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Armin Müller

The dynamics of unemployment insurance coverage in Chinese cities

Preliminary results (2012-2018)

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ABSTRACT

Despite the rise in scholarly interest directed towards social protection in China in recent years, unemployment insurance remains an understudied topic. Overall, coverage has been rising, but this process remains largely unexplained. This study proposes four hypotheses from different theoretical perspectives, linking unemployment insurance coverage to socio-economic development, economic interdependence, state capacity, and employment and skills. The hypotheses are tested via fixed effects regression on panel data of Chinese prefectural cities, which allows more comprehensive and detailed analyses than previous studies. The results indicate that increases in local population coverage are driven by an increasing scope of formal employment and rising fiscal capacity. Rising economic interdependence, conversely, erodes population coverage. The difference between *de jure* and *de facto* coverage, approximated here through formal sector coverage, is influenced by structural change in the formal urban labor market. Rising employment in skill-intensive services and rising administrative capacity increase coverage. The study's main contribution is an insight into the dynamics of social protection in China since 2012, and shedding light on the increasingly important unemployment insurance and on the crucial role of local governments. The study explains the results in the context of labor market polarization and a changing impact of economic interdependence.

ZUSAMMENFASSUNG

Trotz des in letzter Zeit steigenden Interesses an chinesischer Sozialpolitik bleibt die chinesische Arbeitslosenversicherung ein weitgehend unbekanntes Thema. Insgesamt hat sich die Inklusivität des Systems erhöht, aber der dahinterstehende Prozess wurde bisher nicht erklärt. Diese Studie schlägt vier Hypothesen aus unterschiedlichen theoretischen Perspektiven vor, welche die Inklusivität der Arbeitslosenversicherung mit der sozioökonomischen Entwicklung, wirtschaftlicher Interdependenz, Staatskapazität und Beschäftigung und Ausbildung in Verbindung bringen. Diese Hypothesen werden über fixed effects Regression mit Paneldaten chinesischer Städte getestet, welche im Vergleich zu früheren Studien eine umfassendere und genauere Analyse erlauben. Die Ergebnisse belegen, dass wachsende Inklusion der Bevölkerung durch die Ausweitung formalisierter Arbeitsverhältnisse und wachsende fiskalische Staatskapazität begünstigt werden. Im Gegenzug unterminiert eine steigende Weltmarktintegration die Inklusivität. Der Unterschied zwischen *de jure* und *de facto* Inklusion, welcher hier durch das Proxy der Inklusion Beschäftigter im formalen Sektor gemessen wird, wird durch den Strukturwandel des formalen Arbeitsmarktes beeinflusst: steigende Beschäftigung in ausbildungsintensiven Dienstleistungen erhöht hier die Inklusivität. Der zentrale Beitrag der Studie ist ein Einblick in die Entwicklungsdynamiken der sozialen Sicherung Chinas seit 2012, sowie in die zunehmend wichtige Arbeitslosenversicherung und die zentrale Rolle der subnationalen Verwaltungsebenen. Die Studie erklärt die Ergebnisse im Kontext der Arbeitsmarktpolarisierung und der sich wandelnden Rolle wirtschaftlicher Interdependenz.

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1. INTRODUCTION

Interest in Chinese social policy has been growing in the context of the extraordinary period of sustained high economic growth the People's Republic of China (PRC) underwent since the beginning of the Reform and Opening Policies that ended the Cultural Revolution period after 1978. A series of crucial studies has accompanied the transition from socialist policy heritages to a modern social insurance system for the urban formal sector, and complementary systems of insurance and social assistance for the remainder of the population (see for example: Duckett, 2011; Frazier, 2010; Leisering, Liu, & ten Brink, 2017; Leung & Nann, 1995; Stepan & Lu, 2016; Wong, 1998). Only a comparatively small number of studies has focused on explaining the uneven expansion (or lack thereof) of coverage in the urban formal sector. Some studies identified reluctance of companies and local governments to assume the costs or give up privileges of the old protection systems in the state sector as slowing down the expansion of coverage (Duckett, 2001; Giles, Wang, & Park, 2013). Overall, coverage expansion was found to proceed faster in the coastal provinces, in the public sector, as well as in large and unionized companies (Dong, Luo, & Wei, 2016; Gao & Rickne, 2017). Furthermore, companies were found to respond to low levels of unemployment by more generously signing their employees up for social insurance (Rickne, 2013).

The literature on coverage in Chinese social policy programs has left several gaps, however. First, the empirical focus has been mostly on the Hu and Wen period (2003 – 2012), while there are few studies analyzing more recent data. Second, a substantial part of the literature uses company surveys, which only offer crude indicators of coverage; or rely on local case studies that are not representative for the entire country. Third, the focus is usually either on social insurance for

the formal sector at large, or on pension or health insurance. Other programs, such as unemployment insurance, have remained understudied. Fourth, the existing literature has not yet been linked to the larger corpus of theories on social policy and welfare state development from a political science perspective. This study contributes to filling those gaps: it aims at explaining the coverage expansion of China's unemployment insurance in the second decade of the 21st century.

The following research question will thus guide the inquiry: why did *de facto* unemployment insurance coverage change in Chinese cities between 2012 and 2018? The study draws on several theories from political science to draft working hypotheses about the coverage expansion, and tests them through fixed effects regression. In terms of data, it relies on a dataset of Chinese cities, mostly at prefecture level, which cover more than 90% of the PRC's population. This dataset provides more precise and up-to-date measurement of coverage than the company surveys that informed previous studies. Furthermore, the prefecture-level is a crucial locus of political decision-making, given the strong decentralization of social insurance. Prefectural city governments usually pool the insurance funds and take important policy decisions. The 2010 Social Insurance Law requires full coverage of urban formal employees by all five branches of social insurance. But in practice, there are substantial differences in coverage that largely result from variations in subnational implementation (Giles et al., 2013; Sun & Liu, 2014).¹ So far, scholarly understanding of what causes the differenc-

1 As of 2017, unemployment insurance covered only 13.51% of China's population, compared to 16.03% covered by health insurance and 21.05% covered by pension insurance. To make the figures for health and pension insurance comparable to those for unemployment insurance, retirees receiving pensions and health benefits have not been considered. There are some differences in the coverage rules as described by Giles and colleagues, but those do not explain the differences in coverage.

es between *de jure* and *de facto* coverage remains incomplete. This study will focus on two indicators of *de facto* coverage² suitable for quantitative analysis: overall population coverage, and coverage among formal employees (formal sector coverage). The latter is also an indicator for the difference between *de jure* and *de facto* coverage, as all formal employees should be covered according to the Social Insurance Law.

The remainder of this study is organized as follows: Section 2 provides an overview of the research on unemployment and unemployment insurance in the PRC, followed by an analysis of *de jure* and *de facto* coverage of unemployment insurance at national level. Section 3 provides a summary of core theoretical approaches explaining welfare state development via political actors and institutions on the one hand, and a variety of socio-economic factors on the other. Existing research on actors and institutions in China provides important background information, while different socio-economic factors are more readily available for measurement. Section 4 provides an overview of methods and data, and section five presents the results. The results indicate population coverage is reinforced by growth in formalized employment and fiscal capacity, but undermined by rising economic interdependence. The difference between *de jure* and *de facto* coverage is influenced by the structure of the formal urban labor market, with rising employment in skill-intensive services raising formal sector coverage.

2 *De jure* coverage will not be analyzed as a dependent variable in this study, given the largely time-invariant nature of the group-specific coverage regulations discussed below. Empirically, the share of formal urban employees in the local population serves as a proxy for *de jure* coverage. But even though this figure is time-variant in each city, its theoretical significance as a dependent variable would go far beyond social policy research. It is affected by a broader set of socio-economic and political influences the analysis of which is beyond the theoretical and empirical scope of this study.

