology, investment capital, industries, talents).

At the same time, policy design and implementation is missing a stable institutional framework at the local level (Chou 2009, xi). The adoption of national guidelines thus usually does not result in a clear-cut strategy or elaborated vision for the region. Instead, different ministries and departments will each release policies in an uncoordinated fashion (Liu et al. 2017, 4), not least due to strong competition between different authorities that the Chinese administrative system produces (“*fragmented authoritarianism*”, cf. Heilmann 2008, 21-22). Local innovation strategies and their implementation are hence very case- and area-specific and must be understood as a set of (mostly uncoordinated) policies rather than a coherent strategy (cf. Summers 2018, 17).

Similarly, policy implementation lacks institutionalization, so that it is often rather dependent on individuals' relationships and their power to negotiate (Breznitz and Murphree 2011, 11; Ahlers 2014). It becomes obvious that also socio-political, and not only economic innovation resources are relevant for innovation strategy-making in China (cf. Rithmire 2014, 170). I may be even imagined that there is a discrepancy between local innovation resource endowment and its actual use due to political interests. It is thus important to shed light on the role of the local context for the adoption of old and new national innovation guidelines – only such an analysis will allow us to assess the real significance of the shift in innovation strategies on the national level. This paper will thus pursue the following research interest:

- (A) Which role does the local context play for local innovation strategy development?
  - (a) How and why are old and new national innovation guidelines adopted and/ or adapted in differing local contexts?

### **4.3 Policy and Innovation Research on China**

I will look at the literature<sup>5</sup> on innovation and policies from three relevant perspectives: policy analysis, policy research, and the geography of innovation perspective in China.

Political science policy analysis usually addresses the formation process of policies, where they address the process of policy-making, and particularly the relationship between local and national governments (Summers 2018, 17). Policy analyses agree that Chinese policy-making and –implementation in “the local” is at least as much dependent on local conditions and dynamics, as it is determined by central authorities and that it is very case-specific due to the lack of institutionalization (Hu and Hassink 2017; Mulvad 2015; Rithmire 2014; Breznitz and Murphree 2011; Lieberthal 2004). Their analyses mostly constitute case studies, but do not deal with innovation or regional variety in particular (e.g. Teets et al. 2017). This paper thus draws conceptual knowledge on policy-making processes from policy analysis, which will not be addressed here specifically – it serves as a backdrop to the analysis of the local context and its conditions for innovation guideline adoption, which may be seen as a precondition to policy-making processes in the first place.

From the perspective of innovation policy research in China, the majority of studies focuses on policy design either on the national level (Liu et al. 2017; Fu et al. 2016; Zhou and Liu 2016; Fu and Mu 2014; Klochikhin 2013; Pang and Plucker 2012; Liu and Cheng 2011; Liu et al.

---

<sup>5</sup> Due to the lack of quality control, I only included international publications (cf. Boeing 2014).

2011), or tackle policy implementation in a specific (emerging) industry in a specific region (Lauer and Liefner 2019; Yang 2014, 2015; Zhang and Wu 2013; Barbieri et al. 2010; Zhong and Yang 2007; Wu 2007b). Ma et al. (2019) indeed trace the development of policies and their impact on the formation of an innovation system in Changzhou as a knowledge resource scarce region, but the case study character does not allow for a generalization on China in general. To date there are no innovation policy-related studies on the rather resource scarce regions of Chongqing and Yunnan, which might be the case, because it is in general difficult to study policy evaluation in China – the more as a foreigner – since policy impact is considered a sensitive topic for China’s national sovereignty (cf. Barbieri et al. 2010).

Geography of innovation (Feldman 1994) and innovation studies (cf. Fagerberg et al. 2013) share a functional perspective on the resources and resource combination within bounded spaces, mostly provinces, to either determine regional innovation performance (e.g. Liu et al. 2018; Kroll 2016; Liefner and Wei 2014b; Chen and Guan 2012, 2011) or to re-construct individual systemic relations for the innovation outcome in a specific region (e.g. Cai and Liu 2015; Liefner et al. 2013; Zhao and Richards 2012; Wu 2007a). Most innovation studies on China therein apply the perspective of National (NIS) or Regional Innovation Systems (RIS) (Nelson and Winter 1977; Cooke 1992). Empirical NIS and RIS studies usually treat innovation policies as given functional parts of the (regional or national) system, but usually do not ask about their conditionality. Nevertheless, the perspective applied by geography of innovation provides an understanding that particular resources and relationships, as well as spatially bounded institutional environments are favorable for innovation processes. The functional perspectives on innovation in Yunnan (Liu et al. 2018), Chongqing (ibid) and Shanghai (e.g. Chen 2006; Zhang 2015; Liefner et al. 2013; Lin and Wang 2009) will thus provide a mapping of existing resources and networks for innovation, which will serve as a basis for our own analysis.

In general, geography of innovation, policy analysis and innovation policy research to date may not lack case studies on specific industries. However, profound knowledge on the broader local context and its influence on innovation strategies and implementation is not available. Qualitative case comparisons between differently endowed regions must thus shed light on the national and local conditionality of innovation policy design.

#### 4.4 Data and Methodology

The research to identify local (and national) conditionality for innovation strategies was carried out in Shanghai, Chongqing and Kunming.



Figure 9: Research areas in the 'West' and the 'East' of China as defined by 'Go West' (Yeh & Wharton 2016, 289). Cartography: Stephan Pohl.

The cities under investigation differ strongly with regard to economic development, resource endowment, and support from the political center. While Kunming, located in Yunnan, a border province to Southeast Asia, exhibits an only low level of economic development and a lack of industrial and scientific resources, Chongqing is, despite being located in the “underdeveloped West” of China, an emerging economy with a solid industrial basis, not least due to special (financial) attention by the central government constructing Chongqing as a “growth pole” for the whole “West” of China (Li and Wu 2012, 68). Shanghai profited earlier than Chongqing and Yunnan from the opening reforms in the 1980s as one of the regions to “get rich first” (Liefner and Wei 2014b, 4) and thus developed into a prosperous city with respective innovation resource endowments (Table 5).

Table 5: Regional innovation resources. Own elaboration.

	<i>Shanghai</i>	<i>Chongqing</i>	<i>Yunnan</i>
<i>Administrative status</i>	City with provincial status	City with provincial status	Province
<i>Attributed role</i>	Future Global S&T Innovation Centre (GIC) (Liu et al. 2018)	Growth pole for the “West” (Li and Wu 2012)	Bridgehead to Southeast Asia (Summers 2012; Su 2014)
<i>GPD per capita (Yuan) 2018</i> (Nat Bur of Stat Ch 2020)	134 892	65 933	37 136
<i>Average GDP growth 2009-2017</i> (Nat Bur of Stat Ch 2020)	7.71% %	18.22%	13.80%
<i>Main industries</i> (Liu et al. 2018)	Diversified – large shares: manufacturing; financial industries; trade	Manufacturing	Agriculture; mining; tourism
<i>Dominance of company types/ output</i> (Liu et al. 2018)	Large-scale enterprises; FIE	Large-scale enterprises; SOE	Large-scale enterprises; SOE
<i>S&amp;T quality</i> (Kroll 2016)	Strong public research basis	Small public research basis	Small public research basis
<i>S&amp;T activities orientation</i> (Kroll 2016)	Strong international orientation	Low international orientation	Very limited outward orientation
<i>Patents</i> (Kroll 2016)	Medium share of university patents	Medium share of university patents	High share of university patents
<i>R&amp;D expenses in 100 Mio Yuan (2017)</i>	120.521	36.463	10.936 (2015)
<i>Share of</i> - enterprises - universities - scientific research institutions (Nat Bur of Stat Ch 2020)	62% 9.1% 26.5%	82.4% 9.3% 5.1%	56.66% 9.65% 20.64%
<i>Local government expenditure on S&amp;T in 100 Mio Yuan (2017)</i> (Nat Bur of Stat Ch 2020)	389.9	59.31	53.42
<i>Total growth of expenditures 2009-2017</i>	81.09%	281.41%	181.31%

#### 4.4.1 Method of Analysis

For the analysis of this paper, I applied two methods, qualitative policy content analysis and a qualitative analysis of interview data.

In order to address the research questions, which role the local context plays for the local innovation strategy development, and more specifically, how and why old and new national

innovation guidelines are adopted and/ or adapted in differing local context, I conducted semi-structured interviews in Shanghai, Chongqing and Kunming, Yunnan. The interviews were centered around local innovation resources, regional development, innovation policies, and governmental as well as firm-specific innovation and upgrading strategies in the respective regions. The guiding questions changed throughout the research process according to a typical qualitative-iterative design to reach theoretical saturation regarding local innovation strategies in each region (for a discussion on this design, see Saunders et al. 2018). For evaluation, I applied a qualitative content analysis according to Mayring (2000).

Innovation policy content analysis alone is not appropriate for learning about the conditions for local innovation policies and strategies (shifts); Chinese policies usually do not give an analysis of the local situation to base their policy design on, but rather refer to the central government's strategic decisions for the whole of China (cf. Alpermann and Fröhlich 2017). This research aims to understand complex contexts and conditions that lead to innovation strategy building, which is neither sedimented in policy papers (as one interviewee expressed: "*The policy papers are one thing but actually the development is another thing*" (SH-S4), nor accessible via indicator based analyses of innovation output change in the respective regions. Therefore, I conducted a policy content analysis in chapter 5.1., but strongly supplemented it with the main analysis of interview data in chapter 5.2.

#### 4.4.2 Sample

I conducted and recorded 13 (Shanghai), resp. 14 (Kunming/ Chongqing) semi-structured interviews with "regional observers/ experts" per region in English, German, or Chinese with simultaneous English interpretation, and subsequent translation of transcribed interviews. The aim of the qualitative interviewing and qualitative content analysis (acc. to Mayring 2000) was to analyze regional "observers" (or "experts" with contextual and partly, processual knowledge acc. to Meuser and Nagel 2002) perspectives who have a broad knowledge on the political as well as economic processes of innovation policy formation and implementation and their interplay with the local context. Such a broad perspective is required, since the analysis aims to reveal the conditions for different innovation policies, which may eventually explain why some innovation policies are regionally more emphasized than others (such as old and new type). The qualitative approach gives access to the negotiation of innovation policies and can thus reveal, *why* specific innovation strategies emerge in different local contexts. The experts have knowledge on both local government's innovation policies and policy implementation as well as firms' innovation strategies; at the same time, they do not hold an official function in

government (except for the two S&T department staff members, who were useful as a backdrop for comparison). Therefore, this group is both involved in innovation capacity-building and consulting innovation strategy-making, and is at the same time independent enough to take a critical position<sup>6</sup> towards local innovation strategy making.

Table 6: Sample structure and interview labels. Own elaboration.

<i>Sample</i>	<i>Shanghai</i>		<i>Chongqing</i>		<i>Kunming</i>	
<i>Scientists/ researchers on innovation</i>	5	SH-S	5	CQ-S	4	KM-S
<i>Academies of Sciences/ Policy-advisors</i>	3	SH-P	1	CQ-P	/	KM-P
<i>Intermediate organization managers: incubation services; science/ industrial park managers; S&amp;T platform managers; IP and FDI managers</i>	5	SH-I	7	CQ-I	8	KM-I
<i>S&amp;T Department staff</i>	/	SH-G	1	CQ-G	2	KM-G

## 4.5 Results

I will first present the results of the policy content analysis to make use of it as an informational and critical backdrop against the subsequent qualitative content analysis of the interview data.

### 4.5.1 Innovation Policies

To gain an overview of the innovation policy landscape in Shanghai, Chongqing and Kunming, I conducted a policy content analysis based on a comprehensive internet-based search of policy documents in both English and Chinese language. I included policies between 2014 and 2018, that is, policies released 2 years prior to and 2 years after the publication of the 13<sup>th</sup> Five-Year-Plan, which reinforced the new innovation strategy in 2016 (Liu et al. 2017) – the introduction of new policies does not necessarily lead to an abolition of previous policies. As with other Chinese documents and statistics (Holz 2004), the policies are, however, not reliably published on the internet, nor fully accessible – this is a severe restriction on the comprehensiveness of the analysis. The following policy-analysis thus only serves to gain a rough overview as a backdrop for our qualitative content analysis; to work out the regional specificities of regional

<sup>6</sup> In the Chinese context it is further relevant to mention that my interview partners generally seemed free to speak their mind, since most of the time I was not accompanied by governmental clerks, which is the case in many other research contexts (e.g. Hu and Hassink 2017; Alpermann 2012).

policies, I conducted a comparison between the contents of local innovation-related policies and the contents of national innovation guidelines (see appendix).

Table 7: Policy content analysis. Own elaboration.

	<i>Shanghai policies</i>	<i>Chongqing policies</i>	<i>Yunnan policies</i>	<i>Kunming policies</i>
<i>Regional focus through specialized policies and/or particular emphasis</i>	Improving the technology transfer system  Constructing a global S&T innovation center (GIC)	Promotion of hi-tech firms for increasing internal R&D investments  Improving cooperation between universities and firms	Increasing governmental R&D spending  Pilot zones and Top 100 firms receive special funding  Attraction of firms and talents (external resources)	Promoting entrepreneurship  Outstanding talents' attraction in key industries
<i>Conclusion</i>	Improving available S&T innovation processes	Improving available S&T innovation resources	Attracting/ building innovation resources, which are locally not available	

The policy analysis shows that each region designs policies according to the availability of innovation resources. In Kunming and Yunnan the policy focus suggests that innovation resources have to be built in the first place, while Chongqing already focuses on improving available resources. As a well-developed region, Shanghai policies already suggest to improve the process – since resources seem to be sufficiently available.

#### 4.5.2 Qualitative Content Analysis

To address the research questions, I will first present the comparison of the national and local conditions of adopted old and new strategy elements for each case (Table 5). Second, I will intersect the analysis with the results of the policy content review before proceeding to a case comparison in chapter 4.6.

##### *Shanghai – Improving Available S&T Innovation Processes?*

The central government and the Shanghai government set the goal in 2010 to turn Shanghai into a Global S&T and Innovation Centre (GIC). Together with Beijing, Shanghai, as one of the most developed local economies in China and abundant innovation resources (Table 5), was designated to contribute to the national strategy for China to become an S&T and innovation power by 2050. The central government assigned this task to Shanghai among others because science and education resources are abundant (Liu et al. 2018, 137), which are important in



innovation processes. This nationally important task is a recurring topic in the interviews, so that the GIC seems the most prominent strategy with regard to innovation capacity-building in Shanghai.

#### *Old Strategy Type Elements*

Turning Shanghai into a GIC is inherently connected to the old strategy type of government-interventionist innovation processes: since “hard” S&T, such as basic research, is central to the understanding of a globally leading innovation center<sup>7</sup>, the government has to focus particularly on the transfer between universities and the industry. The local government further aims to focus on innovation within key technologies and Strategic Emerging Industries (SEI), which are seen as even more essential, since China is entrenched in the trade war with the USA (SH-I5). Government procurement is thus an important consumer for the S&T innovation made in Shanghai. In this respect, Shanghai’s innovation resource development is strongly determined by a nationally assigned role: The old type of innovation strategy is continuing as a GIC is to be facilitated by government-controlled resources; mainly universities and research institutes are supported as the initiators for innovation processes, which are then linked up with companies (SH-P1) (university → company). *“Maybe for Shenzhen, the development is very, very good but for Shanghai and Beijing, the research part is very, very important for the whole country”* (SH-S5). The experts’ reports thus emphasize that elements of the old strategy type based on national conditions constitute the “specificity” of Shanghai’s policies.

To fulfil national plans, the local Shanghai government can rely on two of its locational advantages: the availability of S&T resources and national key industries, backed by SOE (Table 5). Shanghai’s government shifts its support from trading and service companies to Hi-tech large-scale enterprises (SH-S4). Liu and Cheng (2011, X, 45) suggest that the notion of indigenous innovation argues for the inclusion of private actors to a greater extent into innovation strategies. However, it becomes clear here that in Shanghai the local government does not necessarily focus on a broad nor particularly private set of actors: it concentrates on particular large-scale enterprises, especially Shanghai’s strong SOE, because it expects both spillover effects and tax revenues. As one interviewee puts it: *“For the national government, they focus on the strategy, but for the local government, they focus on tax”* (SH-P3). Most Small

---

<sup>7</sup> Documents, such as policies, usually refer to innovation as based on “hard” S&T. That is, the government (still) sees scientific research as the main basis for innovation production. This is most likely a corollary of China’s previous exclusive focus on S&T to gain nationally important technology before embracing the term “innovation” in their upgrading strategies (Pang and Plucker 2012, 248).

and medium-sized enterprises do not bring the minimum level of R&D capacities that makes them eligible to formal support, such as bonus payments through government for patents. Informally – and this usually means much better support – SME are then individually supported, when they promise to grow rapidly and turn into mega-enterprises such as Alibaba to yield respective tax revenues (SH-P3); only SME with a good relationship with government officials can draw on extra financial resources for innovation, while there is a more official way for large-scale enterprises (SH-S5; SH-I4; SH-P2; cf. Lieberthal 2004).

#### *New Strategy Type Elements*

The experts report that Shanghai's support of individual SME-“champions” is not the “regular”, i.e., strategic case (cf. Howell 2017). Rather, they acknowledge that Shanghai's government makes efforts to establish an innovation environment for private enterprises to respond to market demand. Corresponding to the new strategy type, the experts highlight that the local government takes up Shanghai's locational advantage of good access to the global world: the national strategy “1000 Talents Plan” to recruit leading experts in scientific research, entrepreneurship and innovation from abroad is seen as particularly promising in Shanghai (SH-S3). Within this strategy, the local government pays particular attention to private entrepreneurs, preferably Chinese returnees, which also corresponds to the “Mass Entrepreneurship” plan on the national level. The critique on implementation, however, indicates that these plans are copied from national guidelines rather than locally designed: The experts attest the Shanghai government a general lack of creativity with regard to innovation policy-making, not least because the local government is prioritizing tax revenues (SH-I1; SH-P2; SH-P3). They criticize the fact that Shanghai orients itself very closely on national government decrees and thus copies rather than designs innovation strategies adapted to the local context (SH-P2). That means, even though Shanghai's government might have risen its support for private actors, such as SME and entrepreneurs on policy paper (SH-P1), the implementation of such policies might be insufficient.

The analysis has shown that the local government in Shanghai draws on both old and new strategy elements, which are adoptable by the local context due to Shanghai's resource endowment. Therefore, it is important to reconstruct the experts' assessment to understand more profoundly the conditions for a potential shift from old to new strategy elements.

*Challenging the Choice of Resources*

Contrasting the old strategy type, which focuses on government-interventionist innovation, experts see the market as a necessary element to create innovation. Instead of promoting large-scale enterprises and government-interventionist innovation (university → company), the interviewees see the need to support SME. SME have the potential to fill gaps in the local industrial chain, which is an important concept among experts: they compare to Shenzhen, which hosts complete industrial chains and is hence capable of reacting faster to changing market demands (SH-I1; SH-I2; SH-S5). Secondly, in contrast to the majority of local policies, they favor the small over the large dimension, because they see the independence of innovation actors as a necessary prerequisite for innovation efficiency, since private companies innovate according to market demand (company → university), while large-scale government-supported enterprises do not (SH-P1; SH-S2; SH-S4). The experts depict SME as actors who are indeed willing to upgrade and innovate, but do not have the necessary resources available, nor get sufficient support by the government (SH-I1; SH-I2; SH-S2). Therefore, they see the focus on basic research within the GIC strategy not as a locational advantage in Shanghai, even though Shanghai has the country's second best resource in scientific talent. Indeed, they agree that this resource base has to be promoted, but not in terms of basic research. They look more towards the local industrial endowment of Shanghai and see the need to promote innovation based on industrial manufacturing instead of merely supporting S&T (e.g. SH-S4). In this, they argue within the new strategy type, which favors an integrated development instead of focusing on S&T per se as the driving force for innovation.

Concluding, in Shanghai the local government does not pay sufficient attention to building an independent innovation environment (new strategy type) for the local economy, but rather an S&T-based cluster of excellence for the national agenda (old strategy type). This nationally determined strategy in innovation capacity building is indeed based on the availability of local resources, such as high-class research facilities and talent. Yet, these resources are mostly government-controlled so that the government remains a necessary intermediary to facilitate and demand innovation processes. Therefore, the local innovation strategy misses to mobilize a big part of the local innovation potential, since it ignores local market-oriented SME and manufacturing enterprises; which have a particular potential, since Shanghai's companies have an extraordinary good access to the global market (Liu et al. 2018). This emphasis of the local government to mobilize government-controlled rather than private resources is mirrored in the particularity of local policies: the focus on the improvement of particularly S&T innovation

processes requires the participation of large-scale enterprises (especially SOE), universities and research institutes, since even Shanghai SME usually cannot process “hard/ basic” S&T in their innovation processes (SH-S1; SH-I4; SH-P2). In such an environment, it is harder to shift from old to new innovation strategies – the specificity of local policies to improve local S&T innovation processes is thus inclined towards using government-controlled resources.