2. BACKGROUND INFORMATION AND LITERATURE REVIEW

2.1 Unemployment and unemployment insurance

In 21st century China, unemployment has altogether been a problem of subordinate importance. Compared to many nations of the former Soviet Union, the transition from economic planning to markets has proceeded smoothly. Starting in the mid-1990s, the government reformed and privatized many of its state-owned enterprises, and a substantial part of the former elite of urban workers entered the informal sector, which grew substantially (Leung, 1995; Naughton, 2018, pp. 213–216). Some researchers feared unrest at the time (Mok, Wong, & Lee, 2002), but the unemployed were carefully surveilled and managed by local governments and para-statal community organizations (Heberer, 2009; Jiang, Zhang, Zhang, & Zhi, 2014; Yang, 2015). Furthermore, the state created new social benefit systems to provide a basic livelihood to the new unemployed, and the urban poor in general. These included income-based social assistance called Dibao for the urban poor, comprehensive social responsibilities for state-owned enterprises who let off workers, and unemployment insurance as part of a new social insurance system for the urban formal sector (Gao, 2017; Leisering et al., 2017; Solinger, 2005). Unemployment insurance had a special status as the first social insurance to be enacted for enterprises in public ownership in 1986 (Preliminary regulations regarding "waiting-for-work" insurance for employees in state-owned enterprises, 1986),³ and then to be extended to the private sector in 1999 (Unemployment insurance regulation, 1999). With a mixture of surveillance, social

3 For details regarding the complex and troubled implementation process, see: Leung (1995, 144ff); Solinger (2005, 89ff); Warner (1995).

control and social benefits, Chinese cities largely overcame the unemployment problem during economic transition.⁴

In contemporary China, coverage of unemployment insurance is largely based on formalized, contract-based employment – similar to the Urban Employees’ Basic Pension and Health Insurance programs (Müller, 2017). China’s migrant workers, who come from the countryside and mostly work in the informal sector of the urban areas, tend to return to their rural homes when economic crisis renders them unemployed (for a discussion, see: Cai & Chan, 2009; Chen et al., 2012; Lyu, Dong, Roobavannan, Kandasamy, & Pande, 2019). They are often not covered by unemployment insurance due to lack of stable formal employment and/or lack of an urban household registration (*hukou*). The household registration has been likened to India’s caste system (Whyte, 2010), for it assigns a social status at birth and ties the rural population to its place of origin, and for blocking migrant workers’ and their children’s access to public services and formal employment in the cities (Chan & Buckingham, 2008; Davies & Ramia, 2008; Solinger, 1999).⁵ Even those migrant workers formally covered by unemployment insurance may face difficulties in accessing benefits due to regulatory complications.⁶

Overall, the growth of labor migration and the informal sector in urban China concentrate coverage of unemployment insurance in large companies, and in the formal and the public sector. The informal sector and small- and medium-sized enterprises – mostly in the private sector – are not covered as much (see also: Huang, 2017; Park & Cai, 2011). Besides migrant workers, university graduates also face the risk of unemployment when integrating into the urban labor markets (Bai, 2006).

As few international studies provide detailed analyses of how unemployment insurance is administered in China’s multi-level polity, some background information is necessary to understand the empirical approach of this study. First, the administration of unemployment insurance is quite decentralized: for the most part, pooling is at the level of prefectural cities, but there is also variation; among 31 provincial units,⁷ the 4 provincial cities and 4 other provincial units pool funds at the provincial level;⁸ whereas the provinces of Jiangsu, Zhejiang and Hubei are still largely pooling at the county level⁹ and are currently in transition

4 For more recent research on surveillance and social benefits at local level, see: Pan (2020).

5 Officially, restrictions for unemployment insurance directly based on household registration have been abolished in 2008. Wang and Sun (2014). But according to some sources, some localities continue to apply *hukou*-based rules until today. Yu and Yang (2020).

6 As of today, eligibility for benefits often requires one year of continuous premium payments for unemployment insurance, which can exclude those migrant workers who return home for the spring festival every year, and end up with less than 12 months of premium payment. Zhou and Liu (2020) Another source of distortion is that even among those unemployed eligible for benefits, many do not officially register as unemployed. One study analyzing survey-based data from the provincial capitals found that some 68.85% of

the unemployed registered neither with the local labor department nor with market-based recruitment agencies. Wang and Sun (2014) Migrant workers who receive benefits often do so in the form of a lump sum, rather than monthly payments. Tian (2016)

7 The Special Administrative Zones Hong Kong and Macao, as well as Taiwan, are omitted here.

8 The four provincial cities are listed in the dataset as cities, so the pooling unit and the case are congruent here. The four other provincial units are the small island of Hainan, and the sparsely populated Western regions of Tibet, Qinghai, and Ningxia. The former three are only represented in the dataset with a single city each, which greatly limits any potential distortion in measurement. Furthermore, the term “pooling” (*tong-chou*) also means coordination, so it is not always clear whether the full amount is pooled at the level indicated, or whether only part of the funds has been centralized. Therefore, the four cities in Ningxia may still pool a substantial part of their insurance funds at city level.

9 The county level is the lowest level at which pool-

to city-level pooling (Tian, 2016, p. 25). Prefectural cities are thus the primary locus of local government decision-making about how to implement unemployment insurance, or – in the few areas that pool at county level – represent the closest aggregation of local decision-making in the administrative hierarchy. The city-level data used in this study is thus very suitable for the analytical purposes, but any quantitative analysis should carefully control for heteroskedasticity induced by the complex multilevel data structure.

2.2 *De jure* and *de facto* coverage

In China's multilevel polity, competences for regulating coverage through laws and regulatory documents are distributed across administrative levels.¹⁰ First and foremost, the 2010 social insurance law broadly refers to employers (*yongren danwei*) and formal employees (*zhigong*) as subjects of mandatory participation and premium payment (Social Insurance Law of the People's Republic of China, 2010). The 1999 regulations, extending unemployment insurance from the public to the private sector, more narrowly referred to urban companies and public service units (*chengzhen qishiye danwei*) and their employees, clarifying that this included state-owned, collective, foreign-invested, private and other urban enterprises (Unemployment insurance regulation, 1999). Subnational levels have the authority to go beyond central regulations in terms of inclusiveness. Most regulatory variation is at provincial level and affects only small minorities among the provincial units.¹¹ The sole exception is

the inclusion of small family businesses (*geti gongshang hu*) and their employees in 16 of 31 provincial units (Tian, 2016, p. 83).¹² Furthermore, flexible workers (*linghuo jiuye ren yuan*) have been included in a few local experiments by city governments.¹³ But the inclusion of informal and migrant workers is usually kept on a voluntary basis, as Giles and colleagues (2013, p. 129) note. So overall, the regulatory standards at multiple levels of government have developed in an incremental fashion, but effective variation is rather limited.

This study adopts a working definition of *de jure* coverage as coverage that is both obligatory and codified by a proper law – the Social Insurance Law in this case – rather than less authoritative forms of subnational regulation. This working definition of *de jure* coverage does not extend to people in informal employment, as employment without a labor contract constitutes a violation of the Labor Contract Law rather than the

hai included its civil servants; the provincial city of Beijing, Henan Province and the Guangxi Autonomous Region included employees in Township and Village Enterprises (for an overview of rural industrialization and the role of these enterprises, see: Naughton (2018, pp. 307–330)); and all except four provinces included employees of social organizations (*shehui tuanti*) and private non-company employers. In all these cases, only a small minority of the 31 provincial units differs from the mainstream. Tian (2016, p. 83)

12 For a discussion of this regulatory variation, see section 4.2.1 and FN 38 in particular.

13 Documented variation of coverage regulations at city level is overall negligible. Tian (2016, pp. 157–161) reports pilots in four cities in the 2000s, three of which he describes. Harbin, the capital of Heilongjiang Province, started an experiment including flexible workers in 2010. As of 2016, about 5,000 out of a total of 969,600 insured were flexible workers. Nanjing, the capital of Jiangsu Province, started a similar experiment in 2002. As of 2016, some 65,000 out of 2,597,600 insured were flexible workers. The city of Huangshi in Hubei Province had initiated a similar experiment in 2006, which ended in 2011 before the period of observation. A fourth experiment in Kunming, the capital of Yunnan, was not described in detail.

ing is allowed. (Unemployment insurance regulation, 1999)

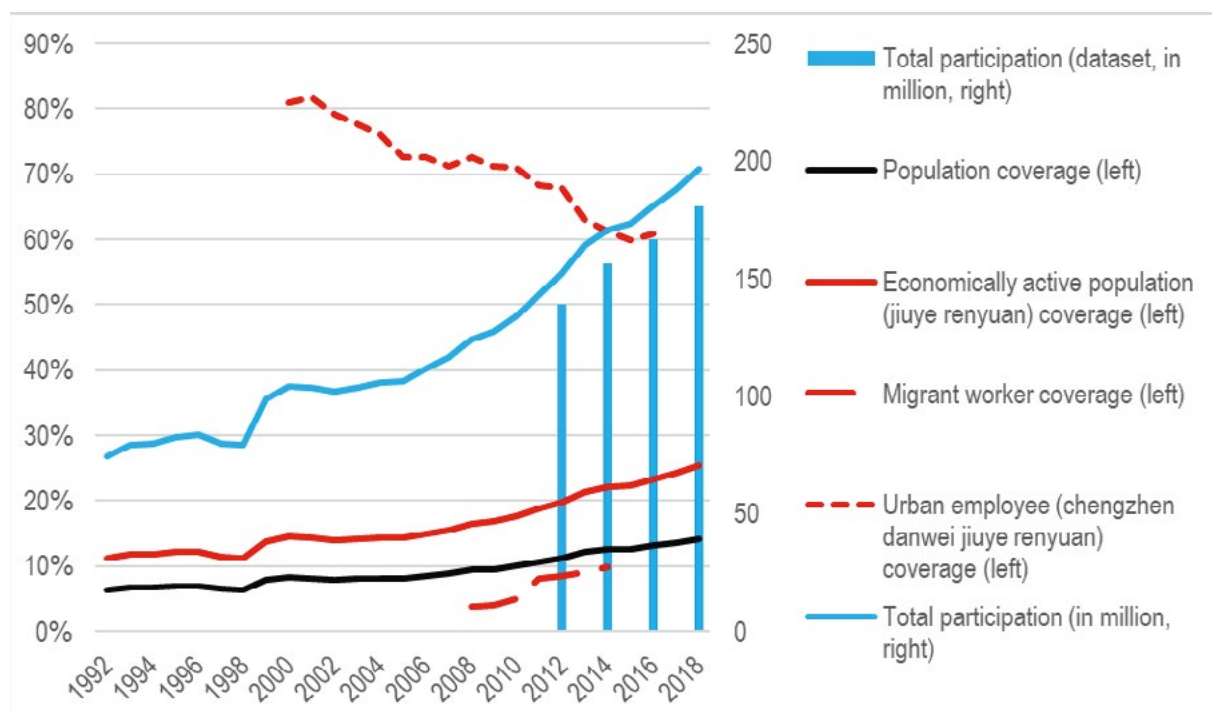
10 The same is true for regulations regarding benefits.

11 Many of the regulations were drafted before the Social Insurance Law was enacted, and thus refer back to the 1999 regulations, which focused coverage more narrowly on urban enterprises of different ownership type and public service units. Building up on this, the provincial city of Shang-

Social Insurance Law. From a legal perspective, all employees in the PRC should have a labor contract formalizing the employment relationship in accordance with the 2008 Labor Contract Law (Gallagher, Giles, Park, & Wang, 2015). By 2010, some 81.24% of urban local wage workers and 60.44% of migrant wage workers had a labor contract (Gallagher et al., 2015, p. 208). But as section 3.2.1 will discuss, the informalization of urban labor markets has been further increasing over the last decade, and the total number of formal employees has slightly declined since 2014 (Rozelle, Xia, Friesen, Vanderjack, & Cohen, 2020). As figure 2 in section 3.2.1 illustrates, the share of formal employment in total employment has overall been decreasing in the 2000s. Partly as a result of this, *de jure* population coverage – measured by the proxy of the share of formal employees in the population also illustrated in figure 2 – reached a peak in 2014 and has since then declined gradually.

Participation and *de facto* population coverage have followed similar trends, as figure 1 illustrates. First, the blue line illustrates the development of total unemployment insurance participation as reported in national-level statistical yearbooks, and the blue columns illustrate total participation in the dataset used in this study (for a description, see section 4.2). Absolute participation has been rising continuously, except for a brief phase of stagnation after extension to the private sector in 1999. The dataset matches the development at national level very well. While formal employment peaked at 183 million in 2014, as illustrated in figure 2 below, unemployment insurance participation surpassed formal employment in 2016, thus obviously going beyond *de jure* coverage by the working definition outlined above. One would expect voluntary participation of migrant and informal workers to explain some of the differences. Second, *de facto* population coverage, illustrated in the black line in figure 1, has followed a similar trend, and

Figure 1.
Unemployment insurance coverage at national level



Source: author's dataset; Health Commission, 2019; Ministry of Human Resources and Social Security, 2019; Ministry of Labor and Social Security, 2001; National Bureau of Statistics, 2010; 2012; 2015a; 2018; 2019; Tian, 2016, p. 32.

an equivalent variable at prefectural level is used as dependent variable in the statistical analysis below.

Third, the red lines illustrate coverage among several groups of the economically active population: coverage of the total economically active population (*jiuye ren yuan*) is significantly higher than total population coverage and follows a similar trend. Coverage of migrant workers remains below population coverage in the few years for which figures are available.¹⁴ Finally, in contrast to the other trends, coverage among urban formal and informal employees (*chengzhen danwei jiuye ren yuan*)¹⁵ has overall declined from about 80% to about 60% since the early 2000s. This falling trend reflects the rising informalization of urban labor markets discussed in section 3.2.1.¹⁶ These red lines differ from the dependent variable of *de facto* formal sector coverage used for statistical analysis below – the number of the insured divided by the number of formal employees (see figure 4): in the dataset, it reached a low of 90.26% in 2014 and rose to 108.26% in 2018. As figures 5a and b in section 4.2.1 below illustrate, formal sector coverage can be way below or way above 100% depend-

ing on the city and the year.¹⁷ Appendix 3 furthermore illustrates all three coverage indicators for the different provinces. The variation in formal sector coverage indicates that *de jure* coverage raises the probability of those targeted to also be covered *de facto*. However, *de facto* coverage excludes some who should be covered and includes some who need or should not be covered (see also: Pan, 2020).

In summary, the Western literature has briefly developed a focus on unemployment insurance and functionally equivalent policy practices when China was reforming state-owned enterprises. Subsequently, in the context of economic growth and full employment, interest in the topic receded. As a result, there are no studies analyzing the development of *de facto* coverage so far. While the trend of informalization of the labor market in the context of economic reforms (Park & Cai, 2011) appeared to have been reversed after the enactment of the 2008 Labor Contract Law under the Hu and Wen administration (2003 – 2012), scholars more recently noted that under the Xi administration (since 2013), informalization of urban employment re-emerged as the dominant trend and formal employment even declined in absolute numbers (Rozelle et al., 2020; see also: figure 2). These trends suggest a growing precariousness of urban employment and highlight the importance of the research question this study seeks to answer: why did *de facto* unemployment insurance coverage change in Chinese cities between 2012 and 2018? The following sections will thus develop working hypotheses about *de facto* coverage, reviewing theories about welfare state development and contrasting them with studies about social protection and politics in China more generally.

14 Covered migrant workers arguably disproportionately represent the roughly 25% of them who have established themselves in the city permanently with their families, rather than engaging in circular migration. Han, Jin, and He (2011)

15 This figure is reported by Tian and differs from those in the dataset, which refer to *congye ren yuan* (here: a joint category for formal employees and civil servants) instead of *jiuye ren yuan*. *Chengzhen danwei jiuye ren yuan* (the economically active population in urban units) here also includes self-employed people and those working in the informal sector. As of 2016, the dataset counted 171 million formal employees, while the number of *jiuye ren yuan* reported by Tian was slightly above 400 million – about the sum of formal and informal employees presented in figure 2 below.

16 Tian (2016, 32ff) suggests that the gap is concentrated in the private sector. This point will be discussed in section 3.2.4.

17 As section 3.1.3 discusses, this is partly due to the existence of informal veto players at local level who may create substantial implementation gaps.

3. THEORETICAL APPROACHES AND HYPOTHESES DEVELOPMENT

This section reviews important theoretical approaches to check their suitability for the formulation of working hypotheses. The expansion of *de facto* coverage and the difference between *de jure* and *de facto* coverage can be explained from competing theoretical perspectives. Not all theoretical approaches – in their present state of development – are equally applicable in the analysis of China. The reasons for these differences are two-fold: first, political science largely operates with medium-range theories, which explain specific phenomena – such as welfare state development – in specific contexts. Second, the corpus of theories regarding the welfare state in political science was largely developed based on data from the OECD world, and in part builds up on elements of their political systems which are not necessarily present in developing or authoritarian countries. The applicability of existing middle-range theories thus depends directly on their degree of context-dependence: more generalist approaches or approaches operating more at the international level are more easily applicable than approaches linking up to specific institutional structures or processes such as competitive multi-party elections. While institutionalist and actor-centered approaches are important in analyzing the development of Chinese social policy, existing medium-range theories in these schools are often difficult to apply, and more basic research is needed to formulate medium-range theories that better fit the Chinese case. The following sections give a non-exhaustive overview of core theoretical approaches to social policy in Western political science and their potential for application in the PRC, before drafting working hypotheses.