### ***Chongqing – Improving Available S&T Innovation Resources?***

The economic development and upgrading of Chongqing is strongly determined by its role as a growth pole to Central and Western China, which was designated by the central government in 1997 to make the Western region catch up with the East (Li and Wu 2012, 68; Yeh and Wharton 2016). The Chongqing economy thus not only has to respond to specific national innovation guidelines, but also has to create fast and strong development in general in order to spillover to widely surrounding cities and provinces. Chongqing’s location along the Yangtze river is seen a decisive advantage for the economy, as it provides access to other inland markets and abroad. Transport infrastructure is thus a pillar of Chongqing’s growth (Summers 2018, 63 ff.). In general, the strong development and upgrading of Chongqing’s economy in recent years has mainly been induced by investment from the national and local government following the Western Development Strategy (ibid, 65 ff.). The analysis shows that the local conditions make the government favor the old strategy type rather than the new.

#### *Old Strategy Type Elements*

The local government strives to live up to national innovation guidelines, for instance by developing Strategic Emerging Industries (SEI) to catch up with the coastal areas. For that reason, the local government attracts companies from quite diverse industries and supports its resource-strong SOE (CQ-I1; CQ-I2). The companies that the local government aims to attract or support are hi-tech large-scale enterprises, which are more productive than SME (CQ-P1). The local government thus unites two different demands: it focuses on hi-tech for upgrading the economy, and on large-scale enterprises, which promise a higher contribution to economic growth. Such an approach to innovation capacity building is oriented along the wider development strategy for Chongqing’s industries to move up the global value chains (Yang 2017; Summers 2018, 67; 69). The integration into the global economy is quite dominant in Chongqing’s innovation strategy design, as I will show in the following.

For innovation, the experts see the government as a necessary intermediary: the attraction of foreign and other hi-tech companies (CQ-I2; CQ-I6; CQ-P1) – is seen as “*an easier way, a*

*shortcut for them to motivate these local companies to change them to learn from the outsiders to quickly grow up*” (CQ-S5). The Chongqing government counts on spillover and trickle down effects from technologically more intensive companies, since local suppliers will have to upgrade their offer in order to remain competitive: *“Then small enterprises do not have the capacity to produce this kind of production [innovation]. It is necessary to go, but in the current situation, many companies are a small enterprise that helps others”* (CQ-I5) – the experts describe Chongqing as a city exposed to the global economic dynamics and therefore see the need to establish a knowledge-based economy to remain competitive (CQ-I1; CQ-I5; CQ-S1; CQ-S3). The local strategy for innovation is hence determined by the need to improve the technological resources of Chongqing’s economy in the first place. Even though *“some large companies that can truly innovate, (...) but their research institutes are still very weak”* (CQ-S2). Contrary to large-scale enterprises, the government therefore ignores local SME as passive receivers of spillovers, which have to take care of their development independently. With that, the Chongqing government focuses old strategy type elements resembling the old pre-innovation S&T-strategy of the national government in the 1980s and 1990s: the focus on the technology transfer through attraction of large-scale hi-tech companies, especially in SEI and the use of government-controlled resources – the local government spends most of its budget on S&T through universities (university → company) instead of creating an institutional framework to mobilize private actors. This may also be conditioned by Chongqing’s industrial structure. SOE and large-scale enterprises in the second (heavy) industry dominate, while SME are less abundant.

The preference of large-scale hi-tech enterprises over SME with regard to innovation capacity building mirrors the wider approach to regional development to achieve a better position in global value chains: Central government policy initiatives starting from 2010 make explicit that the attraction of domestic and international firms constitute a core task for Western Chinese provinces to leverage development (Summers 2018, 28). This may cause less incentives to establish an innovation environment, where all kinds of private actors combine their resources for different types of innovation (i.e., apart from “hard” S&T, CQ-S2; Table 5).

#### *New Strategy Element Type*

Yet the local government attempts to implement some new innovation strategy elements by offering rewards for entrepreneurs (national plan on “Mass Entrepreneurship”). However, the experts assess that entrepreneurs do not have a significant effect on the intended transformation of the economic structure.

### *Challenging the Old Strategy Type for Chongqing*

More important in Chongqing's context than the negotiation of old and new innovation strategies is the question of innovation per se. A widespread opinion among experts is that many local companies do not see the need to develop innovation capabilities (CQ-S2; CQ-I1; CQ-I3; CQ-I6). On the one hand, they can still rely on profits from Original Equipment Manufacturing. On the other hand, SME in particular do not have the means to develop innovation capacities, since they lack assets and access to credits and loans. Therefore, the experts weigh up between government-interventionist S&T innovation and a general need to increase economic growth (CQ-I1; CQ-I3; CQ-S3). They see local industrial development as the more efficient strategy to live up to the task of acting as a growth pole for central and Western China. They do not include innovation capacities in this notion of industrial development, but rather the steady growth of local companies by other means; with that, they prioritize the growth strategy over the innovation strategy as they do not inherently see innovation as a strategy to leverage economic development in Chongqing: *"(...) Peking, Shanghai, so this kind of cities, the economy is very big, they spend a lot of money for the enterprise to do the strategy, innovation. But in most of the cities in the western part of China the main purpose of these cities is to develop their economies (...). So (...) maybe Chongqing focus more on the industry, manufacturing"* (CQ-P1; cf. CQ-S1; CQ-S2; CQ-I1; CQ-I3; CQ-I5). This might be the case, since innovation is not yet seen as a productive feature of Chongqing's economy (CQ-S2; CQ-S3; CQ-S5).

If the experts allow for a discussion of innovation as a secondary or future potential for Chongqing's economy, they criticize the fact that the Chongqing government promotes innovation mainly through S&T-funding according to the old strategy type; in their opinion, innovation promotion should rather be based on Chongqing's locational advantages, the automobile and electronics industries, instead of installing completely new SEI and key technology clusters via large-scale firm attraction, conforming to the old type of innovation strategy: *"In Chongqing we must focus on our own advantage industry. An advantage technology. But we cannot (...) invite some much more, much higher technology (...) in our city. But most important I think is to (...) bring our own innovation capability"* (CQ-S3). They see the need to link innovation closer to market mechanisms: Chongqing's future lies in S&T-extensive adaptive innovation and incremental product development to sustain the local industry, which demands to *"innovate the traditional engineering to the new engineering"* (CQ-S3). At the same time, they do not think that local companies are yet capable to approach

markets with innovation demand on their own due to a lack of resources and motivation (CQ-S2; CQ-I3).

In general, the experts thus rather favor the new innovation strategy, which enables local actors, such as SME and other private enterprises to engage in innovation processes independently of government intervention. They see the need to enable private actors to choose the means for and direction of innovation processes. Yet at the same time, they hold the government responsible for creating such an enabling innovation environment. Resource constraints and institutional impediments prevent the majority of local firms from acting independently of government resources and support (CQ-S2; CQ-S3; CQ-P1; CQ-I1; CQ-2; CQ-I3; CQ-I4). One expert draws on the following example to illustrate: industry park managements as potential intermediaries refrain from cooperating across the city, since their parks' success is measured in short-term GDP growth. This causes strong competition and makes long-term returns on innovation capacity-building through cooperation less attractive. At the moment, innovation thus does not underlie *"(...) market mechanism, it's all government-mechanism"* (CQ-S3). *"Innovations that we generally understand are based on the enterprise and market-oriented. But the innovation of Chongqing military products is a national plan"* (CQ-S2). The state should thus maintain its role for innovation, however not in the processes themselves, but rather in the provision of an environment by removing barriers (new strategy type). To counteract the government mechanism, one interviewee emphasizes the "emergent" character of innovation: *"When we pour these chemical substances that make up the human body into a bucket and stir, can we stir up a living substance? Similar to the formation of living things, innovation requires a special environment"* (CQ-S2).

Concluding, in the Chongqing case, it seems that the old strategy type matches the wider local development plans better than the new strategy type. The S&T-focus and large-scale orientation of the old strategy type integrates well into the endeavor to leverage development in the short term to act as a growth pole for whole "West" of China. However, the experts who are more deeply concerned about innovation, while the local government has to live up to different demands, see more potential in the new innovation strategy type. While the experts see the theoretical and long-term benefit of the new innovation strategy type, the local government might not have enough incentives to concentrate on innovation per se as a means to upgrade the local economy: The rather short mandate terms and the evaluation system of Chinese officials offers incentives to present fast results instead of long-term achievements (Teets et al. 2017, 506) – officials may still score with GDP growth regardless of productivity increase.

Innovation is thus too costly and long-term-oriented to match with local officials' needs (CQ-S2). It seems, as in Shanghai, that the wider regional development goals conflict with an application of the new strategy type. Local conditions and interests of local government provoke a tendency towards the old strategy type. This is mirrored in Chongqing's particular policy-emphasis on upgrading available S&T resources. The prominent S&T-oriented large-scale hi-tech firm support as well as improvement of processing university research results in firms draws on already available resources, which are, however, rather government-controlled than available to a wide variety of actors in Chongqing.

***Kunming – Attracting/ Building Innovation Resources, which are Locally not Available?***

Yunnan's strategy for innovation capacity development has to build on quite different preconditions than that of Shanghai and even Chongqing. While the those cities either have financial means available and/or particular attention from the political center, "*Kunming lacks similar national policy support*" (KM-G2). The most important concern among Kunming and Yunnan experts with regard to economic upgrade is not necessarily innovation. As one of the least developed areas in China (National Bureau of Statistics in China 2018) with hardly any innovation resources, many agree that tourism and trade are more promising strategies to increase Kunming's economic growth than S&T-related industrial innovation. Yet despite the lack of resources, the Yunnan and Kunming governments attempt to implement the national guideline on innovation. The analysis shows that in Yunnan/ Kunming the innovation strategy is mainly conditioned by national guidelines rather than emerging from local needs.

*Old Strategy Type Elements*

Since Yunnan and Kunming have not been focus regions of the central government, the infrastructural preconditions for innovation differ widely from those of Shanghai and Chongqing. In general, the Belt and Road Initiative (BRI)<sup>8</sup> is named as the most promising motor of development for the Yunnan province and Kunming city (KM-S1; KM-S4; KM-I1; KM-I2; KM-G2), which mirrors the general discourse on Yunnan's future development as a border region (cf. Su 2014; Summers 2012, 2013). The interviewees generally agree that Kunming and Yunnan do not yet host the necessary infrastructure and resources to establish a knowledge economy with S&T-based innovation activities. Neither companies nor universities have the necessary intellectual resources and quality to engage in innovation. An exception

---

<sup>8</sup> The Belt and Road Initiative (BRI) is an international mega-project initiated and controlled by the Chinese government with the aim of fostering international outlet markets for the Chinese economy.



seems the “Chenggong Information Industrial Park” (KM-I4). This industrial park is invested by the national government and focuses on an S&T-based innovation development in the area of IT, such as artificial intelligence. With the setup of such a park, the local and national government adhere to the old strategy by steering cooperation between S&T university research and industries (university → company).

#### *New Strategy Type Elements*

Similarly, but rather according to the new strategy type, the local government’s “*latest policy is to encourage teachers who are in colleges and universities to engage in innovation and entrepreneurship*” (KM-S3) – the Department for S&T put it even as “*in fact, we are most concerned about the project of innovation and entrepreneurship*” (KM-G1) (Table 7; KM-I3; KM-I2; KM-I4; KM-G1; KM-I6). The emphasis on mobilizing private actors corresponds to the national strategy of “Mass Entrepreneurship”, which supports through incubation services. However, in Kunming/ Yunnan the incubation platforms are still “*also looking for its development model. (...) Our development level of here is not so fast*” (KM-I3). Looking at the low success of entrepreneurship programs so far, the experts hold it that Yunnan’s culture is not suitable for (innovative) entrepreneurship: “*(...) the long-term character formed by people is to avoid risks and not to take risks*” (KM-S1) and „*the mindset of people is not open, not far-sighted, and not market oriented*” (KM-S3; cf. KM-I1; KM-I4; KM-S1; KM-S2; KM-G2) so that they would not recognize nor react to innovation demand<sup>9</sup>. The same goes for the national “Internet+” guideline. Even though this national guideline might be useful in the Kunming/ Yunnan context, since it has potential for technology upgrade in Kunming’s/ Yunnan’s major industries of tourism and trade (KM-I1), the lack of knowledge resources and market incentives makes Kunming’s/ Yunnan’s industries consumers of new technologies rather than developers: “*(...) the structure in the main R&D or other fields is not so good because some people say that in terms of processing and manufacturing, in fact, there are still some markets for profits*” (KM-S3). The development of technologies within Kunming/ Yunnan is seen as too costly, too time-consuming and hence too risky (KM-S2; KM-S3; KM-I1). Innovation policies are thus to date without much effect on the local economy (KM-I1; KM-I3; KM-S2; KM-S3).

---

<sup>9</sup> Such a regard to Yunnan people might link up to the discourse on ethnic minorities in the „West“ of China and Yunnan: it essentializes the folkloric way of living of ethnic minorities, which constitute about one third of Yunnan’s population and thus excludes them from development and modernization in a derogatory way (Barabantseva 2009). An upcoming paper by the author will analyze the significance of the discursive reference to Yunnan’s culture for innovation and regional development.

Considering the resource scarcity and the lack of incentives, the Yunnan specific policies thus rather seem like an imposition from the national level instead of emerging from local needs. The policy specification in Yunnan is inclined towards creating necessary innovation resources by mobilizing especially private entrepreneurs – in contrast to Chongqing and Shanghai new strategy type elements seem to prevail over old strategy type elements, most likely simply because there are hardly any resources available that the government could broadly control for innovation capacity development. However, there is a multitude of obstacles to innovation processes emerging from the local context that these policies seemingly do not address.

### *Challenging innovation for Yunnan*

It must be noted that the interviews were generally dominated by a negative perspective on Yunnan/Kunming development, which often did not allow for a direct conversational focus on innovation strategies; instead, the experts put emphasis on more basic preconditions for economic development, such as industrialization, attitude of local entrepreneurs, and local markets. The interviewees are rather pessimistic about the development of innovation capacities (KM-I1; KM-I2; KM-I4; KM-S2; KM-S3; KM-G1; KM-G2) and support the local government's focus on material infrastructure improvement, such as roads to increase trade with Southeast Asian neighbors. More directly, one interviewee disagreed with the national task of developing innovation capacities in Yunnan: *“Although national government has put forward the public innovation slogans, (...) I will do not support my children to entrepreneurship. Because innovation entrepreneurship is good for the whole country, (...). But (...) We cannot innovate for the sake of innovation.”* (KM-S2). The experts do not see innovation as the most important means for development in Kunming and Yunnan. Instead, they see the extension of national and international outlet markets as crucial for Yunnan's future, as well as an improvement of basic infrastructure (KM-S1; KM-S4; KM-I1; KM-I2; KM-G2). This echoes the general regional development discourse, which constitutes Yunnan as a bridgehead of China to Southeast Asia (cf. Summers 2012). Consequently, they rate the national government's mega-project BRI as more relevant for Yunnan than its goal of building up a knowledge-based economy: Yunnan is in a developmental stage that does not yet call for innovation, but first for the extension of distribution channels, i.e. a scalar increase through the BRI, which is supposed to grant access to Southeast Asia (KM-S1; KM-I1; KM-I8). The extension of outlet markets is not only to fulfil the function of increased sales, but also to induce

a cultural change, which shall eventually lead to innovation: at the moment, *guanxi*<sup>10</sup> is a determinant of market relations within Yunnan. Most local entrepreneurs limit themselves to the local Yunnan market, where *guanxi* guarantees for a certain market share – as a consequence, they are not overly interested in extra-regional or international markets: “*You know, I know you make a good product, I know I also could make product, but we can do/ we are doing different prices (...). So the competition just regional (...)*” (KM-I1). A crucial strategy for increasing innovation is hence the link-up with extra-regional and international partners to establish access to extra-local markets (KM-G1; KM-I1; KM-S3). The experts see potential in the adaptation of existing products for markets with lower purchasing power such as Myanmar and Laos, which are not necessarily dependent on “hard” S&T, other than what the national Chenggong Information Industrial Park intends to foster (KM-S1; KM-I1). Therefore, BRI and its intended increase of market integration shall increase incentives for product development and innovation in the future.

In conclusion, the experts do not see many opportunities for an “internal” increase of Yunnan’s product level due to the general lack of resources, such as S&T quality, R&D capacity, market access, incentives and financing. That also means that the old strategy type focusing on government-interventionist innovation capacity building does not help the local Yunnan situation, since the government does not have these resources available. The locally specific policy emphasis on the attraction of external resources and the creation of entrepreneurs thus rather corresponds to the new strategy type, which induces the mobilization of private actors rather than government resources (Table 7). The experts agree on the use of such new innovation strategy elements, even though they state that it needs more basic development before Yunnan can dedicate to developing an innovation based economy. They thus see innovation as a task for the future, not as a means to develop the economy right now.

#### 4.6 Case Comparison

A direct case comparison yields further insights as to how and why old and new national innovation guidelines are adopted and/ or adapted to the local context. Case differences show that the shift from the old to the new strategy type on the national level, as suggested by Liu et al. 2017, Zhou and Liu 2016, Pang and Plucker 2012, and Liu and Cheng 2011, cannot (yet) be traced in all regions and hence does not necessarily become significant on the local level in

---

<sup>10</sup> Guanxi is a term which describes the personal relationship networks, which are decisive for bargaining interests in China (Heinelt and Zheng 2014, 25).

China; case commonalities demonstrate that in all three regions the local government still applies old strategy elements.

Table 8: Significance of old and new strategy elements per region. Own elaboration.

	<i>Shanghai</i>	<i>Chongqing</i>	<i>Kunming/ Yunnan</i>
<i>Old Strategy</i>	✓	✓	(✓)
<i>New Strategy</i>	✓	<b>X</b>	(✓)

The analysis has shown that the local governments tend to favor the old strategy; either because they do not have the means or incentives to establish an independent innovation framework for private actors (Yunnan and Chongqing), or because government control over mega-projects and focus on government-interventionist S&T serves their particular local interests – national support for GIC in Shanghai and the growth pole in Chongqing. Contrary to local strategy-making, the interviewed experts see advantages with the new strategy type, which is supposed to enable a more sustainable and widespread innovation capacity-building in their local economies. However, local preconditions (Yunnan: lack of resources) as well as nationally important development goals (Chongqing: leveraging growth for western China, Shanghai: establishing a global S&T innovation center) do not foster such a new strategy, which has to draw on the local context much more than the old strategy type. In all three regions, the new strategy type to date thus remains a policy idea or new vision (*spirit/ jingshen*) rather than a productive force (Zhong 2003, 129).

To conclude, in Chongqing and Yunnan, the new strategy type of constructing an independent innovation environment fails with the lack of private local resources for innovation. Both the lack of financial means and the present profitability of economies of scale, i.e. the local market, provide little incentive for private entrepreneurs to innovate. For Chongqing, this means that the government takes over to guide innovation processes through universities, SOE and the attraction of hi-tech enterprises, and for Yunnan that both old and new strategies lack the necessary preconditions for innovation at all and are thus overall negatively rated. Additionally, this is mirrored by the fact that the Kunming experts easily got away from the innovation concept when explaining regional economic dynamics. The new strategy type thus seems to be developed on the basis of regions richly endowed with private innovation resources, as one interviewee in Chongqing expressed: *“I personally think that technological innovation, first of all, is still subject to the ideological concept of a region on a large scale. Because Chongqing, as the central city of the Western region, (...) from the overall thinking, it should be said that*

*there is a certain difference with our coastal developed regions. This also determines the limitations of the ideological concept”* (CQ-S2). What he/ she states is, in essence, that innovation is a concept by and for the coastal areas of China, whereas it is “alien” to the West. Therefore, it is not surprising that both the new and the old strategy type find their best theoretical local fit in the most developed region, Shanghai, and less/ least, in the less/ least developed regions of Chongqing and Yunnan.

Despite the discrepancy between local resource endowment and the requirements that the new strategy brings, the national government requests all regions regardless of their development to apply innovation policies according to the national guidelines, as policy papers and local adaptations of the 13<sup>th</sup> Five-Year Plan demonstrate (see appendix). What is to learn from all three cases is, however, that wider regional development plans – the GIC in Shanghai, the growth pole (Western Development Strategy), resp. moving up the value chain in Chongqing and the BRI in Yunnan – are more significant than innovation capacity building per se; and the demands for innovation capacity building in the sense of the new strategy type do not necessarily fit neatly into the wider regional development plans in all regional contexts.

#### **4.7 Conclusion**

This paper took the observation by Liu et al. 2017, Zhou and Liu 2016, Pang and Plucker 2012, Liu and Cheng 2011 and Liu et al. 2011 that the national innovation guidelines change their focus from government-interventionist innovation production to creating an independent innovation framework as a reason to ask (1) which role the local context plays for the local innovation strategy development, and more specifically, (2) how and why old and new national innovation guidelines are adopted and/ or adapted in differing local context. (3) provides some more general lessons.