3.1 Political actors and institutions

3.1.1 THEORIES OF PARTY COMPETITION

Voting procedures and party competition are at the core of one very important line of theory building, which focuses strongly on welfare state development in OECD countries – and Western liberal democracies in particular. Party differences regarding social policy in this line of theorizing are usually connected to the preferences of their voters, or to inherent ideological creeds of the parties themselves (for a summary, see: Zohlnhöfer, 2019). There are many different approaches, and the discussion here will be limited to a few important aspects. First, the PRC does not have a multi-party democracy with competitive universal elections. Rather, it is an authoritarian regime with socialist legacies. The ideological orientations of the Communist Party could explain the development of Chinese social policy until the end of the Cultural Revolution in 1979. But subsequently, economic reforms were followed by a phase of state retrenchment (Duckett, 2011), which in the 2000s was followed by a phase of consolidation and renewed expansion of social protection. The latter is largely – though not entirely – credited to the Hu and Wen administration (2003 – 2012), which shifted the ideological orientation from liberal market reforms towards state-intervention. Overall, party leaders and their ideology play an important role in China as well as in other emerging economies (Manor & Duckett, 2017). However, the idiosyncrasies of Socialism with Chinese Characteristics complicate international comparisons based on ideology, and the role of ideology is more crucial for the inception of new policies than for the actual dynamics of coverage at local level.

Even though Chinese citizens are not allowed to elect their government from multiple, competing parties, citizens' preferences nevertheless influence politics. As an authoritarian regime, China has a comparatively

broad “selectorate” (Mesquita, Smith, Siver-son, & Morrow, 2005), and the government is very concerned about the state of public opinion. The core selectorate are state cadres and the military, which is among other things reflected in the fact that by the early 2000s, about 80% of state budgetary expenditures for healthcare were used for the social protection of 8.5 million state cadres (Huang, 2013, p. 67). Beyond this core, the former elite of state-owned enterprise workers used to be a crucial and much broader support group, which has been largely displaced by the new urban middle class in the 2000s. This urban middle class is largely equivalent to employees in the formal sector and their families, and to be distinguished from the rural population and workers in the informal sector of the urban areas, many of whom are migrant workers. From the perspective of Moene and Wallerstein (2001), one would expect people with lower incomes – most notably the rural population and migrant workers – to have a stronger interest in redistributive social policy that reallocates resources from the wealthy to the poor. Conversely, the urban middle class would have a stronger preference for insurance against social risk, rather than redistribution. The massive rise in economic inequality since 1979 would be a key driving force behind these preferences. While these assumptions are overall sound, their analytical leverage for this study is limited.

Usually, unemployment insurance is regarded a redistributive policy because of its focus on income replacement for the jobless, and because unemployment risk is often seen as concentrated in the lower income groups. In China, however, unemployment insurance mainly covers formal employees in the urban areas, so most of the redistribution takes place between members of the middle class, rather than across classes. Furthermore, the assumption of Chinese unemployment insurance being a predominantly redistributive program would require empirical validation. As of 2016, only 40.3% of its

total expenditures were used for traditional benefits such as income replacement or skill training during unemployment; 55.5% of expenditures were used as subsidies to support struggling companies (*kunnan qiye shebao butie he gangwei butie*), to stabilize formal employment (*wending gangwei butie*), and other preventive measures. In 2017, new regulations allowed for unemployment insurance to pay for employees’ testing fees for vocational qualification certificates (Tian, 2016, pp. 25–29).¹⁸ The system incurs relatively large surpluses every year, leading to reductions in contributions in recent years (Tian, 2016, p. 246); and benefit regulations differ between provinces (Tian, 2016, pp. 77–113). To establish the preferences from a rational choice perspective would require detailed analysis of provincial regulations and expenditure patterns which is beyond the scope of this paper. Besides the unemployed, employees and companies are direct beneficiaries of unemployment insurance due to its strong focus on preventing unemployment, which differs fundamentally from Moene and Wallerstein’s assumptions.

3.1.2 THEORIES OF POWER RESOURCES AND CORPORATISM

Theories of power resources and corporatism resemble theories of party competition in their strong focus on actors. Power resource and corporatism theories interpret social policy as the result of societal power struggles, most notably between the organized interests of capital and labor. Organized labor and business can influence the allocation of resources in society through different channels. First, the electoral channel involves workers’ parties pushing for an extension of social rights in the political arena (and vice-versa for business) and overlaps with theories of party competition. The

¹⁸ This change in functions may well be connected to the stagnation and decline of formal employment in urban China discussed below.

corporate channel involves labor unions and business associations representing the interests of their respective constituencies. Theories of collective action play an important role in explaining asymmetries in social and political influence of the opposing camps. Beyond indicators regarding voter mobilization in elections and government participation of the respective parties, these theories also incorporate indicators regarding the strength of unionization and of business associations, as well as strikes, and collective bargaining. On the one hand, there is substantial empirical overlap with theories of party competition. On the other, there is also substantial need for qualitative research and case studies, for not all meaningful elements of these theories render themselves easily to quantification. (Ebbinghaus, 2019)

Theories of collective action can be fruitfully applied to the PRC, but a direct transfer of the medium-range theories of social policy developed in research on OECD countries is fraught with difficulty. These difficulties are connected to, first, ambiguities in the economic order and ownership rights; second, the authoritarian nature of the regime and the absence of competitive multi-party elections; and third, the institutional legacies of the planned economy, which critically weakened autonomous community and market institutions. The Communist Party claims to represent the interests of both capital and labor and tolerates little to no competition in this role. Capital-intensive sectors and large companies are typically state-owned, and high-ranking party officials are often also members of wealthy families that represent the interests of big business to some extent. Unions serve as a prolonged arm of state and management and play a coordinating role in companies rather than representing workers' interests independently. Similarly, sectoral associations (*hangye xiehui*) are usually the organizational remnants of the old industrial ministries of the planned economy; they, too, play a coordinating role rather than one of independent interest representation.

The representation of these societal interests primarily occurs through informal channels connected to the CPC and is more difficult to observe directly than in liberal democracies.

Nevertheless, the lenses of power resources, corporatism and collective action can be fruitfully applied, most notably at the local level. This is evident in a large literature on local state corporatism, especially in the context of rural industrialization since the 1990s (see for example: Edin, 2003a; Oi, 1995, 2011; for an overview of rural industrialization, see: Naughton, 2018, pp. 307–329). On a national scale, there is some evidence that private entrepreneurs in China begin to form a strategic group with shared common interests and shared identity that pursues goal-oriented and strategic action. Entrepreneurs strive to get access to organs of government, such as People's Congresses and People's Consultative Conferences, where they can act on behalf of local entrepreneurs or specific sectors. They form business associations and other organizations, both formal and informal, and they use social media to connect and coordinate among each other, to stay in touch with government, and to influence its decisions (Heberer & Schubert, 2019; Schubert & Heberer, 2017). However, they rarely confront the government directly, and their actions are to a large extent informal, so data is less readily available than in OECD countries. Overall, it is plausible to assume that employer interests are well-represented at city government level, which will influence the interpretation of the results in section 5.

Regarding organized labor, recent studies found the presence of labor unions and party committees in private enterprises¹⁹ – which has increased in recent years – to have had a positive effect on social insurance coverage in the early 2000s (Dong et al., 2016; Gao & Rickne, 2017). While these phenomena are important determinants of China's devel-

¹⁹ The public sector is characterized by higher levels of formality in its labor relations.

opment track, respective data from government surveys is not always readily available. But the function of unions here is more one of facilitating state capacity than an independent representation of the interests of labor.

3.1.3 INSTITUTIONALISM²⁰

Rational choice institutionalism in social policy research largely focuses on the effects of institutional barriers. Those are usually veto-points, or veto-players, embedded in the institutional architecture of political systems. Some approaches incorporate the ideological distance of the veto-players as reinforcing their obstructive potential vis-à-vis reforms. Others focus more on the enabling potential of veto-points for the representation of special interest. These approaches are closely embedded into the political systems of, or inspired by, Western liberal democracies. Ideal-typical veto-players are second chambers of parliament with different majorities, or independent central banks and courts (Wenzelburger, 2019).

A direct application of these approaches to mainland China is difficult, most notably due to the weakness of many formal institutions, the opaqueness of political processes, and the resulting informality. The formal institutions of China's political system suggest a strong political centralization and display strong Leninist heritages. But actual decision-making at central level is usually consensus-based and characterized by extensive negotiations, in which central government ministries and provincial governments are involved. At the higher administrative levels, therefore, China's political processes display many characteristics of *"Politikverflechtung"*

in the style of German federalism (Heilmann, 2004; Lieberthal & Lampton, 1992). However, there is no formalized representation for the subnational units. Furthermore, much like France, China lacks a strong tradition of the societal self-organization of economic and social actors, requiring a strong coordinating role of government and public administration. And like Italy, China's political system enforces a uniform set of political institutions on a territory that is socially and economically diverse, and there are massive local differences in the strength and embeddedness of political institutions (state capacity). Furthermore, similar to Switzerland, administrative decentralization in China is strong, and there is a vibrant culture of local policy experimentation to promote or block reform initiatives, and to develop incremental policy change (Heilmann, 2008). Overall, there are plenty of veto-points and veto-players, but they are rarely formally codified and difficult to observe in action directly. Furthermore, the measurement of ideological distance is complicated by the absence of open political debates and formalized factions of the party.