- (1) The local context is decisive for the innovation strategy development first, in terms of its innovation resource endowment, and second, because of wider development plans for the region. Innovation as a theoretically-informed means to transform the whole Chinese economy into a knowledge-based system does not necessarily fit into the development plans by and for subnational regions. Therefore, national innovation guidelines might sometimes be adopted rather than adapted, since they either cannot draw on local resources, or they cannot be easily integrated into regional development plans, nor correspond to local interests. Despite its reinforcement in the 13<sup>th</sup> Five Year-

Plan, the innovation-based economy seems only one strategic goal that has to be negotiated with other economic interests.

- (2) The old strategy type is dominant in Chongqing and Shanghai and at least equally important in Yunnan, since it draws on government-controlled resources (cf. Table 4). Such government control is easier to match with local interests: in Shanghai, the GIC leads to strong national and thus financial support, in Chongqing, it allows for both an increase of hi-tech resources and an immediate increase of growth, while in Yunnan, government-controlled resources (SOE, universities) are the only available resources. To implement the new strategy is, in contrast, risky. The long-term returns on investments threaten GDP growth, which is still an important performance indicator in the Chinese administrative system for local officials' careers. Governments in all three regions do not have enough incentives to favor the long-term return on innovation environment building over the directly measurable investment into government resources. There is also a lack of vision and incentives to engage in innovation among private actors in Yunnan and Chongqing, since innovation is not yet necessary for company survival. To engage in innovation independent of government support is neither yet possible in Chongqing, Yunnan, nor Shanghai due to the lack of resources and resource access for the mass of private actors.
- (3) A more global learning is that China's economic guidelines, which are usually announced from the central government and sometimes cause anxiety among the international community of states, cannot be evaluated from (central) government papers alone. I have shown that the local and the regional contexts are decisive for the implementation of centrally announced strategies: local conditions are indeed relevant for shaping the importance of individual strategies by assigning greater significance to one element over another. Even more importantly, it became evident that national guidelines compete with or sometimes even contradict other nationally determined strategies in the local context. Therefore, it is far from self-evident that national guidelines will eventually become significant in the local context.

### ***Implications for Further Research***

It became evident that the local governments continue to foster a knowledge-based economy by exerting control over innovation resources. The state is thus still an important factor for innovation processes. The extent to which such government control is indeed productive in the

long term remains to be analyzed – will the state be effective and ubiquitous enough to guide innovation in the long term, or will it eventually have to give up control in favor of independent innovation environments? Especially since the analytical perspective of the experts strongly emphasizes that the mobilization of various private actors is the future concept for China to survive in the global economy. The question of how productive the Chinese state is and can be is thus an important one and remains to be answered.

Further, the analysis revealed that innovation is only one goal that competes with many others. To truly understand the significance that innovation has and will have for the Chinese economy, it will hence be crucial to understand, how innovation and regional development are negotiated and intertwined – not by analyzing only the national scale as usual (cf. Liu et al. 2017, 1), but by focusing on China’s disparate regional economies, which can tell so much more about China’s innovation landscape.

<sup>1</sup> It must be noted here that even though I intended to center the interviews around Kunming, the majority of interviewees did not differentiate between Yunnan and Kunming, since they attest both the province and the city the same preconditions for innovation: *“Because she mentioned Kunming is just a city of the Yunnan province and it cannot have the power to push the switch of the economic structure”* (KM-S1, interpreter). Therefore, I will only differentiate between Yunnan and Kunming in the interview analysis where interviewees made the difference explicit. In the policy content analysis, however, I will include both Kunming and Yunnan, since provincial government are closer to designing guidelines, while municipal governments are closer to adaptation and implementation of policies and thus may enact distinct roles (cf. Lauer and Liefner 2019).

## CHAPTER 5

# **National Innovation Policy Negotiated in the Local Context: Narrative Patterns and Discourses on Innovation and Regional Development in China's 'West'**

**Author:** Anna-Barbara Heindl

**Status:** under review in *Journal of Contemporary China* as of 19 January 2020

### **Abstract**

Subsequent to the financial crisis and slowed-down economic growth, China's leaders call for innovation to provide for a more sustainable basis to China's future development. The national government thus demands the build-up of science and technology innovation capacities throughout its regional economies. However, since it is not clear how innovation and regional development reinforce each other, there is no blueprint strategy for successful innovation capacity building. This leaves room for local governments to negotiate the national government's call for innovation with their local demands for regional development – due to general innovation resource scarcity in China's 'Western' regions, it is far from certain that innovation capacity building can support current regional development processes and vice versa. Departing from sociology of knowledge, this paper posits that discourses are constitutive of policy practice. It thus focuses on narrative patterns among policy consultants to understand how innovation and regional development are negotiated in China's less developed 'Western' regions. In a comparative perspective, research on most different cases within 'the West', Yunnan and Chongqing, demonstrates that the discourse on innovation in China's 'West' is infused with general expectations on innovation as a factor for regional development. Due to resource scarcity, however, it cannot be grounded in the local context. This leads to a shift of innovation for regional development to an unknown future, while 'locally' specific narratives establish alternatives to the national government's demand to build innovation capacities. It is thus necessary to observe regional economic processes more closely to estimate China's widely predicted development towards an 'innovation superpower' properly.



## 5.1 Introduction

In 2014, China's president Xi Jinping coined the expression of a 'new normal' to describe China's current and future slowed-down economic growth subsequent to the financial crisis. While in the past, cheap labour force had been a successful driver of development, the according to China's leaders, the "new normal" now requires an increase of total factor productivity for a more sustainable development. For that purpose, they call for innovation to become the basis for economic development: in its central documents, China's national government re-emphasises the necessity to transform into a knowledge-based economy (e.g. 13<sup>th</sup> Five Year Plan 2016). Such central documents – or national guidelines – provide a general 'marching route' for the whole country (Zhong 2003). In the Chinese administrative system, subnational governments are responsible for adapting and implementing national guidelines to their local economy (Lieberthal 2004) to manage the diversity and marked disparities between Chinese regions (Liefner and Wei 2014b). Due to the obligatory character of centrally issued documents, all local governments in China will adopt these national guidelines on innovation, even though innovation resources are hardly available in some regions, while they are abundant in others (Liu et al. 2018). Yet, as national guidelines are not context-specific, it is far from clear how local development and innovation capacity building correspond to or may even challenge each other. Quite contrary, national innovation strategies seem designed for the contexts of advanced and richly endowed regions in the East of China (cf. author under review). It thus remains open how less endowed regions will and can react to this call for transformation.

To date, research on regional innovation in China misses to explore the context of innovation and regional development in less developed regions of China. To explore this link, this paper draws on the sociology of knowledge approach to discourse analysis (SKAD) to ask, how the context between innovation and regional development is constructed at the local level; it further asks, which knowledge is drawn upon when innovation capacity building is negotiated with other regional development strategies for the region. An interpretive approach to narratives on innovation and regional development is highly relevant, since it allows to work out underlying reservoirs of knowledge, which indeed may have a very practical consequence: 'Ideas and practice are constitutive of each other, (...) I see narratives as being in dialectical relationship with the practice of political economy' (Summers 2012) – thus, they are directly relevant for explaining local policy-making. The SKAD approach further allows to analyse the entanglement of regional narrative patterns with more global discourses; it helps to explain how

and why local and national policy-making and –implementation correspond or even conflict with each other.

My research focuses on narrations by regional ‘observers’, in this case, people who have (more or less) an influence on policy-making via their professions encompassing political consultancy. It compares two relatively heterogeneous regions in the less developed ‘West’ of China, Chongqing and Yunnan. The research therewith focuses on Chinese regions, which may not be intuitively compatible with national calls for innovation development. The case comparison further allows for a distinction of global and locally-specific narrative patterns with regard to innovation and regional development. Five dominant narrative patterns can be found in both regions to link up innovation with regional development – geography and the construction of difference, culturalisation, teleology, scientific theory and national government, locale – while they are related to each other differently for different purposes in each region.

The paper is organised as follows: chapter 5.2 introduces the research phenomenon of regional innovation in China. Chapter 5.3 describes data and methodology. Results of both case studies are presented in chapter 5.4, before they are compared and discussed in chapter 5.5. Chapter 5.6 provides a conclusion and suggestions for further research.

## **5.2 Regional development, regional innovation and discourses in China**

Discourses on development in China divide China’s territory into the developed ‘East’ and the underdeveloped ‘West’ (Yeh and Wharton 2016), localizing the country’s marked disparities in a regionalist perspective (Zhuang and Li 2016). The socio-economic development of China’s ‘West’ had been neglected until the 2000s as the government pursued the strategy to let the promising eastern provinces ‘get rich first’ (Liefner and Wei 2014b). However, as the disparities between China’s West and East grew constantly, China’s central government re-focused its attention to the neglected regions by releasing an encompassing development strategy<sup>11</sup> in 1999: the Western Development Strategy (WDS; *Xibu da kaifa*, Guo 2017). In the course, the central government increased its investments into China’s Western regions, especially into infrastructure mega-projects and industry and technology transfer from East to West (Yeh and Wharton 2016). Yeh and Wharton (2016), and Yu (2018), however, assess that these infrastructure investments have not yet yielded noteworthy results; not least, because the

---

<sup>11</sup> Next to the WDS the central government also released strategies for the ‘Rise of the Central Region’ in 2002 and a ‘Revitalization Plan for the Northeastern Region’ in 2003, which also lags behind the development of the east coast of China (Yu 2018, 179).

WDS rationale grounds on state interventionism rather than mobilising private resources for market-oriented development. Therefore, China's government recently links up the WDS with its grand Belt and Road Initiative (BRI) to reach out to international markets to increase the pool of resources for regional development (Yeh and Wharton 2016; Summers 2018). Nevertheless, it is questionable whether regional economies in China's West already have respective institutional and economic resources available, which enable them to establish innovation as a factor for development. The following section will look into the geography of innovation (Feldman 1994) as a theoretical reference to understand how resources and institutional arrangements may be significant for regional innovation.

The geography of innovation literature suggests that the regional level is decisive for innovation processes: spatial (i.e. regional) proximity provides for an effective exchange of resource and between a multitude of actors with particular knowledge, whose combination is necessary for successful innovation (Moulaert and Sekia 2003). These innovation-relevant resources and actors are usually classified as research capacities, (venture) capital, entrepreneurs, universities and intermediaries, such as technology brokers (Howells 2006), whose exchange is supported by an institutional and cultural framework (Cooke 1992). Geography of innovation's theory, however, is based on stylised facts (Feldman and Kogler 2011) and case studies in economically advanced regions (Saxenian 1983). Case studies on less developed regions indeed make suggestions how to understand the context of lower development and innovation, yet they do not allow for generalisation or other forms of theoretical explanation (Komninaki 2015). Thus, it is not clear, what enables innovation in regions with less abundant innovation resources and actors. Nevertheless, political and expert discourse has appointed the 'regional' level to the scale, where economic and innovation capacity development should take place (Bathelt and Henn 2017). Consequently, regional innovation policies are concept-driven and normative, orientating along 'best practice' examples rather than solid theory (ibid). Likewise, the Chinese government takes up this normative concept (Brødsgaard and Rutten 2017) to call for the development of innovation-based regional economies in the country. Yet the Chinese government cannot tell how innovation systems shall be set up China's less developed regions, which differ strongly from geography of innovation's 'best practice' examples. This is evident in Chinese policy documents: they do not give ideas on how to develop innovation capacities in a coordinated manner (Liu et al. 2017), nor on how innovation may intertwine with regional development (author under review). Therefore, it is not possible to analyse from policy documents how local governments (will) place innovation as a regional development factor, especially in resource scarce regions.

It is the more productive to research underlying knowledge structures, which actors involved in innovation (policy-making and-implementation) and regional development (planning) draw upon when negotiating the context between innovation and regional development. Despite its authoritarian system, local policy processes in China are still negotiated among different faction (Heilmann 2008), leaving room for consultancy and different representations of interest. Therefore, it is crucial to understand how different kinds of actors draw on different knowledge structures when they discuss innovation as a part of regional development. The analysis of knowledge structures will help us to understand how innovation and regional development are being linked to each other; thus, we will get access to a basic understanding, which generally resonates in the shaping of innovation and regional development. The sociology of knowledge approach to discourse analysis (SKAD) holds it that both ‘making sense of the world’ and action in a reflexive way influences and is influenced by a collective knowledge reservoir (i.e. structure) of a knowledge community (Keller 2011). With Summers (Summers 2012) this paper thus considers ‘narratives as being in dialectical relationship with the practice of political economy’; therefore, I aim to answer the question, which narrative patterns – as expressions of a common knowledge reservoir – are constructed, and which discourses are drawn upon to place innovation as a factor in regional development in less developed regions of China.

### **5.3 Method of analysis and data**

To pursue the research question, this paper draws on an interpretive analysis, which allows to work out the discursive context between innovation as a factor in regional development, to better understand policy-making and –implementation in China’s less developed ‘West’. After introducing the research areas and the sample, I will pay particular attention to the applied method of interpretive data analysis.

#### **5.3.1 Research areas**

This analysis draws on Chongqing and Yunnan province examples for China’s less developed regions, where innovation and the resources for innovation are not as widely available as in China’s advanced regions, such as Shanghai (author under review). Yet within the category of the less developed ‘West’, Chongqing and Yunnan exhibit marked disparities.

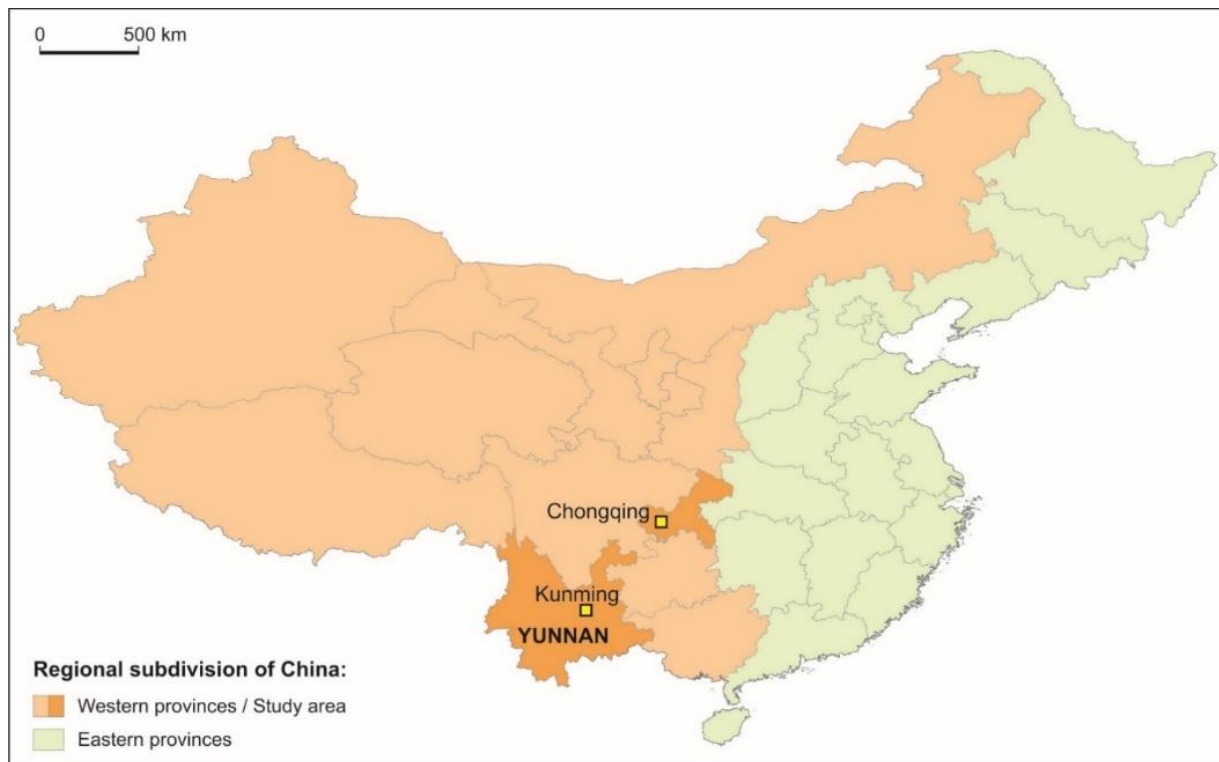


Figure 10: Chongqing and Yunnan in the ‘West’ of China as in WDS (Yeh & Wharton 2016, 289). Cartography: Stephan Pohl.

Chongqing was appointed to a ‘growth pole’ for the West of China by the national government, and subsequently integrated into the global economy from the 1990s onwards (Summers 2018). As from 1997, Chongqing gained the administrative status as a city directly under government (Li and Wu 2012). The independence of Chongqing from the province of Sichuan attracted more investment from inland sources, while at the same time local politicians were able to position Chongqing as the ‘gateway to Western China’ (Summers 2018). This importance of Chongqing as a growth pole or gateway to the West has been further supported and extended by Xi’s BRI initiative, which constitutes Chongqing as gateway to the global economy. Chongqing’s economic path development is shaped by relocation of heavy industry from China’s east coast during the Sino-Japanese war in the late 1930s resulting in industrialisation (ibid, 63). However, the early industrialisation also meant that subsequent to the communist rule, the resources were and are today still largely controlled by the government. Only in the late 1990s in the course of the WDS, the Chinese government started privatising some of Chongqing’s state-owned assets (Chen 1998). Due to the delay of central government effort to develop China’s regions ‘other’ than the east coast (Guo 2017), the overall level of development and quality of resources necessary for innovation processes in Chongqing is still rather low (Liu et al. 2018). Yet, ‘more recently, Chongqing officials have been keen to note that the city is at the top of many rankings among cities in western China’ (Summers 2018).

Yunnan, in contrast, is a province in Western China, which ranks low in many dimensions (Liu et al. 2018). Even though Yunnan also experienced a period of industrial relocation from the east coast, it did not develop solid industrialisation. In contrast to Chongqing, the province has been less central to national government development efforts (Summers 2012). Agriculture, the exploitation of natural resources and tourism dominate the provincial economy. Officials of Yunnan province foster internationalisation with neighbouring countries to promote their development, re-positioning Yunnan from a ‘remote’ and ‘exotic’ province to a ‘bridgehead’ to Southeast Asia to get the attention from the central government (Su 2014). This effort finds its echo only now in Xi’s BRI strategy released in 2013. Nevertheless, especially with regard to innovation resources, such as universities, industries, entrepreneurship and institutional support, Yunnan lags behind in the ‘West’ and Chongqing (cf. author under review; Table 9).

*Table 9: Quality of innovation resources in Chongqing and Yunnan (National Bureau of Statistics in China 2020; Kroll 2016; Liu et al. 2018).*

	<i>Chongqing</i>	<i>Yunnan</i>
<i>Administrative status</i>	City with provincial status	Province
<i>Attributed role</i>	Growth pole for the west	Bridgehead to Southeast Asia
<i>GPD per capita (Yuan) 2018</i>	65 933	37 136
<i>Average GDP growth 2009-2017</i>	18.22%	13.80%
<i>Main industries</i>	Manufacturing	Agriculture; mining; tourism
<i>Dominance of company types/ output</i>	Large-scale enterprises; SOE	Large-scale enterprises; SOE
<i>S&amp;T quality</i>	Small public research basis	Small public research basis
<i>R&amp;D expenses in 100 Mio Yuan</i>	36.463 (2017)	10.936 (2015)
<i>Local government expenditure on S&amp;T in 100 Mio Yuan (2017)</i>	59.31	53.42
<i>Total growth of expenditures 2009-2017</i>	281.41%	181.31%

Therefore, with regard to the overall development of China, the case selection conforms to a similar-case-design: both regions of interest are located in China’s less developed West. When considering the disparities within the West of China, however, the case selection constitutes a different-case-design. This case selection for comparison allows to draw more general conclusions on China’s West, but also on the particularity of regional contexts with regard to innovation and regional development.

### 5.3.2 Sample

For the interpretive analysis of narrative patterns and discourses, I draw on the sociology of knowledge approach to discourse analysis (SKAD). Using interview data, SKAD allows to work out individual agents' narrative patterns and how those are related to (global) knowledge structures. I draw on such individuals who have contextual knowledge (Meuser and Nagel 2002) on local innovation conditions and regional economic development; these interviewed 'observers' share (more or less) knowledge on two contexts of action: first, the situation of local companies and their needs with regard to innovation and development, and second, on policy processes and politics with regard to innovation and regional development in their respective region. This focus on the observers' perspective therefore does not only allow for an analysis, which national discourses affect regional policy-making, but is also able to take alternative narrative patterns and their relation to the local context critically into account. The sample is structured as follows, which was accessible through snowball sampling and arrangements through the personal network of my Chinese research partner<sup>12</sup>:

Table 10: Sample structure. Own elaboration.