Nevertheless, institutionalist approaches as such can be fruitfully applied in the PRC, especially in fields of policy characterized by dense regulations such as healthcare (Müller, 2016a). But like with theories of power resources and corporatism, there is still a need for qualitative basic research before these approaches can reach a similar maturity. Access to relevant data is a crucial bottleneck and becomes more challenging in times of tightening authoritarianism. A fruitful line of research has developed in analyses of the effects of the cadre evaluation system on local government action (see for example: Edin, 2003b; Heberer & Schubert, 2012; Li & O'Brien, 1999). Most notably, this system prioritizes the multitude of programs and goals communicated by the higher levels of government, and lets local authorities know what is really expected of them. If local experiments or model projects are accompanied by changes in cadre evaluation, this

20 A discussion of historical and discursive institutionalism is omitted here because these approaches do not fit the research design. The former usually requires a period of analysis of more than a decade and is primarily concerned with the distributive consequences of institutions. The latter requires a different type of data than analyzed here.

can support strong quantitative analyses, as recent studies in environmental protection policy demonstrate (Chen, Li, & Lu, 2018).

Local experiments and cadre evaluations constitute important entry-points for empirical research and theory-building. But in the case of unemployment insurance, they do not render themselves easily available: as noted above, unemployment insurance was introduced by decree with little to no previously documented experimentation. Furthermore, the cadre evaluation system creates pressure for local governments to present their localities in a favorable light, which includes reporting low unemployment rates. While evaluations here help rendering important statistical indicators less meaningful, the effects on unemployment insurance coverage are less straightforward. More qualitative research would have to precede a quantitative inquiry from this perspective, but this is beyond the scope of this paper. Furthermore, prolonged gaps between *de jure* and *de facto* coverage of unemployment insurance can be interpreted to at least partly result from the influence of informal local veto players who resist the implementation. But as the number and strength of these veto players does not render itself easily to quantification, this insight is more of a general help to interpret the findings.

Finally, a state capacity perspective can provide important insights into how differences in local administrative and fiscal capacity influence local decision making and policy implementation (Schwartz, 2003). Fiscal capacity in particular is a crucial factor: China's public finance system is largely considered dysfunctional, given that revenue is centralized, expenditure is highly decentralized, and fiscal redistribution via central subsidies is insufficient to compensate for the sometimes-heavy fiscal imbalances at local level (Lee, 2000; Wong, 2009). Readily available indicators of local revenue and expenditure point to a locality's degree of fiscal autonomy and reliance on central subsidies. In a similar way, the number of staff

in the local public administration and social organizations such as unions can provide a rough proxy for local administrative capacity. Previous studies found local state capacity to be an important factor in determining local levels of unemployment and organizing local job creation programs (Duckett & Hussain, 2008). This study aims to further develop this perspective, linking the coverage of unemployment insurance to the uneven fiscal and administrative resources behind the largely uniform institutional setting of local government. The first working hypothesis thus assumes a positive effect of local state capacity on unemployment insurance coverage.

H1: An increase in local fiscal and administrative state capacity facilitates a rise in de facto unemployment insurance coverage.

3.2 The economy

3.2.1 SOCIO-ECONOMIC THEORIES OF THE WELFARE STATE

Approaches linking socio-economic development to the formation and expansion of the welfare state are among the earliest steps in theory development, and among the most generalist ones. Socio-economic theories of the welfare state revolve around two central hypotheses: first, economic growth and development are strong predictors of welfare state development; and second, countries with comparable development levels will display a certain degree of policy convergence. The causal chains that connect these variables are long and complex: technological progress changes the methods of production, which in turn has a transformative impact on social structure and family relations. Rising life expectancy and lower fertility rates are among the outcomes of this transformation which call for further social policy intervention. Finally, economic progress creates the financial resources that enable social

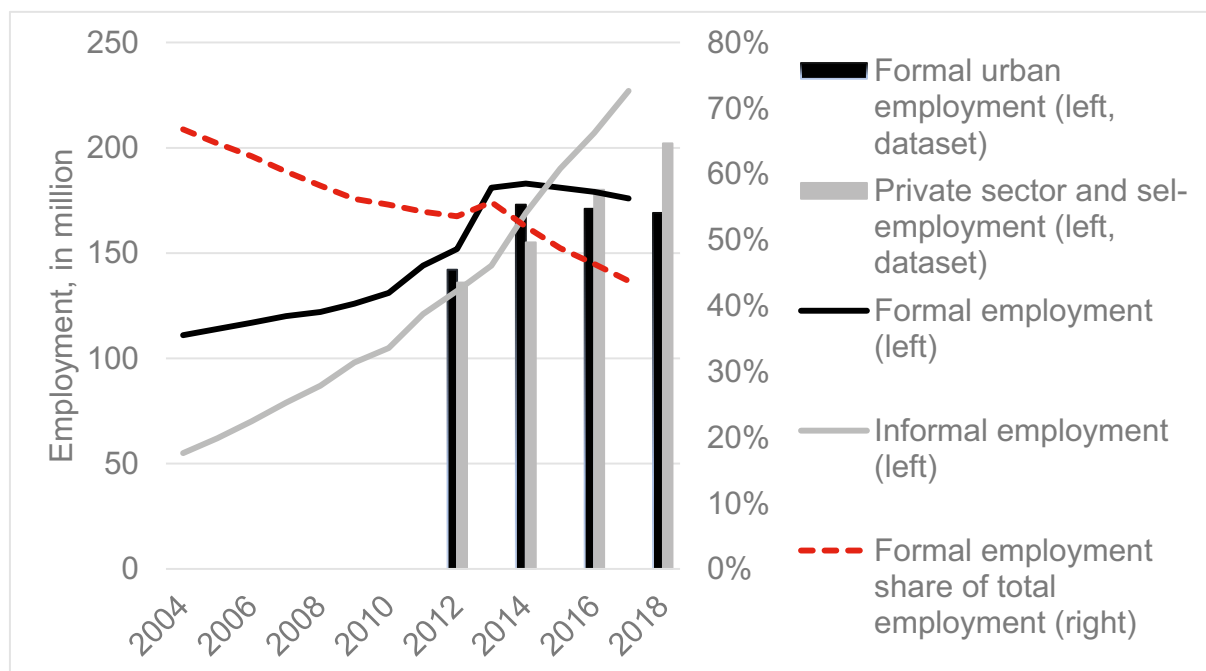
policy intervention by the state. The level and growth over time of GDP is thus a crucial explanatory variable for social policy and welfare state development. (Obinger, 2019).

The PRC today looks back at what is probably the longest period of sustained high economic growth in recorded history. Put in motion by the reform and opening policies enacted since 1979, it has made China a crucial center of global manufacturing (the so-called “work-bench of the world”) and value chains (Naughton, 2018). This growth model was largely based on cheap labor, most notably migrant workers from the rural areas and the inland provinces who came to the coastal cities to improve their incomes. City governments in Coastal China crafted a political consensus between local business and residents on mass immigration by systematically excluding migrants from formal employment, local public services, social protection and permanent local household registration (Chen, 2009). Despite this ex-

clusion, the growth miracle lifted millions of – mostly rural – citizens out of poverty. And while the first two decades of the reform and opening period were largely characterized by state retrenchment (Duckett, 2011), since around 2000 there has been a renewed – albeit gradual – expansion of social protection by the state. Another outcome of the growth miracle are huge imbalances between economically prosperous coastal provinces and the less economically developed central and western provinces. As research on the introduction of rural health insurance indicates, prosperous areas often introduced rural health insurance earlier and operated more generous systems than less developed areas (Müller, 2016a). While actors and institutions also played important roles, the level and speed of economic development is a crucial explanatory factor for the expansion of social insurance.

In the past decade, however, economic development in China has changed direc-

Figure 2.
Formal and informal employment in the Chinese labor market



Source: Rozelle et al., 2020, p. 563; author’s dataset.