<i>Sample</i>	<i>Chongqing</i>		<i>Kunming / Yunnan</i>	
	<i>No.</i>	<i>Label</i>	<i>No.</i>	<i>Label</i>
<i>Scientists/ researchers on innovation and regional economics</i>	3	CQ-S	4	KM-S
<i>Academies of Sciences/ policy-advisers</i>	1	CQ-P	/	KM-P
<i>Intermediate organization managers: incubation services; science &amp; industrial park/ development zone managers; IP and FDI managers</i>	5	CQ-I	5	KM-I
<i>S&amp;T Department staff</i>	1	CQ-G	2	KM-G
<i>Total no. of interviewees</i>	<i>10</i>		<i>11</i>	

I collected my interview data in Chongqing (10 interviews) and Kunming (for Yunnan, 11 interviews) between September 2017 and September 2019 in semi-structured interviews of 1-2.5 hrs duration each. The interview structure changed throughout the research process: the typical qualitative-iterative design guaranteed for theoretical saturation regarding innovation and regional development in each region. Since I am not proficient in Chinese or other

<sup>12</sup> For a discussion on the decisive role of research partners for field access in China, see Alpermann 2012.

languages spoken in Yunnan and Chongqing, my research team and I conducted the interviews in Chinese and English with simultaneous English translation where applicable. The interviews were recorded and later transcribed in English and Chinese. The Chinese part of the interviews was additionally translated into German by a Chinese colleague with German philology training. The translation was conducted as close to the Chinese original as possible.

### 5.3.3 Articulation analysis

Kruse and Schmieder (2012) draw on the interpretive paradigm to show that an interpretive approach to texts in the research context of foreign languages and cultures is particularly important to separate the researcher's own system of 'making sense' (Schütz 2004) from the that of the text to avoid 'over'-interpretation. Since SKAD provides a research perspective rather than a concrete method (Keller 2011), I developed my own approach based on the discourse analysis method by Glasze et al. (2009), which had to be adapted to the specific requirements of interpretive approaches to texts in foreign language: since I lack linguistic understanding of Chinese, I needed an approach, which allows for a separation of the Chinese interviewees' systems of making sense, and mine. The adapted method thus had to provide for an explication of the interviewees' 'way of speaking', requiring an analysis as close to the text as possible. At the same time, the method should not neglect the content level beyond power-relations produced through language, which usually constitute the focus of scholars working on and with foreign languages (conversation analysis: Berkenbusch (2012), positioning analysis: Kruse and Schmieder (2012)).

Glasze et al. developed their method of coding for discourse analysis on written media documents, but their approach is also applicable to interview data. They focus on discourse elements – words, a word sequence or a semantic concept –, and articulations – connected discourse elements – to conduct their analysis. Discursive articulations are thus a result of repeatedly produced connections between two or more words or word sequences to form a discursive structure (Glasze et al. 2009) – or, narrative pattern (Glasze 2013). To work out these articulations in a structured way, Glasze et al. (2009, 296) suggest a framework for categorising the quality of the connections between the elements: relations of equivalence, of opposition, of causality and of temporality.

In my approach, I pre-defined elements to code the interview data. I coded the material according to the elements 'regional (economic) development', 'development', 'innovation', and 'regional innovation system' across the interviews, resulting in 114 assertions from Kunming interviewees and 83 assertions from Chongqing interviewees. In contrast to Glasze et



al. (2009) for whose discourse analysis it is important to code re-appearing word (sequences) and semantic concepts in media documents, my coding strategy of pre-defined elements was less focused on specific expressions. Rather, my coding included all paragraphs that were content-related to the abovementioned elements. Next, I analysed the English and German translations of the assertions, resp. English transcriptions by categorising particles, especially conjunctions, according to the quality of relations, i.e. equivalence, opposition, causality and temporality as a basis for interpretation. The structure of each coded assertion was cross-checked with the simultaneous translation during the interview (Kruse et al. 2012). While Glasze et al.'s (2009) discourse analysis is particularly interested in how quality relations reappear and re-connect in their texts, in my approach to interview data they were more important to make the 'way of reasoning' explicit in each sentence. Framed by this, I was still able to focus on the contents, while supplementing the analysis by a close control of their representation by the interviewees. For interpretation, I further drew on Alpermann and Fröhlich 2017, Alpermann and Selcuk 2012, and Alpermann 2012 who outline the main conversational and grammatical signifiers in Chinese conversation and discourse to cross-check the basis of my interpretation of how assertions were presented by the interviewees. Such an approach finally allowed for an analysis of narrative patterns across interviewees, examining regional differences in argumentation. I found that some of the emergent narrative patterns were related to other more global discourses, so that I could also trace a common knowledge reservoir beyond the regional context.

#### **5.4 Results**

To address the question which narratives are constructed and which discourses drawn upon to place innovation as a factor in regional development, particularly in less developed regions of China, the comparative feature of this analysis is especially important: it allows to examine how and to which extent narrative patterns may be more general for less developed regions in China to conclude on a more global knowledge reservoir. Therefore, the following presentation of results will focus on narrative patterns, which both Chongqing and Yunnan interviewees construct on the relationship between innovation and regional development. These topical patterns, however, are differently structured and aim at different purposes in the different regions. The main narrative patterns by both Chongqing and Yunnan observers, which link innovation with regional development are: geography and the construction of difference; culturalisation; teleology; scientific theory and national government; locale.

### 5.4.1 Yunnan

#### *Geography and the construction of difference*

By referring to Yunnan as a ‘border region’ located at the ‘margins’, the interviewees explain Yunnan’s lack of spatio-economic functionalisation. This neglect of economic functionalisation is for one related to the fact that keeping political stability is considered a more important task for Yunnan: ‘(...) *from the perspective of location, political stability is more important than economic development in China's border areas*’ (KM-S2-1). For the other, Yunnan’s disadvantageous ‘*geographical space*’ (KM-I2-20), which is ‘*not very convenient for transportation*’ (KM-S3-1) is made responsible for the fact that Yunnan’s economy is hindered to develop in the same fashion as China’s more advanced regions. The observers further include Yunnan into the global discursive construction of the ‘West’ and ‘Southwest’ (Yeh and Wharton 2016), which is ridden by a severe lack of resources. Drawing on Yunnan’s belonging to the ‘West’ and ‘Southwest’, they actively construct a difference to the ‘East’, the ‘Coast’ and the ‘North’ to make and higher-ranking authorities and other circumstances and actors than themselves responsible for Yunnan’s developmental deficit. An interviewee talks about expected benefits from the BRI initiative with ‘*We have been waiting for many years*’ (KM-S1-5) to construct Yunnan’s economic and political actors as passive and dependent on national government impulses for development. This construction of passivity through belonging to the underdeveloped ‘West’ seems necessary, since the observers consider the lack of local resources as too decisive to enable endogenous (innovation) development. Even though Yunnan’s officials have indeed made independent efforts to development by establishing their province as a bridgehead to Southeast Asia well before BRI, the Chinese authoritarian system still requires acknowledgement by the national government before local strategies can be put into practice (Summers 2012, 2013). This might explain why the observers do not grant themselves an active role, but rather wait for impulses from above: the observers see the national programmes WDS and BRI decisive for future development, which they expect to deliver a favourable spatial functionalisation in the future.

When arguing the reasons of Yunnan’s current state of regional development, the observers hardly consider innovation as an element for development, since local resources are too scarce. Future imaginations, however, indeed take innovation for development into account: Some observers are able to construct a positive differentiation of Yunnan and the ‘West’: the overall positive regard of Yunnan’s ‘*diversity of regional characteristics. Geographical characteristics, cultural diversity, diversity of biological resources*’ (KM-S3-1) renders it possible to imagine

a future orientation of economic development along these particular characteristics. Therefore, they see the right to an own development path, especially since the higher-order belonging to the ‘West’ and thus, their underdevelopment, is not their own ‘fault’: ‘(...) *from the perspective of resource allocation and resource combination in our geospatial space, I think that the innovation of Yunnan in the future will still be very different from the coastal areas. Go out of your own path*’ (KM-I2-15). With this emphasis on their particular resources, the observers echo the recent and strong dedication of the national government to solve ecological problems, reinforced by an interviewee as: ‘*Xi Jinping has said that green water and green mountains are the golden mountain and silver mountain. An important way is ecological compensation in [for] developed areas*’ (KM-S2-4).

### ***Teleology***

When talking about the role of innovation for regional development, the observers generally draw on a teleological understanding of development. That means they understand economic development to proceed in pre-defined steps towards a final end, whereas Yunnan has not yet reached the (final) level of an innovation-based economy. Most of the observers, however, agree that it is ‘*very necessary, very necessary [for Yunnan] to be in an era of innovation*’ (KM-S3-2). The argument of step-wise development constitutes a teleological understanding of history and development basic to CPC’s state ideologies of Confucianism (Lieberthal 2004) and Marxism (Sayers 2019). It is closely related to the notion of catching-up, which used to be central to Chinese national innovation policies (Zhou and Liu 2016). The lack of resources for innovation makes it necessary to detach their explanations how innovation and regional development relate to each other from the local context. They shift all innovation capacity building efforts discursively to the (teleological) future, drawing *on national leaders’ thoughts and scientific theories*, as well as national guidelines and innovation strategies instead of local examples; they do not develop ideas about concrete measures and ideas how to reach the goal of establishing an innovation-based economy. Due to the lack of local points of reference for innovation, they do not explicitly link innovation to the next steps on the development path. Instead, the observers draw on the vague national strategies of BRI and WDS to argue for spatial functionalisation as an effective tool to leverage development in the future.

### ***Locale***

The observers mostly draw on a narrative pattern of teleology to explain an ideal or future context between innovation and regional development in Yunnan. When the observers draw on

the locale for explaining this context, they argue that there is currently no notable contribution of innovation to the economy in Yunnan. In negative ways, they relate to resource scarcity or culture (cf. next paragraph) as a reason for missing science and technology (S&T)- innovations. One interviewee even criticises that Yunnan is supposed to innovate for the sake of national politics, not for the end of development in Yunnan: *'Because innovation entrepreneurship is good for the whole country, it can promote the development of economy. But (...) we cannot innovate for the sake of innovation'* (KM-S3-3). In a more productive way, the observers refer to the local context to establish their independence from national government, similarly to how they use the 'West' to argue for their own advantages: natural resources have great potential for a non-S&T, alternative path of development. Therein, they even argue that the local government is much more knowledgeable on the local situation so that it is potentially able to develop more appropriate policies and measures for the Yunnan case. However, they criticise at the same time that the local government intervenes too strongly into the economy, so that the driving force of innovation to date is the state rather than the market.

### ***Culturalisation***

While geography and the construction of difference are used to reason the lag of economic development, the observers draw on culture to explain the absence of innovation. They hold that the local population and companies do not have the capabilities nor the cultural premises to build up innovation resources independently; local Yunnan people are *'(...) feeling their life is relaxed, so they think, so I'm so relaxed, why am I working so hard to find a trouble for me (laughing) to develop a new technology or to pay more attention on the innovation (...)'* (KM-I1-5). More directly, an interviewee holds it that Yunnan's cultural diversity is responsible for the lack of innovation: *'(...) Yunnan is a city that we have a lot of different kinds of people and also, it's a city that close to many different nations so (...) that they struggle in different kind of cultures, different kinds of thinking's, ideas, so that makes they cannot just focus on one target'* (KM-I4-12). Innovation is here understood as something alien to the local context and to the local markets. This may be related to how the Chinese discourse (also reproduced in WDS, (Barabantseva 2009) treats ethnic minorities in China: by essentialising their ethnicity, modernisation and development is not considered compatible with their ascribed folkloric way of living. Particularly Yunnan is home to a multitude of different ethnic groups, constituting about one third of the population. At the same time, all my interview partners were Han Chinese, the biggest group in China, which dominates in size and powerful positions (ibid, 242; 250). It is hence well imaginable that the interview partners draw on this hegemonic discourse to

explain the lack of innovation and at the same time, to distance themselves as Han from the deficit in innovation activities.

Hence the observers see a significant lack of Yunnan people's initiative, therefore they see the need for the state to establish an innovation environment: to date, there are no capacities and neither the cultural precondition in the private sector for innovation. Similarly to the use of geography, the local observers draw on characteristics that are hard to change to make government authorities responsible for innovation development. On the other hand, culturalisation is also being used in a positive way to establish local independence. Culture and cultural diversity as a particular asset of Yunnan is marked as a difference to hi-tech innovations. Due to resource scarcity, the S&T-innovation type is not an option for Yunnan's regional development; the more, the observers appropriate Yunnan's culture and folklore as an advantage to drive economic development via tourism and innovation via marketing strategies, resonating government efforts to commercialize ethnic minorities beginning in the 1990s (Litzinger 2004). Culturalisation is thus used to diminish the predominantly S&T-oriented demands for innovation by the national government (Zhou and Liu 2016).

The narrative patterns thus link up to the following argumentation pattern:

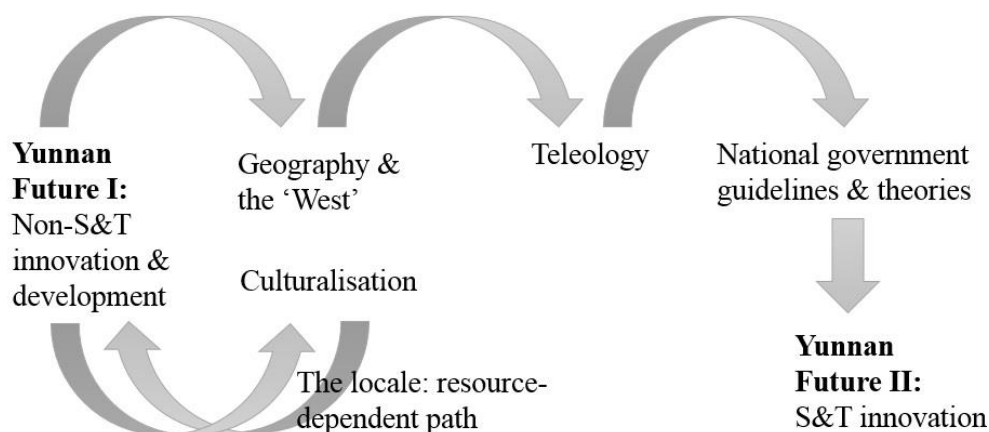


Figure 11: Argumentation pattern on the context of innovation and regional development in Yunnan. Own elaboration.

## 5.4.2 Chongqing

### *Geography, the construction of difference and culturalisation*

Similar to Yunnan observers, Chongqing interviewees place Chongqing in the 'West' of China. They construct a difference between the 'West' and the 'East/ Coast' for three different purposes, which are linked to the narrative patterns of culturalisation and independence in the locale. One, they draw on the discursive construct of the 'West' to defend the current structure

of the Chongqing economy, which is not (yet) driven by innovation. The recourse on the ‘West’ thus serves to give up responsibility for the current state of development to the national context. The observers culturalise innovation as a concept of China’s east coast, which does not conform to the Western ‘way of thinking’: *‘Because Chongqing, as the central city of the western region, (...) conceptually, from the overall thinking, it should be said that there is a certain difference with our coastal developed regions. This also determines the limitations of the ideological concept, which also determines that in the subsequent stages of technological innovation, capital investment and policy, some changes in thinking at all levels (...)’* (CQ-I3-4). However, all Chongqing observers hold that Chongqing’s culture has to be transformed in order to embrace innovation in the future. In contrast to Yunnan observers, CQ-I3 and CQ-S2 relate it to state capacities that innovation is *‘not as deep-rooted’* (CQ-S2-6) in the ‘West’ as in the ‘East’: *‘Our department and internals from the Western region (...) are not the same [like the eastern regions’], and (...) the understanding of innovation is still very short’* (CQ-S2-6); in Yunnan, culturalisation is more directed towards private people. In the ‘West’ and thus, Chongqing, the lack of innovation in the economy is related to wider systemic problems: the provincial and local governments do not only miss the apt way of thinking to enable innovation, they also hinder innovation by neglecting market forces and intervening too much.

### ***Geography, the construction of difference and the locale***

The ‘West’ is further used to defend the situation that Chongqing is not innovation-driven in comparison to the eastern provinces. Since the ‘West’ is an underdeveloped region, Chongqing does not have the opportunity to and should not (yet) focus on innovation. Industrial development regardless of knowledge as a contributor is marked as much more important than enhancing innovation per se. Here, the negative approach to the ‘West’ as an underdeveloped region thus serves, similar to Yunnan, to constitute independence from national government, or at least reduce the demand of national innovation guidelines by constructing an own regional path to development. Three, similarly, in a more positive reference to the ‘West’ as an underdeveloped region, the observers produce Chongqing as a city, which is at the forefront of development in the ‘West’ (Summers 2018) – even though in this respect, they do not link this positive development to innovation. If they refer to innovation as an important aspect of Chongqing’s economy, it is to sketch the future, imagined context between Chongqing-specific industries and innovation – which is, at the moment, not realisable due to inappropriate policies and government behaviour. However, the global discourse of uneven development between the

‘West’ and the ‘East’ generally superposes the local context when observers explain the relationship between innovation and regional development.

### ***Scientific theories, national government and teleology***

Like in Yunnan, the general approach to development is based on a teleological understanding. The observers see Chongqing in a relatively low stage of development, which is to explain why Chongqing’s economy produces, if at all, innovations on a low level; that means, imitational innovation and adaptive innovation, which does not require much S&T. This teleological account of Chongqing’s state of development requires further theoretical arguments to thoroughly explain the relationship between innovation and regional development – while it is, at the same time, hardly possible to draw on the missing local context to relate innovation to Chongqing’s current situation. Innovation is therefore constructed as a demand by the national government on the local economies in China, which is consequently not explained by drawing on the local context. While the observers draw on the ‘West’ to argue why innovation is difficult to establish in Chongqing at the moment, they refer to national government guidelines to imagine the future context between innovation and Chongqing’s development. They state that *‘the central government can grasp some situations through different aspects. How to mobilise the enthusiasm of enterprises through optimising policies, how to let different places get some development opportunities from innovation’* (CQ-I1-2). Observers reproduce such a stance by linking the Chongqing situation to the national slogans, which demand a change *‘from high-speed development to high-quality development’* (CQ-I5-1) and a *‘leap forward’* in the mode of *‘leaping development’* (CQ-I3-10/11). Similar to what the reference to the *locale* has already indicated, the observers do not have any opportunity to argue the need for innovation from the current local context. Rather, they draw on teleological understanding of development and national guidelines and theories to give significance to innovation for the Chongqing context and thus reproduce innovation as a national endeavour rather than a locally emergent phenomenon. The teleological approach to innovation as well as national demands thus superimpose the relationship between innovation and regional development from local examples and stories.

From such an account of teleological understanding interrelated with national government task to provide for innovation strategies, the observers deduct a need for (better) government guidance to create innovation capacities. In contrast to Yunnan, the Chongqing observers see a potential for innovation due to Chongqing’s industrialisation. That means, they can imagine innovation as a part of Chongqing’s economy in the future, even though currently they look for

reasons and guidance to the national government; this may be due to the fact that they see the problems that the ‘West’ imposes on Chongqing more decisive than Chongqing’s local situation, which they could take responsibility for. The future imagination of innovation as a contributor to economic development is thus based on theory rather than local context.

The narrative patterns thus link up to the following argumentation pattern:

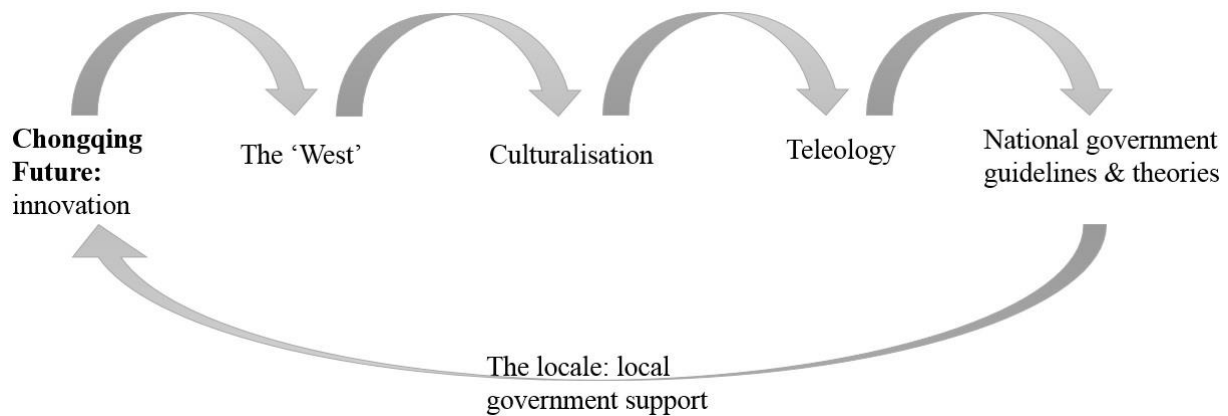


Figure 12: Argumentation pattern on the context of innovation and regional development in Chongqing. Own elaboration.

### 5.5 Case comparison

The following case comparison serves to understand, which narratives and discourses become significant due to the local context, and which narratives may be subject to more global knowledge reservoirs in China’s less developed regions with regard to innovation for regional development. In general, the analysis shows that Yunnan and Chongqing observers construct similar narrative patterns and draw on the same national discourses. They do so, however, for different purposes, which is mirrored in differing argumentation patterns (Figure 11 & Figure 12).

#### *Case commonalities: discourse of inequality and teleological approach to development*

In both cases, the argumentation patterns of Yunnan and Chongqing observers draw on the discourse of inequality between the ‘West’ and the ‘East’ to render local responsibility for the current state of development. With that, they assign the task to initiate development to the higher-order national government. They can make the national government responsible by drawing on a common teleological understanding: since they consider development towards an innovation-based economy as a necessary development, they look towards the ‘experienced’ national government and its plans and theories to design their upgrading strategies. Local resources are currently not sufficient to design a strategy completely on their own (Table 11).



Table 11: Narrative patterns and their link to global discourses. Own elaboration.

	<i>Narrative patterns</i>	<i>Link to global discourses – Yunnan</i>	<i>Link to global discourses – Chongqing</i>
1	<i>Geography &amp; construction of difference</i>	Discourse on inequality between the ‘West’ and the ‘East’ of China	Discourse on inequality between the ‘West’ and the ‘East’ of China
2	<i>Teleology</i>	Marxism, Confucianism; national discourses on innovation	Marxism, Confucianism; national discourses on innovation
3	<i>The Locale</i>	Discourse on natural resources and ethnic minorities	Discourse on inequality between the ‘West’ and the ‘East’ of China
4	<i>Culturalisation</i>	Discourse on natural resources and ethnic minorities	Discourse on inequality between the ‘West’ and the ‘East’ of China

### ***Case differences: culturalisation and the use of the locale***

In Chongqing (Figure 12) emerges an argumentation pattern holding the national and local state jointly responsible for building up an environment for S&T-innovation. Chongqing has basic resources, e.g. industry and universities, for such a, however, future, endeavour available, while the positive culturalisation of the ‘East’ is used to argue that national government plans and theories are still necessary to enable the ‘alien’ concept of innovation to take root in Chongqing.

In Yunnan (Figure 11), observers draw exclusively on national government plans and theories to argue for an innovation-based economy in the future. The reason here is that Yunnan has hardly any basic local resources available, which would allow for a locally-determined design of innovation development strategies (Heindl and Liefner 2019). Therefore, national government plans and theories are used to outline the development of an innovation-based economy in the future, but are not filled with experience or resources from the local context. To maintain independence from national government, however, the observers culturalise Yunnan in a productive – even though still derogatory – way, linking up to more global discourses on diversity in Yunnan (Litzinger 2004): by appropriating Yunnan’s unique natural and cultural ‘resources’ they argue for their own path to development, which is not necessarily connected to S&T-innovation, but some other yet undefined form of creating new economic value.

In conclusion, while Chongqing observers manage to integrate the national government’s demand into their future imagination of innovation for development by referring to their own resources, the Yunnan observers are devoid of local resources and must oppose national government S&T plans to maintain independence, in spite of a common understanding of development between the national and local scale.

## 5.6 Conclusion

The comparison of both case studies results in conceptual lessons for innovation policy research and for the geography of innovation in China. It was shown that local knowledge is always co-produced through global discourses, which constitute a common knowledge reservoir across regions in China. Therefore, the national scale and the local scales are not only intertwined with regard to administrative organisation, but also in a discursive sense. Despite decentralisation and local policy experimentation (Teets et al. 2017), this research suggests that in a discursive sense, the national scale might strongly determine the understanding of innovation development in the locale via ‘general beliefs’; among policy-makers and consultants, innovation is thus portrayed as an abstract concept, which does not necessarily result endogenously from local contexts in less developed regions. Therefore, a theoretical orientation as given by China’s national government seems necessary in these regions to ‘artificially’ construct innovation environments. That regional innovation capacity building in developing regions is an *ex ante* (Padilla-Pérez et al. 2009) and widely normative endeavour (Bathelt and Henn 2017) becomes obvious when discourses render the national government inevitable for local innovation development, and at the same time aim to reproduce their local independence – this antagonism between local independence and guidance by the national government shows that it is far from clear how innovation capacities can and should be developed in the local context. This implies that innovation can neither be identified as a factor for leveraging, nor as a ‘natural’ result of economic development in China’s less developed regions. This is an important insight insofar as research in economic geography and resulting academic consultancy (Crescenzi and Rodríguez-Pose 2012) on regional development is often uncritical towards narrative patterns and discourses co-constructing their ‘factual’ results (Barnes et al. 2007).

In conclusion, this research has shown how important the discursive dimension for understanding regional innovation policy-making and -implementation is. There is thus a greater need for critical (SKAD) approaches to complement the geography of innovation, where analytic approaches and normative policy-making are mostly not explicitly differentiated. Furthermore, this research calls for a spatially differentiated view on innovation capacities in China to properly estimate China’s widely predicted development towards an ‘innovation superpower’, which is predominantly argued for from a national innovation systems perspective.

# CHAPTER 6

## Conclusion

### 6.1 Summary

Upon the research question, which conditions explain regional innovation in (the ‘West’) of China, this dissertation as shown on a general level, that context sensitivity is crucial; ‘Western’ ‘best practice’ concepts of innovation systems cannot be adopted in an undifferentiated manner.

The first article contributed to this understanding by asking, how to better compare qualitative regional innovation system characteristics across China systematically. For that purpose, the article drew on the multiple criteria decision making tool ‘Analytic Hierarchy Process’ used predominantly in Business and Management Studies. The systematic comparison of ‘typically’ Chinese innovation system features in four most different regions of China, Beijing, Shanghai, Chongqing and Kunming was accompanied by a revision of the tool’s quality indices. The critical handling of the method thus showed that it is not possible to identify ‘typically’ Chinese innovation system features in China’s less developed regions. This called for a closer scrutiny of conditions relevant for regional innovation activity in China.

The second article therefore asked how regional innovation conditions in China’s less developed regions may indeed be conceptualised, and what its specificities are in driving regional innovation processes. The study drew on the RIS concept to analyse the framework conditions for innovation in Chongqing as a case, which exhibits developmental deficits in comparison to China’s innovation frontier regions, but a certain catching-up dynamic, providing for a minimum of observable innovation activities. This research based on theoretical coding showed that framework conditions are not equal for all actors in Chongqing, but are rather exclusive; in the case of China, the notion of separate RIS within one region along an actor divide is particularly helpful to assess China’s regional progress in changing its innovation model from a government-controlled towards an open and independent innovation system. At the same time, the notion of separate RIS helps to take innovation types alternative to S&T into account and thus, critically widens the perspective for alternative paths to regional innovation development.

Article two has additionally demonstrated that the national and local government still play an important role in regional S&T-innovation capacity building. Therefore, the conditions local

governments face to transform the innovation model from government-control to open innovation needed clarification. The third article thus draws on a comparative qualitative content analysis to examine, which conditions are decisive for the adaptation of the ‘new’ open, and/ or for the maintenance of the ‘old’ government-controlled innovation system strategy. The particular focus on government behaviour adds up to the results in article two, which focused more broadly on innovation conditions for a diverse set of actors in Chongqing. The research contrasting the cases of Shanghai, Yunnan and Chongqing demonstrates that the application of old and new innovation system strategies is dependent on the availability of (S&T) innovation resources, which in turn shape incentives for local officials. In Chongqing and Yunnan, where less (S&T) innovation resources are available, local officials are inclined towards fostering government-controlled innovation processes to guarantee for fast, even though not necessarily sustainable, success. This fast success is favoured over the support of private actors and independent (non-S&T) innovation processes, since it better aligns with wider regional development plans.

Article four asked, which narrative patterns are constructed, and which global discourses are drawn upon to place innovation as a factor for regional development in less developed regions of China. This question results from article three, which indicates that innovation capacity building in resource scarce regions is an *ex ante* endeavour for regional development. Such an *ex ante* innovation capacity building is consequently dependent on local officials’ conception of innovation, who thus initiate such a capacity building through policies and other impulses in the first place. Results from a comparative analysis of Yunnan and Chongqing show that in China’s ‘Western’ regions the role ascribed to innovation for regional development is shaped by a general understanding of innovation, which is not embedded in local narratives. The local context is thus not necessarily the reason for local policy-makers to construct innovation capacities. This links up to the finding in the previous article, which showed that incentives for local policy-making might depend on national government rather than place-based local development. This research further sensitises to the fact that ‘factual’ results in research and policy-making on regional innovation systems as *ex ante* conceptions are always co-constructed through general knowledge reservoirs – and not necessarily dominated by ‘local’ empirical knowledge.

## 6.2 Main findings

This dissertation raised the question, which conditions explain regional innovation in China, and particularly in its less prosperous ‘West’. Main findings resulting from the four studies will be discussed in the following section.

### *(1) Conceptual findings*

The dissertation has found that explanations for regional innovation activities differ with the definition of innovation. ‘Western’ (Cooke 1992) or developing countries’ RIS frameworks (Padilla-Pérez et al. 2009; Fiore et al. 2011) might productively explain regional innovation system frameworks for high-tech innovations in China. The conceptual consideration of low-tech and frugal types of innovation, however, allows to grasp developmental dynamics particular to China, in a much differentiated way: since the Chinese government favours nearly exclusively high-tech innovations, their exclusive consideration leads to a static understanding of governmental roles in innovation processes. Sensitivity towards other types of innovation, for which the Chinese government controls less resources, opens up a more differentiated perspective on conditions for regional innovation. It is consequently able to consider the changing relationships between the state and the actors outside the state in a more differentiated manner; it further allows for a perspective on regional pathways alternative to S&T, which are currently re-emphasised in the evolutionary perspective on innovation geography (cf. Trippel et al. 2017). It is thus important to consider exactly these changing roles of government called for in the national innovation guideline on open innovation. This research has shown how they become particularly effective in the local perspective: local contexts provoke different government behaviour with regard to innovation, differentiated by both ‘West’-‘East’ conditions, and ‘local’-‘national’ interests.

This finding is further reinforced by the consideration of attitudes towards innovation in China’s less developed ‘West’ in this dissertation. The reconstruction of the role global discourses play in innovation policy consultancy in China’s ‘West’ sensitises research to the sources of innovation capacity building impulses. While quantitative model-based research may observe dependencies between particular innovation system indicators, discourse analysis contributes to understanding *how* these dependencies come into effect in the first place. Interpretive approaches focusing on individuals’ action and ‘making sense’ thus provide for a better understanding, how and why regional innovation system building is approached in the local context. This is important, since it allows to disentangle normativity and academic ‘facts’.

These are inevitably intertwined in RIS research, since the concept is as much a normative policy tool as it an analytical framework (cf. Bathelt and Henn 2017, 457).

## *(2) Empirical findings*

The regional contexts of innovation are further strongly shaped by China's regional disparities. In the 'Western' cases, many private and small companies lack capabilities to participate in S&T-innovation processes fostered by government. Therefore, they have to search for alternative innovation resources independently. In the case of Chongqing and Yunnan those may not be abundant, whereas in Shanghai there is a bigger pool of innovation resources to source by private companies. Innovation policy-making and implementation is likewise dependent on the availability of local innovation resources. Despite the obligation to comply with national guidelines on capacity building, local governments align their local strategies with wider development plans directed at fast economic growth. The control of government resources, and consequently, the fostering of S&T-innovation processes, is more attractive to local officials in regions, where resource scarcity and low(er) economic development incentivises to favour growth over capacity building. A major empirical finding is thus that the local resource endowment is a decisive precondition for local governments' behaviour with regard to innovation capacity building: officials in regions of China's 'West' with less resources are less likely to support the construction of the 'new' open innovation system, since it is too risky. Instead of utilising private resources, such as private companies, the governments err on the side of caution and maintain control. Thus, the incentives for local policy-making and -implementation issued through China's political and economic system differ from democratic, capitalist market systems in the 'Western' world, where relevant theoretical concepts on regional innovation originated. Therefore, it might not be appropriate to distinguish the case of China along the dominant developed countries - developing countries divide for RIS research (cf. Padilla-Pérez et al. 2009), but rather along that of liberal capitalist market vs. government interventionist economies.

This dissertation has thus demonstrated that it is necessary to take China's regional context and disparities into account when assessing its efforts to transform into a knowledge-based economy. In China's less developed regions, the state still controls much of the scarce(r) innovation resources. Incentives to give up control in favour of open innovation are lacking. The most intriguing question for the moment is thus, whether the state's capacities to shape and drive regional innovation systems are sufficient to live up to its goal to make 'science and technology the primary productive force' (Hu et al. 2018, 22) of China's economy. If the state cannot fulfil

such a crucial role in its resource scarce regions, it is at least questionable, whether China's national economy will manage to increase its high-tech innovation capacities throughout the country, or whether its significant innovation capacities will remain limited to its frontier regions (Huggins et al. 2014). On the other hand, increasing global integration and growing domestic markets (Peighambari et al. 2014) hint at the necessity to be more aware of alternative, co-existing paths to regional innovation systems outside state control.

### ***(3) Findings for policy discussion***

With regard to policies, the findings link up to the current debate on place-based policies (Duranton and Venables 2018; Lu et al. 2015; Neumark and Simpson 2 March 2015). China is experienced with place-based policies targeting 'areas, rather than people or firms' (Neumark and Simpson 2 March 2015): the national government has set up Special Economic Zones as early as the opening reforms in 1979; first in the 'East', and later in the 'West' of China. Place-based policies are designed by governments to positively influence the location of economic activity within their administrative territory (Lu et al. 2015, 2). Considering this dissertation's finding that in China's 'West' the government holds a relatively strong control of innovation resources, it is intuitive to think that China would be particularly effective in applying place-based policies for innovation capacity building. Lu et al., however, find that in China 'a zone program's effectiveness depends crucially on the design of the policies' (2015, 19), and thus hint at the necessity 'to pay close attention to the circumstances of the agents influenced' (ibid). That means, the local social context, as represented by the RIS framework is thus crucial for successful place-based innovation capacity building. This research, however, has shown that incentives for local innovation policy-making and –implementation do not consequently orientate along the needs of innovation agents; particularly not along those of private, non S&T-innovators. Innovation capacity building rather competes with a range of other, nationally conditioned incentives – such as fast vs. sustainable growth, and government control vs. open innovation. Therefore, the perspective on the local context might be already existent in China's repertoire of strategies to promote economic development, but general challenges in the authoritarian economic system seem to hamper the design of truly place-based policies with regard to innovation capacity building. From the (limited) perspective of this dissertation, it would thus first of all require a democratisation of local economic processes, before place-based innovation policies were able to provide for a sustainable and encompassing construction of innovation capacities in China's 'Western' regions.

### 6.3 Limitations and future research

This dissertation faces several limitations with regard to the research design (1), and methodology and empirics (2).

#### *(1) Limitations of research design*

This research has drawn on two regions from China's 'West' to research the interdependencies between innovation and regional disparities. Chongqing and Yunnan both cover provinces, which are subject to the national government's 'Go West'-strategy. To level regional disparities, the national government has, however, introduced further substantial development plans: the 'Plan for the Rise of the Central Region' (2002), covering the provinces of Shanxi, Henan, Anhui, Hubei, Hunan and Jiangxi, and in 2003 the 'Revitalization Plan of the North Eastern Region' (Yu 2018), covering Heilongjiang, Jilin and Laoning and the five eastern prefectures of Inner Mongolia. Those plans introduce macro-level strategies different from that of 'Go West', which might induce yet other conditions significant for regional innovation capacity building. Further, the research focused on provinces and cities, without considering rural areas and their dynamics in particular. Disparities between urban and rural areas are at least as substantial as between the 'West' and 'East', yet this dissertation was not able to elaborate on this in particular; it thus remains open for future research, how intra-provincial disparities affect innovation capacity building efforts. The conceptual development in this dissertation, however, indicates that it is worthwhile examining innovation processes in the rural, which might surprise us with their contribution apart from S&T to economic growth and development.

#### *(2) Methodological and empirical limitations*

This dissertation highlighted that the Chinese government nearly exclusively aims at fostering the S&T-type of innovation, in the 'West' predominantly through state-controlled resources. Drawing on theoretical considerations on other types of innovation, such as low-tech and frugal innovations, it has also argued conceptually that there may indeed be a realm for innovation apart from high-technology and state control. However, this argument is based on anecdotal evidence rather than solid empirical description, foremost because innovation processes and output of other than S&T-types are to date hardly measurable (cf. Bennat and Sternberg 2020) – and neither to be mapped with qualitative methods as applied here. Regional innovation systems comprising these forms of innovation follow different system functionalities by applying different learning processes (Dong and Flowers 2016; Warnke et al. 2016; Jensen et al. 2007). Particularly in China, it thus remains open, first, to which extent and how these 'other'



innovation processes take place; second, how the regional dimension influences their emergence; third, how they contribute to regional economic growth and development, particularly in China's highly diverse regions. This dissertation thus suggests that future research should elaborate on how to measure these other types of innovation sensitive to the Chinese context; it should further pay closer attention to these innovation processes apart from (high-) technology not least to critically question the roles the Chinese state plays in potentially different paths to regional innovation.

The role of the state in innovation has recently been drawn back to the spotlight of academic discourse: Mariana Mazzucato's 'entrepreneurial state' (2013) has instigated a debate on the role the state plays – and *should* play – for technological innovation. China's state interventions into the economy seem an interesting sparring partner for such considerations: China's authoritarian system indeed differs from the democratic market economies Mazzucato draws upon, and is rather feared than praised by the international community for its interventions. Since this research drew on qualitative methodology, it was able to identify conditions underlying innovation capacity building processes in China's regional economy – it was not, however, able to judge the efficiency, nor the normativity of state control in innovation processes. It is thus necessary for future research to focus more, first, on the efficacy of China's 'characteristics' of an 'entrepreneurial state' for innovation processes, particularly in the 'West', where the majority of innovation resources are state-controlled. Quantitative methods might help to sketch the particular performance of the state with regard to innovation processes. Second, it is necessary to critically examine the socio-economic side effects of China's government control in innovation systems; they may differ strongly from Mazzucato's accounts of 'Western' countries with regard to liberal and democratic socio-economic development – the case of China thus constitutes a particularly urgent case to research how innovation system governance and democratic economic development may hamper or reinforce each other.

## BIBLIOGRAPHY

- Acs, Zoltan J.; Varga, Attila (2002): Introduction to the Special Issue on Regional Innovation Systems. In *International regional science review* 25 (1), pp. 3–7. DOI: 10.1177/016001702762039358.
- Ahlers, Anna L. (2014): Lokales Regieren und administrative Interessenvermittlung in China. In Hubert Heinelt (Ed.): *Modernes Regieren in China*. Baden-Baden: Nomos Verlag, pp. 89–115.
- Alpermann, Björn (2012): Qualitative Interviewforschung in China. In Jan Kruse, Stephanie Bethmann, Debora Niermann, Christian Schmieder (Eds.): *Qualitative Interviewforschung in und mit fremden Sprachen. Eine Einführung in Theorie und Praxis*. Weinheim: Beltz Juventa, pp. 165–185.
- Alpermann, Björn; Fröhlich, Franziska (Eds.) (2017): *Chinese Studies and the Sociology of Knowledge Approach to Discourse Analysis (SKAD): Challenges and Perspectives*. 14th Networking Meeting Scientific Discourse Analysis. Fulda, Germany, October.
- Alpermann, Björn; Selcuk, Baris (2012): Agency-Analyse in der qualitativen Sozialforschung zu China. In Stephanie Bethmann, Cornelia Helfferich, Heiko Hoffmann, Debora Niermann (Eds.): *Agency. Qualitative Rekonstruktionen und gesellschaftstheoretische Bezüge von Handlungsmächtigkeit*. Weinheim, Basel: Beltz Juventa, pp. 71–98.
- Alqahtani, Khaled Mohammed (2016): Challenges of Innovation for Chinese Small and Medium-sized Enterprises. Case Study in Beijing. In *IBR* 9 (12), p. 165. DOI: 10.5539/ibr.v9n12p165.
- Asheim, Bjorn T. (1998): Territoriality and economics: on the substantial contribution of economic geography. In O. Jonsson, L.-O. Olander (Eds.): *Economic Geography in Transition*. Lund (The Swedish Geographical Yearbook, 74), pp. 98–109.
- Asheim, Bjorn T.; Coenen, Lars; Moodysson, Jerker (2015): Methods and applications of regional innovation system analysis. In Charlie Karlsson, Martin Andersson, Therese Norman (Eds.): *Handbook of research methods and applications in economic geography*. Cheltenham, U.K, Northampton, MA, USA: Edward Elgar Publishing (Handbooks of research methods and applications), pp. 272–290.
- Asheim, Bjorn T.; Smith, Helen Lawton; Oughton, Christine (2011): Regional Innovation Systems. Theory, Empirics and Policy. In *Regional Studies* 45 (7), pp. 875–891. DOI: 10.1080/00343404.2011.596701.
- Asheim, Bjørn T.; Gertler, M. S. (2005): The Geography of Innovation: Regional Innovation Systems. In Jan Fagerberg, David C. Mowery, Richard R. Nelson (Eds.): *The Oxford Handbook of Innovation*. New York: Oxford University Press.
- Asheim, Bjørn T.; Herstad, Sverre J. (2005): Regional innovation systems, varieties of capitalism and non-local relations. Challenges from the globalising economy. In R. A. Boschma, R. C. Kloosterman (Eds.): *Learning from Clusters. A Critical Assessment*.: Springer, pp. 169–201, checked on 9/27/2018.