Note: Rozelle and colleagues use national-level data from employer surveys and the National Bureau of Statistics, which is illustrated in the lines. This study uses local-level data from the National Bureau of Statistics, which is illustrated in the columns.

tions. Economic growth has begun to slow down gradually, and the stream of cheap labor from the countryside is beginning to dry up. China's economy is moving beyond the so-called Lewis Turning Point: labor is getting increasingly scarce and more expensive, which facilitates trends towards outsourcing and automation in manufacturing, and a transition of labor from industry to services.²¹ As a recent study of Rozelle and colleagues (2020) indicates, this trend has coincided with a reversal of labor market development. Analyzing census data and data from company surveys from the PRC, the trend towards formalization of the labor market following the labor contract law has not persisted. Not only has the absolute growth of formal employment peaked in 2014 and started to slightly decline since then. More importantly, the informal sector has continued to grow massively. Overall, economic development has reinforced the trend of informalization of the Chinese labor market (Park & Cai, 2011), with a reversal around 2013 having been short-lived. Figure 2 illustrates the results of Rozelle and colleagues and adds the data on formal employment that this study utilizes.

These findings have far-reaching implications and call for more general reflections about the connection between social policy and economic development in 21st century China and beyond. For this study, first and foremost, they may indicate that the growth of the urban middle class may have entered a phase of stagnation, given the close association between formal sector employment and middle-class status among the urban population. Second, while total participation in unemployment insurance has been increasing continuously as illustrated in figure 1, a small part of its increase in workforce coverage is also due to the decreasing formal sector. It is important to keep in mind that

the dataset used for this study mainly covers the formal sector of the labor market. As figure 2 illustrates, the indicator for formal urban employment (*chengzhen danwei congye renyuan*) matches the development trend of formal employment identified by Rozelle and colleagues quite well. The indicator for private-sector and self-employment (*chengzhen siying he geti jiuye renyuan*) picks up some of the dynamics Rozelle and colleagues identify as informal employment, but its categories partly overlap with those of formal urban employment. This may point to rising numbers of urbanites being self-employed or working in private households or small companies registered with local business administration departments (*gongshang bumen*).²² The figures point to changes in urban labor markets that will be discussed further in the following section.

Socio-economic theories would expect the process of economic development to create new social problems, to which the state reacts with social policy. As China is a developing country, one would expect economic development to facilitate the emergence of a formal sector of the urban economy, in which larger and more productive companies are concentrated, and employment relationships are formalized and contract-based (for a summary of these arguments, see: Middleton, Zideman, & van Adams, 1993). Productivity provides the resources necessary for social policy, and formalized organization and labor relations facilitate state intervention. In many ways, the changing structure of employment at local level is an indicator for the complex causal chains connected to these problems, as will be discussed in the following section. But first and foremost, the following general working hypothesis shall be tested in the further inquiry:

H2: *De facto coverage of unemployment insurance is rising faster in cities with faster*

21 The applicability of the concept of the Lewis Turning Point to China is somewhat disputed. For a summary of the discussion, see: Naughton (2018, pp. 230–233).

22 For detailed definitions of the categories, see: Chen (2019, 386f).

economic growth and a faster-growing formal sector.

Given the changing growth trajectory, the importance of industry in the local economy should be added as a control.

3.2.2 EMPLOYMENT AND SKILLS

This section continues the discussion of economic development and employment, with particular attention to the question of skills. Rozelle and colleagues argue that China is undergoing a process of labor-market polarization, comparable to the USA and other countries, but at a lower level of GDP per capita. To illustrate this, they divide service employment into skill-intensive and labor-intensive sectors.²³ Using largely the same categories of employment, this study reproduces these indicators for city-level data.²⁴ Doing so allows for a rough assessment of the scope of informal employment in different sectors of the economy, which goes beyond the paper of Rozelle and colleagues. Furthermore, it allows to follow the transition of labor from industry to services to some extent, and to see whether the social problems connected to this process facilitate an expansion of unemployment insurance coverage as socio-economic theories would expect.

Figure 3 illustrates the sector-specific employment data. National-level data are presented in the lines and aggregated city-level

data in the columns. The results indicate that for manufacturing (red) and construction (yellow), the city-level data matches the national-level developments: stagnation and decline of total employment after 2014 with a roughly stable share of informal employment.²⁵ For the service sector, however, the city-level data points to a similar trend of stagnation and slight decline in formal employment, both for skill- (purple) and labor-intensive (blue) employment, while informal employment is rising for both. This is important because the figures appear decoupled from the trend that Rozelle and colleagues discovered, namely an expansion of service-sector employment in recent years. They emphasize a growing polarization between more formalized skill-intensive service employment and more informal labor-intensive service employment.²⁶ The city-level data however indicates that in skill-intensive services, too, newly added employment displays high levels of informality and/or self-employment. Overall, it is thus important to remember that employment by sector in the dataset only covers the formal sector of employment, while excluding informal and self-employment, and that this sector reflects the overall trends in manufacturing

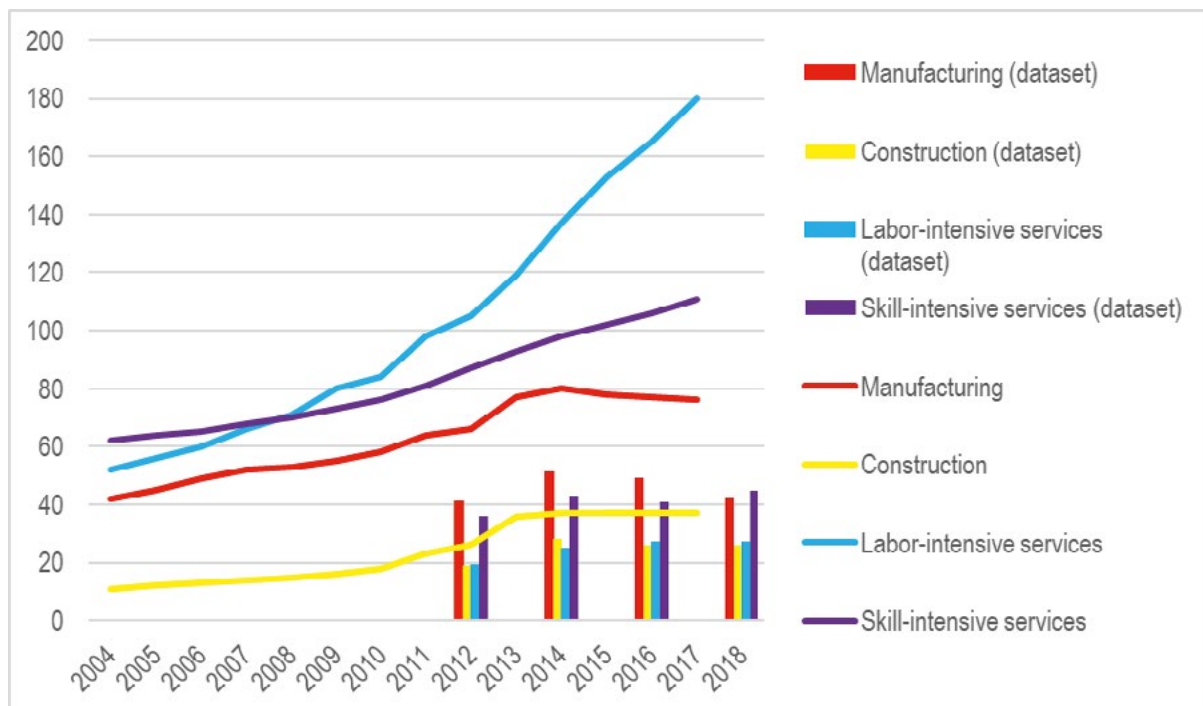
23 The distribution of different categories of employment is as follows: "Labor-intensive services include transportation and storage; wholesale and retail trades; hotel and catering services; leasing and business services; and services to households and other services. Skill-intensive services include information transmission, computer services, and software; financial intermediation; real estate; scientific research; technical services and geologic prospecting; education; health care and social welfare; and culture, sports, and entertainment." Rozelle et al. (2020, p. 563)

24 The category "technical services and geologic prospecting" does not exist in the City Statistical Yearbooks, indicating slight differences between the two indicators for skill-intensive services.

25 This matches reports about migrant workers leaving manufacturing in recent years, and entering the service sector as small entrepreneurs – running restaurants or beauty parlors for example – or in informal or atypical employment relationships – such as online platform delivery services like Meituan. Financial Times (2018); Yuan (2021) Former migrant workers often lack the skills to enter regular employment relationships in the formal sector, which is among the core skill formation challenges the PRC is facing in the 21st century. Rozelle & Hell (2020)

26 On the one hand, this may point to a rise in professions of independent practitioners. On the other, this might indicate that due to long-standing problems with graduate unemployment and tightening graduate labor markets, more and more university graduates are founding their own companies or entering informal or atypical employment relationships as well. Bai (2006); Wang (2014); Yang & Liu (2019)

Figure 3.
Total employment by sectors (in million)



Source: Rozelle et al., 2020; author's dataset.

and construction better than in services, both skill- and labor-intensive.