- Baark, Erik (2007): Knowledge and Innovation in China. Historical Legacies and Emerging Institutions. In *Asia Pacific Business Review* 13 (3), pp. 337–356. DOI: 10.1080/13602380701291917.
- Bai, Junhong; Li, Jing (2011): Regional innovation efficiency in China. The role of local government. In *Innovation* 13 (2), pp. 142–153. DOI: 10.5172/impp.2011.13.2.142.
- Barabantseva, V. Elena (2009): Development as localization. In *Critical Asian Studies* 41 (2), pp. 225–254. DOI: 10.1080/14672710902809393.
- Barbieri, Elisa; Di Tommaso, Marco R.; Huang, Manli (2010): Industrial Development Policy and Innovation in Southern China. Government Targets and Firms' Behaviour. In *European Planning Studies* 18 (1), pp. 83–105. DOI: 10.1080/09654310903343542.
- Barnes, Trevor J. (2001): Retheorizing Economic Geography: From the Quantitative Revolution to the "Cultural Turn". In *Annals of the Association of American Geographers* 91 (3), pp. 546–565. DOI: 10.1111/0004-5608.00258.
- Barnes, Trevor; Peck, Jamie; Sheppard, Eric; Tickell, Adam (2007): Methods Matter. Transformations in Economic Geography. In Adam Tickell, Eric Sheppard, Jamie Peck (Eds.): *Politics and Practice in Economic Geography*. London: SAGE Publications Ltd, pp. 1–24, checked on 12/19/2019.
- Bathelt, Harald (2003): Geographies of production: growth regimes in spatial perspective-innovation, institutions and social systems. In *Progress in Human Geography* 27 (6), pp. 763–778, checked on 9/25/2018.
- Bathelt, Harald; Henn, Sebastian (2017): National and regional innovation systems. In Harald Bathelt, Patrick Cohendet, Sebastian Henn, Laurent Simon (Eds.): *The Elgar Companion to Innovation and Knowledge Creation*. Cheltenham, UK, Northampton, USA: Edward Elgar Publishing, pp. 457–471.
- Bennat, Tatjana; Sternberg, Rolf (2020): Knowledge bases in German regions. What hinders combinatorial knowledge dynamics and how regional innovation policies may help. In *European Planning Studies* 28 (2), pp. 319–339. DOI: 10.1080/09654313.2019.1656168.
- Berkenbusch, Gabriele (2012): Die Konversationsanalyse: Methodologische Überlegungen zum Umgang mit fremdsprachlichen (Interview-)Daten. In Jan Kruse, Stephanie Bethmann, Debora Niermann, Christian Schmieder (Eds.): *Qualitative Interviewforschung in und mit fremden Sprachen. Eine Einführung in Theorie und Praxis*. Weinheim: Beltz Juventa, pp. 228–247.
- Boeing, Philipp (2014): China's R&D Subsidies Allocation and Effectiveness. Discussion Paper No. 14-103, Centre for European Economic Research, checked on 11/20/2018.
- Breschi, Stefano; Malerba, Franco (2001): The Geography of Innovation and Economic Clustering: Some Introductory Notes. In *Industrial and Corporate Change* 4 (10), pp. 817–833.
- Breznitz, Dan; Murphree, Michael (2011): *Run of the Red Queen. Government, Innovation, Globalization, and Economic Growth in China*. New Haven & London: Yale University Press.
- Brødsgaard, Kjeld Erik; Rutten, Koen (2017): *From Accelerated Accumulation to Socialist Market Economy in China. Economic Discourse and Development from 1953 to the Present*. Leiden: Brill (China studies, 38).

- Bunnell, Timothy G.; Coe, Neil M. (2001): Spaces and scales of innovation. In *Progress in Human Geography* 25 (4), pp. 569–589. DOI: 10.1191/030913201682688940.
- Cai, Y.; Liu, C. (2015): The roles of universities in fostering knowledge-intensive clusters in Chinese regional innovation systems. In *Science and Public Policy* 42 (1), pp. 15–29. DOI: 10.1093/scipol/scu018.
- Cao, Cong; Suttmeier, Richard P.; Simon, Denis Fred (2006): China's 15-year science and technology plan. In *Physics Today* 59 (12), pp. 38–43. DOI: 10.1063/1.2435680.
- Central Committee of the Communist Party of China (2016): The 13th Five Year Plan for economic and social development of the People's Republic of China (2016-2020). In *Central Compilation & Translation Press*.
- Chen, Aimin (1998): Inertia in Reforming China's State-Owned Enterprises: The Case of Chongqing. In *World Development* 26 (3), pp. 479–495, checked on 9/27/2018.
- Chen, Kaihua; Guan, Jiancheng (2011): Mapping the functionality of China's regional innovation systems. A structural approach. In *China Economic Review* 22 (1), pp. 11–27. DOI: 10.1016/j.chieco.2010.08.002.
- Chen, Kaihua; Guan, Jiancheng (2012): Measuring the Efficiency of China's Regional Innovation Systems. Application of Network Data Envelopment Analysis (DEA). In *Regional Studies* 46 (3), pp. 355–377. DOI: 10.1080/00343404.2010.497479.
- Chen, Kun; Kenney, Martin (2007): Universities/Research Institutes and Regional Innovation Systems. The Cases of Beijing and Shenzhen. In *World Development* 35 (6), pp. 1056–1074. DOI: 10.1016/j.worlddev.2006.05.013.
- Chen, Yun-Chung (2006): Changing the Shanghai Innovation Systems. In *Science, Technology and Society* 11 (1), pp. 67–107. DOI: 10.1177/097172180501100104.
- Chen, Yun-Chung (2007): The Upgrading of Multinational Regional Innovation Networks in China. In *Asia Pacific Business Review* 13 (3), pp. 373–403. DOI: 10.1080/13602380701291941.
- China Data Online (2020). Available online at <https://www.china-data-online.com/member/macroyr/macroyrtshow.asp?code=A0101>, checked on 2/10/2020.
- Chongqing Municipal Bureau of Statistics (2017): Chongqing Statistical Yearbook 2016.
- Chou, Bill K. P. (2009): Government and Policy-Making Reform in China. The implications of governing capacity. London, New York: Routledge.
- Cooke, Philip (1992): Regional Innovation Systems: Competitive Regulation in the New Europe. In *Geoforum* 23 (3), pp. 365–382. DOI: 10.1016/0016-7185(92)90048-9.
- Cooke, Philip (1998): Introduction: origins of the concept. In Hans-Joachim Braczyk, Philip Cooke, Martin Heidenreich (Eds.): *Regional Innovation Systems. The role of governance in a globalized world*. London: Routledge, pp. 2–25.
- Cooke, Philip (2014): Transversal or Linear? Knowledge externalities and the complexity of knowledge interactions. In Cristiano Antonelli, Albert N. Link (Eds.): *Routledge Handbook of the Economics of Knowledge*. London: Routledge, checked on 2/4/2020.
- Cooke, Philip; Morgan, Kevin (1994): The regional innovation system in Baden-Württemberg. In *International Journal of Technology and Management* 9 (3-4), pp. 394–429. DOI: 10.1504/IJTM.1994.025582.
- Cooke, Philip; Morgan, Kevin (1998): *The Associational Economy. Firms, Regions, and Innovation*. Oxford: Oxford University Press.

- Cooper, Orrin; Yavuz, Idil (2016): Linking validation. A search for coherency within the Supermatrix. In *European Journal of Operational Research* 252 (1), pp. 232–245. DOI: 10.1016/j.ejor.2015.12.045.
- Corbin, Juliet; Strauss, Anselm (2008): Basics of Qualitative Research. Techniques and Procedures for Developing Grounded Theory. 3<sup>rd</sup> ed. Thousand Oaks: SAGE Publications Ltd.
- Crescenzi, Riccardo; Rodríguez-Pose, Andrés (2012): An 'integrated' framework for the comparative analysis of the territorial innovation dynamics of developed and emerging countries. In *Journal of Economic Surveys* 26 (3), pp. 517–533. DOI: 10.1111/j.1467-6419.2012.00726.x.
- D'Allura, Giorgia M.; Galvagno, Marco; Mocchiari Li Destri, Arabella (2012): Regional Innovation Systems: A Literature Review. In *Business System Review* 1 (1), pp. 139–156. DOI: 10.7350/BSR.A12.2012.
- Doloreux, David (2002): What we should know about regional systems of innovation. In *Technology in Society* 24, pp. 243–263, checked on 6/14/2019.
- Doloreux, David; Parto, Saeed (2005): Regional innovation systems. Current discourse and unresolved issues. In *Technology in Society* 27 (2), pp. 133–153. DOI: 10.1016/j.techsoc.2005.01.002.
- Doloreux, David; Porto Gomez, Igone (2017): A review of (almost) 20 years of regional innovation systems research. In *European Planning Studies* 25 (3), pp. 371–387. DOI: 10.1080/09654313.2016.1244516.
- Donaldson, John (2016): What Does Xi Jinping's Top-Down Leadership Mean for Innovation in China? Available online at <http://www.chinafile.com/conversation/what-does-xi-jinpings-top-down-leadership-mean-innovation-china>, checked on 11/22/2018.
- Dong, Ming; Flowers, Stephen (2016): Exploring innovation in Shanzhai. The case of mobile phones. In *Asian Journal of Technology Innovation* 24 (2), pp. 234–253. DOI: 10.1080/19761597.2016.1176864.
- Dosi, Giovanni (1988): The Nature of the Innovation Process. In Giovanni Dosi, Christopher Freeman, Richard Nelson, Gerald Silverberg, Luc Soete (Eds.): *Technical Change and Economic Theory*. London: Pinter, pp. 221–238.
- Ducruet, C.; Beauguitte, L. (2014): Spatial Science and Network Science: Review and Outcomes of a Complex Relationship. In *Networks & Spatial Economics* 14 (3-4), pp. 297–316. DOI: 10.1007/s11067-013-9222-6.
- Duranton, Gilles; Venables, Anthony J. (2018): Place-Based Policies for Development. Edited by World Bank Group (Policy Research Working Paper, 8410). Available online at <http://worldbank.org/research>, checked on 2/10/2020.
- Dyer, James (1990): Remarks on the Analytic Hierarchy Process. In *Management Science* 36 (3), pp. 249–258, checked on 10/26/2018.
- Etzkowitz, Henry; Leydesdorff, Loet (1995): The Triple Helix - University-Industry-Government Relations: A Laboratory for Knowledge Based Economic Development. In *EASST Review* 14 (1), pp. 14–19, checked on 10/1/2018.
- European Union Chamber of Commerce in China (2017): China Manufacturing 2025. Putting Industrial Policy Ahead of Market Forces.

- Fagerberg, Jan (2005): Innovation. A guide to the literature. In Jan Fagerberg, David C. Mowery, Richard R. Nelson (Eds.): *The Oxford Handbook of Innovation*. New York: Oxford University Press, pp. 1–26.
- Fagerberg, Jan; Martin, Ben R.; Andersen, Esben Sloth (2013): *Innovation Studies*: Oxford University Press, checked on 9/27/2017.
- Feldman, Maryann; Lowe, Nichola (2017): Innovation, governance and place. In Harald Bathelt, Patrick Cohendet, Sebastian Henn, Laurent Simon (Eds.): *The Elgar Companion to Innovation and Knowledge Creation*. Cheltenham, UK, Northampton, USA: Edward Elgar Publishing, pp. 685–701.
- Feldman, Maryann P. (1994): *The Geography of Innovation*. The Netherlands: Kluwer Academic Publishers.
- Feldman, Maryann P.; Kogler, Dieter F. (2011): Stylized Facts in the Geography of Innovation. In Bronwyn H. Hall, Nathan Rosenberg (Eds.): *Handbook of the economics of innovation*, vol. 1. 1. ed., reprinted. Amsterdam: North Holland (Handbooks in economics, 1), pp. 381–410, checked on 9/18/2019.
- Fiore, Annamaria; Grisorio, Maria Jennifer; Prota, Francesco (2011): Regional Innovation Systems. Which Role for Public Policies and Innovation Agencies? Some Insights from the Experience of an Italian Region. In *European Planning Studies* 19 (8), pp. 1399–1422. DOI: 10.1080/09654313.2011.586173.
- Fischer, Doris (2016): "Green Growth" or "System Transition"? Competing Discourses of China's Past Economic Success and Future Perspectives. In *Comparativ* 26 (2), pp. 42–55, checked on 3/25/2019.
- Flick, Uwe (2016): *Qualitative Sozialforschung. Eine Einführung*. 7<sup>th</sup> ed. Reinecke bei Hamburg: rowohlt Taschenbuch Verlag.
- Flick, Uwe (2018): *Designing Qualitative Research*. In Uwe Flick (Ed.): *The SAGE Handbook of Qualitative Data Collection*. 1 Oliver's Yard, 55 City Road London EC1Y 1SP: SAGE Publications Ltd.
- Freeman, Christopher (1987): *Technology Policy and Economic Performance: Lessons from Japan*. London: Frances Pinter.
- Fu, Wenying; Diez, Javier Revilla; Schiller, Daniel (2012): Regional innovation systems within a transitional context. Evolutionary comparison of the electronics industry in Shenzhen and Dongguan since the opening of China. In *Journal of Economic Surveys* 26 (3), pp. 534–550. DOI: 10.1111/j.1467-6419.2012.00721.x.
- Fu, Xiaolan (2008): Foreign Direct Investment, Absorptive Capacity and Regional Innovation Capabilities. Evidence from China. In *Oxford Development Studies* 36 (1), pp. 89–110. DOI: 10.1080/13600810701848193.
- Fu, Xiaolan; Mu, Rongping (2014): Enhancing China's Innovation Performance: The Policy Choices. In *China & World Economy* 22 (2), pp. 42–60, checked on 3/6/2019.
- Fu, Xiaolan; Woo, Wing Thye; Hou, Jun (2016): Technological innovation policy in China. The lessons, and the necessary changes ahead. In *Econ Change Restruct* 49 (2-3), pp. 139–157. DOI: 10.1007/s10644-016-9186-x.
- Gadiesh, Orit; Leung, Philip; Vestring, Till (2007): The battle for China's good-enough market. In *Harvard Business Review* 85 (9).

- Gao, Ping (2015): Government in the catching-up of technology innovation. Case of administrative intervention in China. In *Technological Forecasting and Social Change* 96, pp. 4–14. DOI: 10.1016/j.techfore.2015.01.014.
- Geels, Frank W. (2004): From sectoral systems of innovation to socio-technical systems. In *Research Policy* 33 (6-7), pp. 897–920. DOI: 10.1016/j.respol.2004.01.015.
- Geerts, Filip (2018): Briefing on the machinery sector in China 2018. Edited by Olga Chilat. CECIMO - European Association of the Machine Tool Industries. Brussels.
- Glasze, Georg (2013): Politische Räume. Die diskursive Konstitution eines "geokulturellen Raums" - die Frankophonie. Bielefeld: transcript.
- Glasze, Georg; Husseini, Shadia; Mose, Jörg (2009): Kodierende Verfahren in der Diskursforschung. In Georg Glasze, Annika Mattissek (Eds.): *Handbuch Diskurs und Raum. Theorien und Methoden für die Humangeographie sowie die sozial- und kulturwissenschaftliche Raumforschung*. Bielefeld: transcript, pp. 293–314.
- Goepel, Klaus D. (2019): Comparison of Judgement Scales of the Analytical Hierarchy Process - A New Approach. In *International Joournal of Information Technology & Decision Making* 18 (2), pp. 445–463. DOI: 10.1142/S0219622019500044.
- Guo, Rongxing (2017): *How the Chinese economy works*. 4<sup>th</sup> ed. London: Palgrave Macmillan.
- Heilmann, Sebastian (2008): From Local Experiments to National Policy. The Origins of China's Distinctive Policy Process. In *The China Journal* 59, pp. 1–30, checked on 5/18/2018.
- Heindl, Anna-Barbara; Liefner, Ingo (2019): The Analytic Hierarchy Process as a methodological contribution to improve regional innovation system research. Explored through comparative research in China. In *Technology in Society* 59, 101197. DOI: 10.1016/j.techsoc.2019.101197.
- Heinelt, Hubert; Zheng, Chunrong (2014): Modernes Regieren in China. Wie erfolgt Interessenvermittlung in der Volksrepublik China? In Hubert Heinelt (Ed.): *Modernes Regieren in China*. Baden-Baden: Nomos Verlag, pp. 13–41.
- Hemmert, Martin; Cross, Adam R.; Cheng, Ying; Kim, Jae-Jin; Kohlbacher, Florian; Kotosaka, Masahiro et al. (2019): The distinctiveness and diversity of entrepreneurial ecosystems in China, Japan, and South Korea. An exploratory analysis. In *Asian Business & Management* 18 (3), pp. 211–247. DOI: 10.1057/s41291-019-00070-6.
- Hennemann, Stefan; Wang, S.; Liefner, Ingo (2011): Measuring regional science networks in China: a comparison of international and domestic bibliographic data sources. In *Scientometrics* 88 (2), pp. 535–554. DOI: 10.1007/s11192-011-0410-1.
- Hirsch - Kreinsen, Hartmut (2008): "Low - Tech" Innovations. In *Industry and Innovation* 15 (1), pp. 19–43. DOI: 10.1080/13662710701850691.
- Holz, C. A. (2004): China's statistical system in transition: Challenges, data problems, and institutional innovations. In *Review of Income and Wealth* 50 (3), 381-409. DOI: 10.1111/j.0034-6586.2004.00131.x.
- Howell, Anthony (2017): Picking 'winners' in China. Do subsidies matter for indigenous innovation and firm productivity? In *China Economic Review* 44, pp. 154–165. DOI: 10.1016/j.chieco.2017.04.005.

- Howells, Jeremy (2006): Intermediation and the role of intermediaries in innovation. In *Research Policy* 35 (5), pp. 715–728. DOI: 10.1016/j.respol.2006.03.005.
- Hu, Angang; Tang, Xiao; Yan, Yilong (2018): Xi Jinping's New Development Philosophy. Singapore: Springer Nature, checked on 9/12/2019.
- Hu, Xiaohui; Hassink, Robert (2017): Place leadership with Chinese characteristics? A case study of the Zaozhuang coal-mining region in transition. In *Regional Studies* 51 (2), pp. 224–234. DOI: 10.1080/00343404.2016.1200189.
- Huggins, Robert; Luo, Shougui; Thompson, Piers (2014): The competitiveness of China's Leading Regions. Benchmarking Their Knowledge-based Economies. In *Tijdschr Econ Soc Geogr* 105 (3), pp. 241–267. DOI: 10.1111/tesg.12065.
- Isaksen, Arne (2001): Building Regional Innovation Systems: Is Endogenous Industrial Development Possible in the Global Economy? In *Canadian Journal of Regional Science* 24 (1), pp. 101–120, checked on 1/21/2020.
- Isaksen, Arne; Trippel, Michaela (2017): Innovation in space. The mosaic of regional innovation patterns. In *Oxford Review of Economic Policy* 33 (1), pp. 122–140. DOI: 10.1093/oxrep/grw035.
- Ishizaka, Alessio; Labib, Ashraf (2011): Review of the main developments in the Analytic Hierarchy Process. In *Expert Systems with Applications* 38 (11), pp. 14336–14345.
- Jensen, Morten Berg; Johnson, Björn; Lorenz, Edward; Lundvall, Bengt Åke (2007): Forms of knowledge and modes of innovation. In *Research Policy* 36 (5), pp. 680–693. DOI: 10.1016/j.respol.2007.01.006.
- Keane, Michael; Zhao, Elaine Jing (2012): Renegades on the Frontier of Innovation. The *Shanzhai* Grassroots Communities of Shenzhen in China's Creative Economy. In *Eurasian Geography and Economics* 53 (2), pp. 216–230. DOI: 10.2747/1539-7216.53.2.216.
- Keller, Reiner (2011): Wissenssoziologische Diskursanalyse. Grundlegung eines Forschungsprogramms. 3<sup>rd</sup> ed. Wiesbaden: VS Verlag für Sozialwissenschaften.
- Kline, Stephen; Rosenberg, Nathan (2010): An Overview of Innovation. In Nathan Rosenberg (Ed.): *Studies on science and the innovation process. Selected works*. Singapore, Hackensack, N.J: World Scientific Pub. Co, pp. 173–203.
- Klochikhin, Evgeny A. (2013): Innovation system in transition: Opportunities for policy learning between China and Russia. In *Science and Public Policy* 40 (5), pp. 657–673. Available online at <https://academic.oup.com/spp/article/40/5/657/1677413>.
- Kominaki, Dimitra (2015): Regional innovation systems in peripheral regions. Insights from western Greece. In *Regional Studies, Regional Science* 2 (1), pp. 332–340. DOI: 10.1080/21681376.2015.1039568.
- Kroll, Henning (2016): Exploring pathways of regional technological development in China through patent analysis. In *World Patent Information* 46, pp. 74–86. DOI: 10.1016/j.wpi.2016.06.003.
- Kroll, Henning; Frietsch, Rainer (2014): Regional structures and trends in China's innovation system. An indicator-based account of the last decade's development. In Ingo Liefner, Dennis Wei (Eds.): *Innovation and Regional Development in China*. Abingdon: Routledge (Routledge studies in the modern world economy), pp. 41–72.



- Kroll, Henning; Liefner, Ingo (2008): Spin-off enterprises as a means of technology commercialisation in a transforming economy—Evidence from three universities in China. In *Technovation* 28 (5), pp. 298–313. DOI: 10.1016/j.technovation.2007.05.002.
- Kruse, Jan; Bethmann, Stephanie; Eckert, Judith; Niermann, Debora; Schmieder, Christian (2012): In und mit fremden Sprachen forschen. Eine empirische Bestandsaufnahme zu Erfahrungs- und Handlungswissen von Forschenden. In Jan Kruse, Stephanie Bethmann, Debora Niermann, Christian Schmieder (Eds.): *Qualitative Interviewforschung in und mit fremden Sprachen. Eine Einführung in Theorie und Praxis*. Weinheim: Beltz Juventa, pp. 27–68.
- Kruse, Jan; Schmieder, Christian (2012): In fremden Gewässern. Ein integratives Basisverfahren als sensibilisierendes Programm für rekonstruktive Analyseprozesse im Kontext fremder Sprachen. In Jan Kruse, Stephanie Bethmann, Debora Niermann, Christian Schmieder (Eds.): *Qualitative Interviewforschung in und mit fremden Sprachen. Eine Einführung in Theorie und Praxis*. Weinheim: Beltz Juventa, pp. 248–295.
- Kunming Municipal Bureau of Statistics (2017): *Kunming Statistical Yearbook 2016*: China Statistics Press.
- Kunming Municipal Government of the CPC Kunming Municipal Committee (12/30/2016): Kunming for the implementation of innovative entrepreneurship for high-level talents.
- Lauer, Johannes; Liefner, Ingo (2019): State - led innovation at the city level. Policy measures to promote new energy vehicles in shenzhen, china. In *Geographical Review* 109 (3), pp. 436–456. DOI: 10.1111/gere.12320.
- Lazonick, William; Zhou, Yu; Sun, Yifei (2016): Introduction: China's Transformation to an Innovation Nation. In Yu Zhou, William Lazonick, Yifei Sun (Eds.): *China as an Innovation Nation*. Oxford: Oxford University Press, pp. 1–32.
- Leadbeater, C.; Wilsdon, J. (2007): *The Atlas of Ideas: How Asian innovation can benefit us all*. London: Demos.
- Lee, John (2016a): China's role in global innovation - more than a fast follower? (Part One). Edited by Mercator Institute for China Studies. Berlin, Berlin. Available online at <https://www.merics.org/de/blog/chinas-role-global-innovation-more-fast-follower-part-one>, checked on 2/11/2020.
- Lee, John (2016b): China's role in global innovation - more than a fast follower? (Part Two). Edited by Mercator Institute for China Studies. Available online at <https://www.merics.org/de/blog/chinas-role-global-innovation-more-fast-follower-part-two>, checked on 2/11/2020.
- Li, D. D.; Wei, Yehua Dennis; Wang, T. (2015): Spatial and temporal evolution of urban innovation network in China. In *Habitat International* 49, 484–549. DOI: 10.1016/j.habitatint.2015.05.031.
- Li, Yi; Wu, Fulong (2012): The transformation of regional governance in China. The rescaling of statehood. In *Progress in Planning* 78 (2), pp. 55–99. DOI: 10.1016/j.progress.2012.03.001.

- Li, Yi; Wu, Fulong (2013): The emergence of centrally initiated regional plan in China. A case study of Yangtze River Delta Regional Plan. In *Habitat International* 39, pp. 137–147. DOI: 10.1016/j.habitatint.2012.11.002.
- Lieberthal, Kenneth (2004): *Governing China. From Revolution Through Reform*. 2<sup>nd</sup> ed. New York, London: W. W. Norton & Company.
- Liefner, Ingo (2006): *Ausländische Direktinvestitionen und internationaler Wissenstransfer nach China. Untersucht am Beispiel von Hightech-Unternehmen in Shanghai und Beijing*. Berlin: LIT Verlag (Wirtschaftsgeographie, 34).
- Liefner, Ingo (2014): Explaining innovation and regional development in China: how much can we learn from applying established Western theories? In Ingo Liefner, Dennis Wei (Eds.): *Innovation and Regional Development in China*. Abingdon: Routledge (Routledge studies in the modern world economy), pp. 21–40.
- Liefner, Ingo; Brömer, Christian; Zeng, Gang (2012): Knowledge absorption of optical technology companies in Shanghai, Pudong. Successes, barriers and structural impediments. In *Applied Geography* 32 (1), pp. 171–184. DOI: 10.1016/j.apgeog.2011.01.012.
- Liefner, Ingo; Hennemann, Stefan; Xin, Lu (2006): Cooperation in the innovation process in developing countries: empirical evidence from Zhongguancun, Beijing. In *Environment and Planning A* 38, pp. 111–130. DOI: 10.1068/a37343.
- Liefner, Ingo; Jessberger, Sabine (2016): The use of the analytical hierarchy process as a method of comparing innovation across regions: the examples of the equipment manufacturing industries of Shanghai and Xiamen, China. In *Environment and Planning A* 48 (6), pp. 1188–1208. DOI: 10.1177/0308518X16636886.
- Liefner, Ingo; Losacker, Sebastian (2019): Low-cost innovation and technology-driven innovation in China's machinery industry. In *Technology Analysis & Strategic Management* 43 (6), pp. 1–13. DOI: 10.1080/09537325.2019.1656333.
- Liefner, Ingo; Wei, Dennis (Eds.) (2014a): *Innovation and Regional Development in China*. Abingdon: Routledge (Routledge studies in the modern world economy).
- Liefner, Ingo; Wei, Yehua Dennis (2014b): Introduction: Innovation and regional development in China. In Ingo Liefner, Dennis Wei (Eds.): *Innovation and Regional Development in China*. Abingdon: Routledge (Routledge studies in the modern world economy), pp. 1–18.
- Liefner, Ingo; Wei, Yehua Dennis; Zeng, Gang (2013): The Innovativeness and Heterogeneity of Foreign-Invested High-Tech Companies in Shanghai. In *Growth and Change* 44 (3), pp. 522–549. DOI: 10.1111/grow.12018.
- Liefner, Ingo; Zeng, Gang (2008): Cooperation patterns of high-tech companies in Shanghai and Beijing. Accessing external knowledge sources for innovation processes. In *Erdkunde* 62 (3), pp. 245–258. DOI: 10.3112/erdkunde.2008.03.05.
- Lin, George C. S.; Wang, Cassandra (2009): Technological Innovation in China's High-Tech Sector. Insights from a 2008 Survey of the Integrated Circuit Design Industry in Shanghai. In *Eurasian Geography and Economics* 50 (4), pp. 402–424. DOI: 10.2747/1539-7216.50.4.402.

- Litzinger, Ralph (2004): The Mobilization of “Nature”. Perspectives from North-west Yunnan. In *The China Quarterly* 178, pp. 488–504. DOI: 10.1017/S030574100400027X.
- Liu, Feng-chao; Simon, Denis Fred; Sun, Yu-tao; Cao, Cong (2011): China's innovation policies. Evolution, institutional structure, and trajectory. In *Research Policy* 40 (7), pp. 917–931. DOI: 10.1016/j.respol.2011.05.005.
- Liu, Shu-Guang; Chen, Cai (2003): Regional innovation system: theoretical approach and empirical study of China. In *Chinese Geographical Science* 13 (3), pp. 193–198, checked on 9/27/2018.
- Liu, Xielin; Cheng, Peng (2011): Is China's Indigenous Innovation Strategy Compatible with Globalization? Honolulu (Policy Studies, 61), checked on 2/26/2019.
- Liu, Xielin; Gao Taishan; Wang, Xi (2018): Regional Innovation Index of China: 2017. How Frontier Regions Innovate. Singapore: Springer.
- Liu, Xielin; Schwaag Serger, Sylvia; Tagscherer, Ulrike; Chang, Amber Y. (2017): Beyond catch-up - can new innovation policy help China overcome the middle income trap? In *Science and Public Policy* 44 (5), pp. 656–669. DOI: 10.1093/scipol/scw092.
- Liu, Xielin; White, Steven (2001): Comparing innovation systems: a framework and application to China's transitional context. In *Research Policy* 30, pp. 1091–1114, checked on 9/27/2018.
- Lu, Yi; Wang, Jin; Zhu, Lianming (2015): Do Place-Based Policies Work? Micro-Level Evidence from China's Economic Zone Program. In *SSRN Journal*. DOI: 10.2139/ssrn.2635851.
- Lundvall, Bengt-Ake (1985) (1985): Product Innovation and User-Producer Interaction. Aalborg: Aalborg University Press.
- Lyu, Guoqing; Liefner, Ingo (2018): The spatial configuration of innovation networks in China. In *GeoJournal* 83 (6), 1393-1410. DOI: 10.1007/s10708-017-9844-1.
- Ma, Lei; Liu, Zheng; Huang, Xiaojing; Li, Tao (2019): The Impact of Local Government Policy on Innovation Ecosystem in Knowledge Resource Scarce Region. Case Study of Changzhou, China. In *Science, Technology and Society* 24 (1), pp. 29–52. DOI: 10.1177/0971721818806096.
- March, James G. (1991): Exploration and Exploitation in Organizational Learning. In *Organization Science* 2 (1), pp. 71–87, checked on 6/13/2019.
- Martin, Ben R. (2012): The evolution of science policy and innovation studies. In *Research Policy* 41 (7), pp. 1219–1239. DOI: 10.1016/j.respol.2012.03.012.
- Martin, Ben R. (2016): Twenty challenges for innovation studies. In *Science and Public Policy* 43 (3), pp. 432–450. DOI: 10.1093/scipol/scv077.
- Mayring, Philipp (2000): Qualitative Content Analysis. In *Forum Qualitative Social Research* 1 (2).
- Mazzucato, Mariana (2013): The Entrepreneurial State. Debunking Public vs. Private Sector Myths. London, New York, Melbourne, New Delhi: Anthem Press.
- Meuser, Michael; Nagel, Ulrike (2002): ExpertInneninterviews -vielfach erprobt, wenig bedacht. In Alexander Bogner, Beate Littig, Wolfgang Menz (Eds.): Das Experteninterview. Theorie, Methode, Anwendung. Wiesbaden: Springer Fachmedien, pp. 71–94.

- Moulaert, Frank; Sekia, Farid (2003): Territorial Innovation Models. A Critical Survey. In *Regional Studies* 37 (3), pp. 289–302. DOI: 10.1080/0034340032000065442.
- Mulvad, Andreas (2015): Competing Hegemonic Projects within China's Variegated Capitalism. 'Liberal' Guangdong vs. 'Statist' Chongqing. In *New Political Economy* 20 (2), pp. 199–227. DOI: 10.1080/13563467.2014.914160.
- Munier, Nolberto (2011): A Strategy for Using Multicriteria Analysis in Decision-Making. A Guide for Simple and Complex Environmental Projects. Heidelberg, London, New York: Springer Science+Business Media.
- National Bureau of Statistics in China (2018). Available online at <http://data.stats.gov.cn/english/easyquery.htm?cn=E0103>, checked on 11/22/2018.
- National Bureau of Statistics in China (2020). Available online at <http://data.stats.gov.cn/english/easyquery.htm?cn=E0103>, checked on 2/11/2020.
- Nelson, Richard; Winter, Sidney G. (1977): In search of useful theory of innovation. In *Research Policy* 6, pp. 36–76, checked on 2/10/2020.
- Neumark, David; Simpson, Helen (2 March): Do Place-Based Policies Matter? In *FRBSF Economic Letter*, 2 March 2015 (7), checked on 2/10/2020.
- Office of Municipal Government Shanghai (11/8/2016): Shanghai Talent Development Thirteen-Five plan.
- Office of Yunnan Provincial People's Government (10/13/2017): Executive opinion of Yunnan Provincial people's government on promoting innovation-driven development in county area.
- Padilla-Pérez, Ramon; Vang, Jan; Chaminade, Cristina (2009): Regional innovation systems in developing countries: integrating micro and meso-level capabilities. In Bengt-Ake Lundvall, K. J. Joseph, Cristina Chaminade (Eds.): *Handbook of Innovation Systems and Developing Countries. Building Domestic Capabilities in a Global Context*. Cheltenham: Edward Elgar Publishing, pp. 140–181.
- Pang, Weiguo; Plucker, Jonathan A. (2012): Recent Transformations in China's Economic, Social, and Education Policies for Promoting Innovation and Creativity. In *J Creat Behav* 46 (4), pp. 247–273. DOI: 10.1002/jocb.17.
- Peighambari, Arman; Hennemann, Stefan; Liefner, Ingo (2014): Success factors for upgrading and innovation in the electronics industry: an analysis of private small and medium-sized enterprises in the Pearl River Delta. In *Technology Management* 65 (1/2/3/4), 49-69. DOI: 10.1504/IJTM.2014.060950.
- Pino, Ricardo M.; Ortega, Ana María (2018): Regional innovation systems. Systematic literature review and recommendations for future research. In *Cogent Business & Management* 5 (1), p. 1331. DOI: 10.1080/23311975.2018.1463606.
- Reichertz, Jo (2016): *Qualitative und interpretative Sozialforschung. Eine Einladung*. Wiesbaden: Springer VS, checked on 2/10/2020.
- Rithmire, Meg E. (2014): China's "New Regionalism". Subnational Analysis in Chinese Political Economy. In *World Pol.* 66 (1), pp. 165–194. DOI: 10.1017/S004388711300035X.
- Russo, Rosaria de F.S.M.; Camanho, Roberto (2015): Criteria in AHP. A Systematic Review of Literature. In *Procedia Computer Science* 55, pp. 1123–1132. DOI: 10.1016/j.procs.2015.07.081.

- Saaty, Thomas L. (2016): *Decision Making for Leaders. The Analytic Hierarchy Process for Decisions in A Complex World*. 3<sup>rd</sup> ed. Pittsburgh: RWS Publications.
- Saaty, Thomas L. (1977) (1977): A scaling method for priorities in hierarchical structures. In *Journal of Mathematical Psychology* 15 (3), pp. 234–281. DOI: 10.1016/0022-2496(77)90033-5.
- Saunders, Benjamin; Sim, Julius; Kingstone, Tom; Baker, Shula; Waterfield, Jackie; Bartlam, Bernadette et al. (2018): Saturation in qualitative research. Exploring its conceptualization and operationalization. In *Quality & quantity* 52 (4), pp. 1893–1907. DOI: 10.1007/s11135-017-0574-8.
- Saxenian, Annalee (1983): The Genesis of Silicon Valley. In *Built Environment* 9 (1), pp. 7–17, checked on 12/21/2018.
- Sayers, Sean (2019): Marx and Teleology. In *Science & Society* 83 (1), pp. 37–63. DOI: 10.1521/isis.2019.83.1.37.
- Schumpeter, Joseph A. (1934): *The Theory of Economic Development*. Cambridge, Massachusetts: Harvard University Press.
- Schütz, Alfred (2004): Common-Sense und wissenschaftliche Interpretation menschlichen Handelns. In Jörg Strübing, Bernt Schnettler (Eds.): *Methodologie interpretativer Sozialforschung. Klassische Grundlagentexte*. Konstanz: UTB/UVK, pp. 155–200.
- Shearmur, Richard (2016): Why local development and local innovation are not the same thing: the uneven geographic distribution of innovation-related development. In Richard Shearmur, Christophe Carrincazeaux, David Doloreux (Eds.): *Handbook on the Geographies of Innovation*. Cheltenham, U.K, Northampton, MA, USA: Edward Elgar Publishing, pp. 432–446.
- Simula, Henri; Hossain, Mokter; Halme, Minna (2015): Frugal and reverse innovations - Quo vadis? In *Current Science* 109 (9), pp. 1567–1572.
- Sipahi, Seyhan; Timor, Mehpare (2010): The analytic hierarchy process and analytic network process. An overview of applications. In *Management Decision* 48 (5), pp. 775–808. DOI: 10.1108/00251741011043920.
- Spigel, Ben (2016): The cultural embeddedness of regional innovation: a Bourdieuan perspective. In Richard Shearmur, Christophe Carrincazeaux, David Doloreux (Eds.): *Handbook on the Geographies of Innovation*. Cheltenham, U.K, Northampton, MA, USA: Edward Elgar Publishing, pp. 88–99.
- State Council of the People's Republic of China (7/7/2015): *Made in China 2025*. Available online at [www.iotone.com](http://www.iotone.com), checked on 11/22/2018.
- Sternberg, Rolf; Müller, Claudia (2005): *Entrepreneurship in Regional Innovation Systems—a Case Study of the Biotechnology Industry in Shanghai*. Paper to be presented at the DRUID Tenth Anniversary Summer Conference 2005 on Dynamics of Industry and Innovation: Organizations, Networks and Systems. Copenhagen, 6/27/2005, checked on 7/5/2018.
- Su, De-Jin; Sohn, Dong-Won (2012): Why do Beijing Universities play important roles in regional innovation systems? Based on resource-based view. In *Afr. J. Bus. Manage.* 6 (14). DOI: 10.5897/AJBM11.2457.

- Su, Xiaobo (2014): Multi-Scalar Regionalization, Network Connections and the Development of Yunnan Province, China. In *Regional Studies* 48 (1), pp. 91–104. DOI: 10.1080/00343404.2013.799766.
- Summers, Tim (2012): (Re)positioning Yunnan. Region and nation in contemporary provincial narratives. In *Journal of Contemporary China* 21 (75), pp. 445–459. DOI: 10.1080/10670564.2011.647433.
- Summers, Tim (2013): *Yunnan- A Chinese Bridgehead to Asia. A Case Study of China's Political and Economic Relations with its Neighbours*. Oxford, Cambridge, New Delhi: Chandos Publishing (Chandos Asian Studies Series).
- Summers, Tim (2018): *China's Regions in an Era of Globalization*. London, New York: Routledge (Routledge Contemporary China Series).
- Suorsa, Katri (2014): The concept of ‘region’ in research on regional innovation systems. In *Norsk Geografisk Tidsskrift - Norwegian Journal of Geography* 68 (4), pp. 207–215. DOI: 10.1080/00291951.2014.924025.
- Tanaka, Osamu (2015): Economic Reform and Economic Policy of the Xi Jinping Leadership. In *Public Policy Review* 11 (1-44), checked on 2/7/2020.
- Teets, Jessica C.; Hasmath, Reza; Lewis, Orion A. (2017): The Incentive to Innovate? The Behavior of Local Policymakers in China. In *Journal of Chinese Political Science* 22 (4), pp. 505–517. DOI: 10.1007/s11366-017-9512-9.
- The State Council of the People’s Republic of China (2006): *The National Medium- and Long-Term Program for Science and Technology Development (2006–2020)*. Available online at [www.itu.int](http://www.itu.int), checked on 9/9/2019.
- Tripp, Michaela; Grillitsch, Markus; Isaksen, Arne (2017): Exogenous sources of regional industrial change. In *Progress in Human Geography* 42 (5), pp. 687–705. DOI: 10.1177/0309132517700982.
- Wang, Yuandi; Sutherland, Dylan; Ning, Lutao; Pan, Xin (2015): The evolving nature of China's regional innovation systems. Insights from an exploration–exploitation approach. In *Technological Forecasting and Social Change* 100, pp. 140–152. DOI: 10.1016/j.techfore.2015.07.010.
- Warnke, Philine; Koschatzky, Knut; Dönitz, Ewa; Zenker, Andrea; Stahlecker, Thomas; Som, Oliver et al. (2016): Opening up the innovation systems framework towards new actors and institutions. In *Fraunhofer ISI Discussion Papers Innovation Systems and Policy Analysis* (49).
- Wei, Yehua Dennis (2004): Trajectories of Ownership Transformation in China. Implications for Uneven Regional Development. In *Eurasian Geography and Economics* 45 (2), pp. 90–113. DOI: 10.2747/1538-7216.45.2.90.
- Wolfe, David (2011): Neo-Schumpeterian Perspectives on Innovation and Growth. In Philip Cooke, Bjørn T. Asheim, Ron Boschma, Ron Martin, Dafna Schwartz, Franz Tödtling (Eds.): *Handbook of Regional Innovation and Growth*. Cheltenham, UK: Edward Elgar Publishing.
- Wu, Weiping (2007a): Cultivating Research Universities and Industrial Linkages in China. The Case of Shanghai. In *World Development* 35 (6), pp. 1075–1093. DOI: 10.1016/j.worlddev.2006.05.011.