There are multiple theoretical approaches to the connection between skills and social protection in the labor market, most of which revolve around employer incentives. As we have seen above, it is plausible to assume that employer interests are well-represented at local and central government level in China. Public sector organizations are closely connected to government and administration due to their ownership status, and private entrepreneurs strive to be represented in legislative and consultative bodies. Neo-classical economists largely see unemployment insurance as undermining competitiveness by raising the costs of employment, and undermining incentives to work by de-commodifying labor (Paster, 2019). However, employers may respond to a scarcity in the supply of labor by providing more social protection to attract and bind employees. Most notably, this would be the case for skilled employees who cannot easily be replaced, and recent research confirms more social spending of

Chinese companies in areas with lower levels of unemployment (Rickne, 2013). Marxist-inspired approaches of de-skilling and skill polarization would come to similar conclusions: companies would concentrate social protection on a small elite of super-ordinate, super-skilled workers, while de-skilling the mass of regular workers to render them replaceable and emancipate themselves from the need to care for their social needs. (Braverman, 1974; see also: Lafer, 2002; Markovits, 2019).

The Varieties of Capitalism literature conversely sees unemployment insurance and other forms of social protection as beneficial for economic growth and in line with employers' interests in coordinated market economies. Here, unemployment not only supports cooperative labor relations by protecting incomes in case of unemployment, but also supports the cultivation of industry-specific skills:²⁷ when skilled workers

²⁷ The term "industry-specific" here refers to a sector of the economy, rather than industrial manufac-

lose their jobs, temporary income replacement allows them to look for a new job that matches their skills, reducing the pressure to take just any job; and it can allow them to take additional training and actualize and further develop industry-specific skills that might otherwise be lost (Estevez-Abe, Iversen, & Soskice, 2001; Paster, 2019). While China is not a coordinated market-economy and empirical evidence for these hypotheses is somewhat mixed even in OECD countries, employers in sectors depending strongly on industry-specific skills might have such calculations. Usually, the Chinese labor market is depicted as a textbook case for market failure (Booth & Snower, 1996), with high levels of poaching and turnover seriously affecting business development and strategies (Cooke, 2005; Cooke, 2012; Woronov, 2016). Key industries are dominated by low-wage-low-skill or high-performance regimes of production operating with a Taylorist work organization (Lüthje, Luo, & Zhang, 2013), which de-skill workers and divide the work process into small and repetitive pieces suitable for automation. Nevertheless, it is plausible to assume that in areas with suitable types and levels of skill-dependence, employers may have an active interest in unemployment insurance coverage connected to skill-formation, especially since its benefits include skill formation for both, employees and the unemployed.

There are thus several theoretical approaches providing plausible lines of argumentation that employers have an interest in providing unemployment insurance for skilled employees. The data used here is not sufficiently detailed to distinguish them empirically, and more qualitative and field-work-based research would be necessary to verify which causal mechanisms really apply. But as the distinction between skill-intensive and labor-intensive employment by Rozelle and colleagues can be replicated, the following working hypothesis will be tested.

Furthermore, as the construction industry is typically labor-intensive with limited skill requirements, it is included here as a low-skill sector (Zhang, 2001).

H3a: An increase in the share of employees in skill-intensive service sectors in a locality's economy facilitates a rise in de facto unemployment insurance coverage.

H3b: An increase in the share of employees in labor-intensive services and construction in a locality's economy facilitates a fall in de facto unemployment insurance coverage.

For manufacturing, the data does not allow for distinguishing different skill levels. The study will thus merely control for the effects of manufacturing.

3.2.3 ECONOMIC INTERDEPENDENCE

China looks back at one of the most impressive periods of long-term sustained growth in recorded history, and this growth was largely driven by exports and foreign direct investment. Economic interdependence has been a driver of economic growth, and economic growth has been a driver of welfare state development. Some characterizations of welfare state development in China and Vietnam labelled them "Market-Leninist" regimes, pointing to the interplay of socialist policy heritage and world market integration as driving forces of institutional change in education and healthcare (London, 2013). Against this background, approaches regarding the connection between economic interdependence and insurance coverage should be considered here.

There are competing theoretical approaches considering interdependence. Some scholars argue that economic openness to the world economy undermines existing arrangements of social protection in the pursuit of profit (Starke & Tosun, 2019). With regard to China, some see the early reform period as a phase of retrenchment, in which

turing in the narrow sense.

socialist guarantees to social security were largely abandoned to facilitate the global competitiveness of China's economy (Duckett, 2011). Other approaches see interdependence as facilitating social protection as a compensatory measure (Starke & Tosun, 2019). From this perspective, the introduction of unemployment insurance could be regarded a compensation for abandoning socialist employment guarantees. The perspective taken here builds up on this latter view: the coastal provinces took the lead in integrating into the world market, they benefited disproportionately from the export-driven economic boom as a result, and they have often taken pivotal roles in developing social protection arrangements. In unemployment insurance in particular, coastal provinces have played a key role in strengthening skill formation benefits (Tian, 2016, pp. 77–113). Studies at company-level however found somewhat mixed results regarding the influence of exports on social insurance coverage (Gao & Rickne, 2017). It is also plausible to assume that export-dependence and import-dependence could differ in their effects on local economic development and, thus, unemployment insurance coverage. This study can only take a first step to analyze this topic complex, which will be further developed in future studies. It departs from the compensatory hypothesis but remains conscious of the opposite argument as well:

H4a: An increase of the share of exports in a locality's GDP facilitates a rise in de facto unemployment insurance coverage.

H4b: An increase of the share of imports in a locality's GDP facilitates a rise in de facto unemployment insurance coverage.

3.2.4 ADDITIONAL CONTROLS

There are several other factors that do not feature prominently in the above-mentioned theories but should be controlled given that previous studies found them to have an im-

pact. First, ownership status of an employer has been reported to affect coverage of social insurance: public and foreign-invested companies were found to have higher coverage than private and collective companies between 2000 and 2010 (Gao & Rickne, 2017; Rickne, 2013). According to Tian, if employees in purely private companies were assumed away, the number of insured would suffice to cover between 90% and 104% of the public and mixed ownership sector between 2005 and 2016 (Tian, 2016, p. 31–32). This idea appears plausible against the background of research on Chinese production regimes (Lüthje et al., 2013): sectors with strong public ownership such as the automotive or chemistry industry often operate strongly bureaucratic production regimes with formalized labor relations, where coverage should be high. The same is true for public service units. Conversely, private companies more often operate high performance or low-wage-low-skill regimes. However, it is important to point to confounding factors between ownership and other industry- and company-specific factors that are rooted in the Chinese reform process. Small companies and light industry were privatized earlier on in the reform of China's state-owned and collective industries in the 1990s and 2000s, whereas the state kept a hold on the "commanding heights" of the economy, and on large and capital-intensive companies more generally (Naughton & Tsai, 2015). As the dataset contains an indicator for formal private-sector employment (including self-employment) in the urban areas, it will be used as an additional control.

Furthermore, the size of companies has been reported to be an important factor (Gao & Rickne, 2017; Rickne, 2013). As the dataset contains an indicator for large industrial enterprises, it will be used as an additional control. Finally, the degree of urbanization might be an important mitigating factor for coverage. This study uses the share of the local population registered as urban in the total local population as an indicator.

3.3 Summary of the working hypotheses

The preceding sections have briefly summarized the expectations of prominent theoretical approaches to social policy and welfare state development regarding unemployment insurance in the PRC. Theories focusing on political actors and institutions face challenges: prominent medium-range theories in political science have been largely developed based on data from OECD countries and liberal democracies. It is difficult to directly transfer them to the Chinese context. In a more general way, actor-centered and institutionalist theories have been very fruitfully applied. However, except for state capacity, the quantification of these approaches is still developing. Relevant data is often not available (as in the case of strikes and civil unrest) or requires extensive search or privileged access to be collected. While the further development of these approaches is important, it is beyond the scope of this study. Existing research on China does however provide us with important insights into the causal mechanisms at work.

Theories about the influence of the economy on social policy conversely are more generalist in their explanatory approach, as they are less closely tied to political institutions. They are also more easily applicable to the PRC, because data on socio-economic developments is much more readily available than data on political developments. It is important in this context to guard against functional fallacies: functional connections – for example between economic growth and social policy – are mediated by actors and institutions, sometimes in long and complex causal chains (Mayntz, 2002, p. 35). Even though those complex causal chains cannot always be observed in their entirety, both direct and indirect effects of the independent variables on changes in coverage are analytically valuable.