- Wu, Weiping (2007b): State Policies, Enterprise Dynamism, and Innovation System in Shanghai, China. In *Growth and Change* 38 (4), pp. 544–566. DOI: 10.1111/j.1468-2257.2007.00387.x.
- Wübbecke, Jost; Meissner, Miriam; Zenglein, Max J.; Ives, Jaqueline; Conrad, Björn (2016): Made in China 2025. The making of a high-tech superpower and consequences for industrial countries. Edited by Mercator Institute for China Studies (Papers on China, 2).
- Yang, Chih-Hai; Lee, Chia-Min; Lin, Chun-Hung A. (2012): Why does regional innovative capability vary so substantially in China? The role of regional innovation systems. In *Asian Journal of Technology Innovation* 20 (2), pp. 239–255. DOI: 10.1080/19761597.2012.741393.
- Yang, Chun (2014): Regional innovation systems in Shenzhen. Technological evolution of foreign-invested and indigenous firms. In Ingo Liefner, Dennis Wei (Eds.): *Innovation and Regional Development in China*. Abingdon: Routledge (Routledge studies in the modern world economy), pp. 191–2015.
- Yang, Chun (2015): Government policy change and evolution of regional innovation systems in China. Evidence from strategic emerging industries in Shenzhen. In *Environment and Planning C: Government and Policy* 33 (3), pp. 661–682. DOI: 10.1068/C12162r.
- Yang, Chun (2017): The rise of strategic partner firms and reconfiguration of personal computer production networks in China. Insights from the emerging laptop cluster in Chongqing. In *Geoforum* 84, pp. 21–31. DOI: 10.1016/j.geoforum.2017.05.010.
- Yeh, Emily T.; Wharton, Elizabeth (2016): Going West and Going Out. Discourses, migrants, and models in Chinese development. In *Eurasian Geography and Economics* 57 (3), pp. 286–315. DOI: 10.1080/15387216.2016.1235982.
- Yu, Hong (2018): Regional Development in China: Xi Jinping's Agenda and the Challenges. In *China: An International Journal* 16 (3), pp. 179–199.
- Zeschky, Marco; Widenmayer, Bastian; Gassmann, Oliver (2011): Frugal Innovation in Emerging Markets. In *Research-Technology Management* 54 (4), pp. 38–45. DOI: 10.5437/08956308X5404007.
- Zhang, Fangzhu (2015): Building Biotech in Shanghai. A Perspective of Regional Innovation System. In *European Planning Studies* 23 (10), pp. 2062–2078. DOI: 10.1080/09654313.2014.1001322.
- Zhang, Fangzhu; Wu, Fulong (2013): "Fostering Indigenous Innovation Capacities". The Development of Biotechnology in Shanghai's Zhangjiang High-Tech Park. In *Urban Geography* 33 (5), pp. 728–755. DOI: 10.2747/0272-3638.33.5.728.
- Zhao, Jingyuan; Richards, Joseph (2012): Beijing innovation system: the perspective of organisational structure and spatial distribution. In *International Journal of Learning and Intellectual Capital* 9 (4), pp. 413–428.
- Zhao, S. L.; Cacciolatti, L.; Lee, S. H.; Song, W. (2015): Regional collaborations and indigenous innovation capabilities in China. A multivariate method for the analysis of regional innovation systems. In *Technological Forecasting and Social Change* 94, pp. 202–220. DOI: 10.1016/j.techfore.2014.09.014.
- Zhao, Shu Liang; Song, Wei; Zhu, Dong Yun; Peng, Xiao Bao; Cai, Wenjing (2013): Evaluating China's regional collaboration innovation capability from the innovation

- actors perspective—An AHP and cluster analytical approach. In *Technology in Society* 35 (3), pp. 182–190. DOI: 10.1016/j.techsoc.2013.06.001.
- Zhong, Xiwei; Yang, Xiangdong (2007): Science and technology policy reform and its impact on China's national innovation system. In *Technology in Society* 29 (3), pp. 317–325. DOI: 10.1016/j.techsoc.2007.04.008.
- Zhong, Yang (2003): Local government and politics in China. Challenges from below. Armonk, London: M. E. Sharpe (Studies on contemporary China).
- Zhou, Yu; Liu, Xielin (2016): Evolution of Chinese State Policies on Innovation. In Yu Zhou, William Lazonick, Yifei Sun (Eds.): *China as an Innovation Nation*. Oxford: Oxford University Press, pp. 33–67.
- Zhu, Sheng; Shi, Yongjiang (2010): Shanzhai manufacturing – an alternative innovation phenomenon in China. In *Jnl of Sci and Tech Pol* 1 (1), pp. 29–49. DOI: 10.1108/17585521011032531.
- Zhuang, Juzhong; Li, Shi (2016): Understanding Recent Trends in Income Inequality in the People's Republic of China. ADB Economics Working Paper Series. Edited by Asian Development Bank (489).



## APPENDIX A

<i>Qualitative studies</i>	<i>Research question</i>	<i>Discussion of RIS</i>	<i>Innovation Type</i>
Zhang, Fangzhu; Wu, Fulong (2019): Rethinking the city and innovation. A political economic view from China's biotech. In <i>Cities</i> 85, pp. 150–155.	“This paper focuses on the connection between innovation and cities”.	Inferential case study	S&T in biotech
Cai, Yunzhuo; Liu, Cui (2015): The roles of universities in fostering knowledge-intensive clusters in Chinese regional innovation systems. In <i>Science and Public Policy</i> 42 (1), pp. 15–29.	Understand the roles universities play in RIS in China via case study the Tongji Creative Cluster, Shanghai	Representational case study Triple Helix Model	S&T
Yuan, Xiu-E; Wang, Jia-Wei; Liu, Hao (2016): Study of Science and Technology Collaborative Innovation in Beijing-Tianjin-Hebei Region - Based on Triple Helix Model. 2016 3rd International Conference on Social Science ICSS (Ed.).	Application of Triple Helix-Model to Beijing-Tianjin-Hebei.	Concept application Triple Helix Model	S&T
Yang, Chun (2015): Government policy change and evolution of regional innovation systems in China. Evidence from strategic emerging industries in Shenzhen. In <i>Environment and Planning C: Government and Policy</i> 33 (3), pp. 661–682.	“Drawing upon the institutional evolution perspective on the regional innovation systems (RISs) approach, I attempt to examine the impacts of policy change on the evolution of RISs in China”.	Representational case study Evolutionary RIS	S&T in LED
Zhang, Fangzhu (2015): Building Biotech in Shanghai. A Perspective of Regional Innovation System. In <i>European Planning Studies</i> 23 (10), pp. 2062–2078.	“Examine(.) the growth of biotech in Shanghai using the perspective of regional innovation system (RIS) (...) to examine three components of RIS: the land, human capital and the regional base”.	Representational case study Evolutionary RIS	S&T in biotech
Leng, Tse-Kang; Wang, Jenn-Hwan (2013): Local States, Institutional Changes and Innovation Systems. Beijing and Shanghai compared. In <i>Journal of Contemporary China</i> 22 (80), pp. 219–236.	Transformation of local innovation systems in the high-tech parks of Shanghai and Beijing and their technological learning and upgrading.	Representational Comparative case study	
Su, De-Jin; Sohn, Dong-Won (2012): Why do Beijing Universities play important roles in regional innovation systems? Based on resource-based view. In <i>Afr. J. Bus. Manage.</i> 6 (14).	1) Propose a model that describes the systematic functions of university in RIS 2) According to resource-based view, the advantages of Beijing universities related to RIS are discussed 3) The impacts of Beijing universities and RIS	Representational case study	S&T
Zhao, Jingyuan; Richards, Joseph (2012): Beijing innovation system: the perspective of organisational structure and	“Critically analyse the Beijing RIS and its structure that would help	Representational case study	

spatial distribution. In <i>International Journal of Learning and Intellectual Capital</i> 9 (4), pp. 413–428.	policy planners to set future direction of its development”.		
Breznitz, Dan; Murphree, Michael (2011): <i>Run of the Red Queen. Government, Innovation, Globalization, and Economic Growth in China</i> . New Haven & London: Yale University Press.	China's innovation model.	Inferential Comparative case study RIS heuristic	S&T
Liefner, Ingo; Zeng, Gang (2008): Cooperation patterns of high-tech companies in Shanghai and Beijing. Accessing external knowledge sources for innovation processes. In <i>Erdkunde</i> 62 (3), pp. 245–258.	1) Do the interaction patterns of high-tech companies in Shanghai and the Yangtze Delta, and in Beijing and the Bohai Region correspond with the accessibility of potential cooperation partners, i.e. FIE, FE and URI? 2) Does the availability of local cooperation partners sufficiently explain cooperation patterns?	Representational Comparative case study	S&T
Chen, Yun-Chung (2007): The Upgrading of Multinational Regional Innovation Networks in China. In <i>Asia Pacific Business Review</i> 13 (3), pp. 373–403.	“China has been gradually upgrading from a low-tech and low-end global factory to include high-tech, high-end production networks. What triggers this upgrading process?” Motorola and Microsoft	Representational case study	
Chen, Kun; Kenney, Martin (2007): Universities/Research Institutes and Regional Innovation Systems. The Cases of Beijing and Shenzhen. In <i>World Development</i> 35 (6), pp. 1056–1074.	„This paper examines the role of URIs in the development of IT clusters in Beijing and Shenzhen“.	Representational case study	S&T
Wu, Weiping (2007): Cultivating Research Universities and Industrial Linkages in China. The Case of Shanghai. In <i>World Development</i> 35 (6), pp. 1075–1093.	Examine the interactions between two elite universities in Shanghai (Fudan University and Shanghai Jiaotong University) and the metropolitan economy.	Representational case study	S&T
Chen, Yun-Chung (2006): Changing the Shanghai Innovation Systems. In <i>Science, Technology and Society</i> 11 (1), pp. 67–107.	“What is the relationship of the Shanghai innovation system with these MNCs’ R&D centres? What are the effects of this new form of FDI on the Shanghai innovation system, especially in terms of technology spillovers?”	Representational case study RIS heuristic	

<i>Quantitative studies</i>	<i>Research question/ aim</i>	<i>Methods</i>	<i>Innovation type</i>
Liu, Xielin; Gao Taishan; Wang, Xi (2018): Regional Innovation Index of China: 2017. How Frontier Regions Innovate. Singapore: Springer.	Innovation performance in China's provinces as of 2017.	Comparative: Statistics	S&T
Wang, Yuandi; Sutherland, Dylan; Ning, Luta; Pan, Xin (2015): The evolving nature of China's regional innovation systems. Insights from an exploration–exploitation approach. In <i>Technological Forecasting and Social Change</i> 100, pp. 140–152.	“(…) to understand how innovative activity is organized regionally and how RISs evolve during the course of development”.	Comparative: Provincial entropy index and use K-means to categorize provinces	S&T
Zhao, S. L.; Cacciolatti, L.; Lee, S. H.; Song, W. (2015): Regional collaborations and indigenous innovation capabilities in China. A multivariate method for the analysis of regional innovation systems. In <i>Technological Forecasting and Social Change</i> 94, pp. 202–220.	“This paper adopts a novel, quantitative approach to study regional innovation capabilities by comparing groups of regions in light of empirically-derived dimensions of regional innovation collaborations”.	Comparative: Ordinal Multidimensional Scaling and Cluster analysis	S&T
Zhao, Shu Liang; Song, Wei; Zhu, Dong Yun; Peng, Xiao Bao; Cai, Wenjing (2013): Evaluating China's regional collaboration innovation capability from the innovation actors perspective—An AHP and cluster analytical approach. In <i>Technology in Society</i> 35 (3), pp. 182–190.	“This paper's primary contribution is methodological in that it provides an approach to establishing the relationship between innovation actors in different areas and on innovation performance”.	Comparative: Analytic Hierarchy Process	S&T
Chen, Kaihua; Guan, Jiancheng (2012): Measuring the Efficiency of China's Regional Innovation Systems. Application of Network Data Envelopment Analysis (DEA). In <i>Regional Studies</i> 46 (3), pp. 355–377.	„The purpose of the present study is to construct a complete measurement framework characterizing the RISs' production framework from original S&T investment to final commercial outputs, and measure the RISs' process-oriented technical efficiency, which is implemented in China's context“.	Comparative: Network Data Envelopment Analysis	S&T
Fu, Wenying; Diez, Javier Revilla; Schiller, Daniel (2012): Regional innovation systems within a transitional context. Evolutionary comparison of the electronics industry in Shenzhen and Dongguan since the opening of China. In <i>Journal of Economic Surveys</i> 26 (3), pp. 534–550.	„In this paper, we show how the formation of RIS has unfolded under these two distinct institutional designs and governance modalities to initiate industrialization following the introduction of the opening policy in China“.	Comparative: Firm survey; descriptive statistics	S&T
Yang, Chih-Hai; Lee, Chia-Min; Lin, Chun-Hung A. (2012): Why does	„This paper aims to investigate the role of RIS	Comparative: Knowledge production	S&T

regional innovative capability vary so substantially in China? The role of regional innovation systems. In Asian Journal of Technology Innovation 20 (2), pp. 239–255.	on regional innovative capability in China“.	function of national innovative capability in Furman, Porter and Stern (2002).	
Chen, Kaihua; Guan, Jiancheng (2011): Mapping the functionality of China's regional innovation systems. A structural approach. In China Economic Review 22 (1), pp. 11–27.	„What are the key factors or the functional constructs determining China's regional innovative outputs? How does the innovation environment perform in the regional innovation process based on system thinking?“	Comparative: Path modeling	S&T
Bai, Junhong; Li, Jing (2011): Regional innovation efficiency in China. The role of local government. In Innovation 13 (2), pp. 142–153.	“The main goal of the current study was to evaluate the efficiency of China regional innovation system, and to examine the influences of local government on regional innovation efficiency.“	Comparative: stochastic frontier analysis (SFA)	S&T

## APPENDIX B: POLICY PAPERS

### *National Policy Papers*

- Central Committee of the Communist Party of China. 2016. The 13th Five Year Plan for economic and social development of the People's Republic of China (2016-2020). Central Compilation and Translation Press. (13th FYP).
- State Council of the People's Republic of China 2015, July 7: Made in China 2025. Retrieved from [iotone.com](http://iotone.com). 22 Nov 2018. (CM2025).
- The State Council on strengthening the implementation of innovation-driven development strategy. To further promote the popular innovation and further development, 2017.
- "Plan for promoting the development of SMEs 2016-2020"/ "Promotion of SME development Planning (2016-2020)" officially released to promote entrepreneurial innovation will become a key work, 2016.
- "Internet Plus", 2015.
- Opinions of the State Council on policies and measures to vigorously promote popular entrepreneurship and innovation, 2015.

### *Shanghai*

- Notice of the general office of Shanghai Municipal People's Government on issuing the Special Action Plan on promoting employment in Shanghai (2018-2022), 2018
- Shanghai encourages entrepreneurship-driven Employment Special Action Plan (2018-2022), 2018
- The Office of Shanghai Municipal People's Government forwarded municipal Human Resources Social Security Bureau and other six departments on the new situation to further promote youth employment entrepreneurship in the city notice, 2018
- Shanghai Industrial Internet Innovation and Development application three-year plan of action 2017-19, 2017
- On the implementation of the city's accelerating the integration of manufacturing and Internet innovation and development, 2017
- Interpretation of the implementation opinions of Shanghai Municipal People's Government on comprehensively, 2016 constructing the innovation demonstration base of public entrepreneurship in YANGPU countries November 24, 2016
- Shanghai Science and Technology innovation "Thirteen-Five" planning, 2016
- The implementation plan of Shanghai to deepen innovation and pioneering education reform in universities, 2016
- "Shanghai Talent Development" Thirteen-Five "plan" issued by the Office of municipal government November 08, 2016
- Guidance opinions of Shanghai Education Commission on further promoting the transfer and transformation of scientific and technological achievements in colleges and universities, 2016
- The implementation plan of accelerating the development of China (Shanghai) free Trade test area and Shanghai Zhangjiang National Independent Innovation Demonstration Zone, 2015

Shanghai's three-year action plan to encourage entrepreneurship-driven employment 2015-17, 2015

Shanghai Municipal People's government issued the "comprehensive construction of the YANGPU National Public Entrepreneurship Innovation Demonstration base of the implementation of advice" notice, 2015

Opinions of the general office of the Shanghai Municipal People's Government on promoting the transformation and upgrading of Shanghai national Economic and Technological Development zone, 2015

Some opinions on reforming and perfecting the management system of scientific and technological achievements of universities and scientific research institutes in the city, 2015

Notice of the Executive Office of Shanghai Municipal People's Government on issuing "implementing opinions on further promoting the transfer and transformation of scientific and technological achievements", 2015

Notice of Shanghai Municipal People's Government office forwarding city Economic Information Committee "on Shanghai to speed up the development of intelligent manufacturing help push the construction of the global Science and Technology Innovation Center", 2015

Some supporting policies on further strengthening financial support and speeding up the construction of science and Technology Innovation Center with global influence, 2015

Opinions of Shanghai Municipal People's government on further improving the employment and pioneering work of the city under the new situation, 2015

### *Chongqing*

Chongqing technology innovation and application demonstration project 2018

Chongqing S&T Committee, Support policy of S&T enterprises 2016

Chongqing high-tech industrial development zone: "One policy for one enterprise", 2016

Technological innovation promotion method of Chongqing high-tech industry zone 2016

Chongqing local taxation bureau, Opinions on the implementation of the policy measures of the peoples' innovation 2015

### *Kunming*

Notice of the people's Government of Kunming municipality on issuing several policies to speed up the construction of the popular innovation supporting platform, 2018

Guandu office of the people's government "Guandu to accelerate the development of scientific and technological innovation driven by a number of policies", 2018

Kunming High-level talents innovative pioneering demonstration base construction management measures (trial), 2018

Kunming to promote public entrepreneurship innovation, 2017

Comments on the implementation of the people's Government of Kunming municipality on speeding up the innovation of mass entrepreneurship, 2017

Notice of the general office of the People's Government of Kunming municipality on issuing several policies for the demonstration construction of Kunming supporting small micro enterprises ' pioneering innovation base, 2017

- Notice of the Office of the People's Government of Kunming municipality on issuing Kunming to speed up the national innovative city and the construction of Science and Technology Innovation Center in South-east Asia, 2017
- Notice on issuing the management measures of the Kunming small micro-enterprise Innovation Service voucher (for trial implementation), 2016
- Notice of Kunming Municipal People's Government of the CPC Kunming Municipal Committee on issuing the "Kunming for the implementation of innovative entrepreneurship for high-level talents", 2016
- Kunming Industrial Technology Innovation Strategic Alliance cognizance management method, 2016
- Notice of Kunming Science and Technology Bureau on issuing the "Kunming development of science and technology to create space to promote innovative dream project implementation measures", 2015

### *Yunnan*

- The executive opinion of Yunnan Provincial people's government on promoting the reform and innovation development of the development zone, 2018
- Opinions of the general office of Yunnan Provincial People's government on promoting innovation-driven development in counties, 2017
- Opinions of Yunnan Provincial People's government on several policies of promoting key industry development, 2016
- Yunnan Provincial People's government of CPC Yunnan Province on implementation of national innovation-driven Development strategy, 2016
- Interpretation of the implementation of the national innovation-driven Development strategy of Yunnan Provincial Government of CPC Yunnan Province, 2016
- Notice of the general office of Yunnan Provincial People's government on issuing the evaluation system of national economic and technological Development zone in Yunnan province to promote innovation-driven development, 2016
- Interpreting the implementation plan of improving the evaluation system of State-level economic and technological development zone in Yunnan province to promote innovation drive, 2016
- Comments on the implementation of the people's Government of Yunnan province on speeding up the construction of popular innovation support platform, 2016
- Yunnan Province issued "opinions" innovation policy measures to promote industrial park transformation and upgrading, 2015
- Science and Technology Department of Yunnan Province: Yunnan Province set off the upsurge of mass innovation and entrepreneurship, 2015
- A summary of constructing innovative Yunnan science and technology into Yunnan policy, 2014

# SHORT CURRICULUM VITAE

NAME: Anna-Barbara Heindl

DATE OF BIRTH: 03 November 1989

BORN IN: Weilburg, Germany

## PRIMARY AND SECONDARY EDUCATION:

2000-2009: Gymnasium Philippinum Weilburg, Germany (Abitur 2009)

1996-2000: Mittelpunktgrundschule Karl Schapper, Weinbach, Germany

## ACADEMIC EDUCATION:

2012-2016: Graduate studies in Geography, Justus-Liebig-University Gießen, Germany (Master of Science 2016)

Semester abroad at Universidad de Antioquia, Medellín, Colombia (Aug 2013-Jan 2014)

Visiting scholar at Central Asian Studies Institute at American University of Central Asia, Bishkek, Kyrgyzstan (Nov 2015-June 2016)

2009-2012: Undergraduate studies in Geography, Justus-Liebig-University Gießen, Germany (Bachelor of Science 2012)

## ACADEMIC CAREER:

Sept 2017-today: Research fellow at Institute of Economic and Cultural Geography at Leibniz University Hannover, Germany

Sept 2016-17: Research fellow at Thuenen Institute of Rural Studies, Braunschweig, Germany

Sept 2012-Feb 2013: Research fellow at Department of Geography, Justus Liebig University Gießen, Germany



# LIST OF PUBLICATIONS

Heindl, Anna-Barbara; Liefner, Ingo (2019): The Analytic Hierarchy Process as a Methodological Contribution to Improve Regional Innovation System Research: Explored through Comparative Research in China. In *Technology in Society* 59, 101197, DOI: 10.1016/j.techsoc.2019.101197