Inspired by the theoretical approaches described above, four working hypotheses are to be tested on the dataset. These hypothe-

ses are geared towards explaining change over time, rather than absolute differences between cities. This approach helps to abstract from a lot of time-invariant confounders in the analysis. As the following section describes, there are two dependent variables on which the hypotheses will be tested. First, population coverage measures *de facto* coverage at large while completely abstracting from participation regulations, which are for the most part time-invariant during the period of observation. Second, formal sector coverage takes formal urban employees as a proxy of the *de jure* covered population, and thus measures the difference between *de jure* and *de facto* coverage. So explanatory power is tested both for overall coverage as well as local implementation dynamics.

List of the Working hypotheses:

H1: An increase in local fiscal and administrative state capacity facilitates a rise in de facto unemployment insurance coverage.

H2: De facto coverage of unemployment insurance is rising faster in cities with faster economic growth and a faster-growing formal sector.

H3a: An increase in the share of employees in skill-intensive service sectors in a locality's economy facilitates a rise in de facto unemployment insurance coverage.

H3b: An increase in the share of employees in labor-intensive services and construction in a locality's economy facilitates a fall in de facto unemployment insurance coverage.

H4a: An increase of the share of exports in a locality's GDP facilitates a rise in de facto unemployment insurance coverage.

H4b: An increase of the share of imports in a locality's GDP facilitates a rise in de facto unemployment insurance coverage.

4. METHODS AND DATA

The previous sections have provided an overview of the literature in unemployment insurance in China and put forth the following research question: why did *de facto* unemployment insurance coverage change in Chinese cities between 2012 and 2018? Furthermore, they reviewed existing theoretical approaches and drafted four working hypotheses aiming to explain change over time. This section outlines the methods and data used to test these hypotheses, and the following section presents the empirical results.

4.1 Analytical methods

This study will analyze change over time, rather than absolute quantities, to exclude the effects of omitted time-invariant variables in the estimation. These include hierarchies in socio-economic development, the administrative status of cities in China's bureaucratic hierarchy, cities' geographical location and its effects on economic structure, and many other unobserved local particularities. By controlling for these effects, the study can observe whether an increase in an independent variable – say growth in the share of formal urban employees in high-skilled service jobs – actually causes an increase in *de facto* unemployment insurance coverage in the same period.

There are two principal model options available to analyze change over time: fixed effects and first differencing. Both are unbiased under the strict exogeneity assumption for panels with $T > 3$, and both are consistent over the central limit theorem. This study chooses fixed effects models for their superior capacity in handling missing data: they do not drop cases automatically if only one observation is missing, which renders the estimates more representative in the context of this design. This allows for integrating

important control variables, such as large industrial enterprises, which would require the exclusion of several cities under first differencing. The calculations presented in section 5 were made with R for Windows 4.0.5 and the plm package version 2.4-1.

4.2 Data and indicators

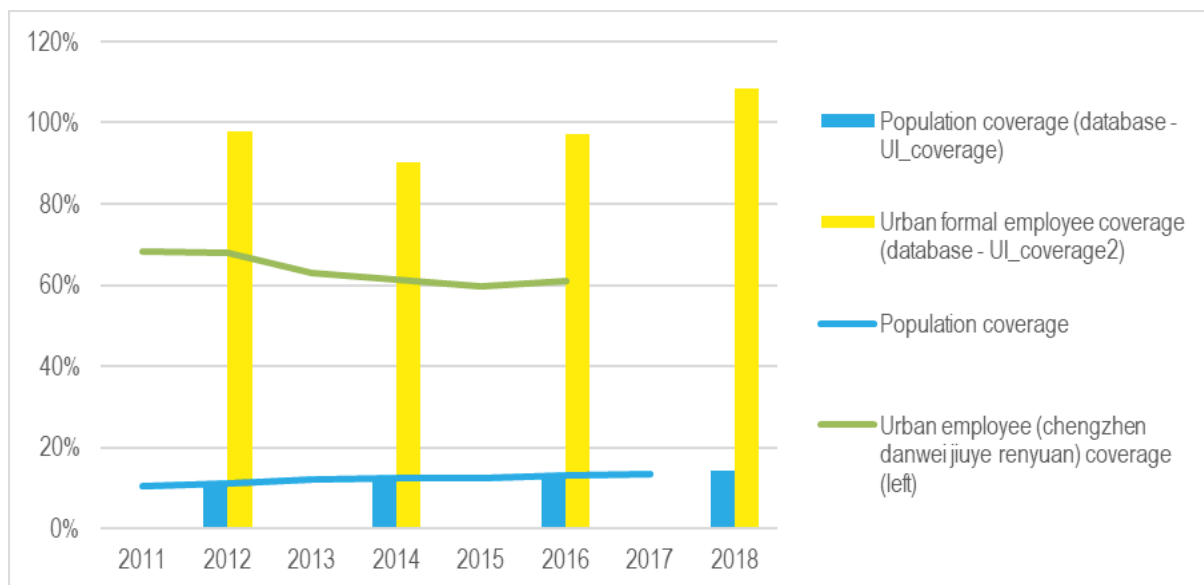
To test the hypotheses specified above, the author compiled a cross-section-time-series²⁸ dataset from the China City Statistical Yearbook (*Zhongguo Chengshi Tongji Nianjian*). This data has the advantage of capturing the dynamics of social insurance expansion at the level where – as discussed in section 2 – pooling is usually conducted, and where important policy decisions for *de facto* coverage are made. Since the 2013 edition, the yearbook covers data on social insurance participation in prefectural cities, which allows for a detailed analysis of the development trends of unemployment insurance at the local level. Compared to previous studies based on company surveys (Gao & Rickne, 2017; Rickne, 2013), the yearbook data is much more precise.²⁹ It is also much more up-to-date, covering the period since 2010. The results should thus provide valuable new insights to the field of research.

There are, however, also some limitations to this data, most notably regarding the number of control variables available. This limitation can be compensated for by choosing appropriate panel models, as discussed above. More generally, China is a

28 The term cross-section-time-series here refers to datasets with $N > T$, as opposed to time-series-cross-sections ($T > N$), both of which differ from Panel data proper due to the absence of random sampling in data collection.

29 The company surveys merely captured in a binary variable whether a company paid any contributions at all for an unknown part of their employees. Local governments in turn report the total number of registered insurance participants and report separate figures for unemployment insurance.

Figure 4.
Unemployment insurance coverage of the population and urban employees



Source: Rozelle et al., 2020; author's dataset.

developing country and its statistics do not have the same standards of quality as those of industrialized countries. But as Naughton (2018, pp. 157–160) notes, the quality of official statistics has improved tremendously over the past decades, and there is no alternative to using official statistics if we want to understand China's development dynamics, especially at local level.

The dataset covers 284 cities over 4 time-periods, using data for the years 2012, 2014, 2016 and 2018 (Chen, 2013, 2015, 2017, 2019). Additional data was taken from the China Statistical Yearbook of the National Bureau of Statistics (2013, 2015b, 2017, 2019).³⁰ A few cities were excluded from the

analysis due to missing data³¹ or highly implausible values.³² The sample of cities used

checks revealed scanning errors in which the figure in the Excel file differed from the figure in the print version by the factor 10. These errors were corrected.

31 The sample is based on cities that already had the status of a prefectural city in 2012, the first year of observation. A total of 11 cities acquired the prefectural city status during the period of observation. These are disproportionately concentrated in the sparsely populated areas of Western China, and in Xinjiang and Tibet in particular. Another city in this region lacked employment data for one year and was thus excluded. These regions also continue to feature some rural prefectures which are not included in the dataset. Furthermore, a few county-level cities could not be considered in the analysis, because only a reduced set of indicators was reported for those jurisdictions.

32 For a small number of cities, these checks revealed contradictory and implausible points of observation. These were concentrated in the various variables regarding employment. In the cases of the provincial-level city Chongqing and the provincial capital Chengdu, employment data seemed massively distorted over prolonged periods of time, and these two were thus excluded from the analysis. Furthermore, three more cities in Anhui Province displayed what appears to be temporal glitches in reporting of employment data. In the cities of Suzhou and Lu'an, the glitch-

30 The data used here is provided by the CNKI database in the form of Excel files. The data from these files was carefully checked for errors. Most notably, 5% of the observations were compared with the visual scans of the yearbooks' print versions. A small number of errors could be detected, which arguably occurred in the scanning process (a ";" or ":" instead of a "," or at random). Similar errors could be searched across the dataset and were corrected. Furthermore, visual controls were applied to check the distribution of the different variables for the different times of observation in each city. In a small number of cases, these

in the analysis covered 1.23 billion registered residents as of 2012, which equaled 90.65% of China's total population.³³ The informal number may be even higher due to the presence of unregistered migrants.

4.2.1 THE DEPENDENT VARIABLES

Two measures of coverage are used as dependent variables here: population coverage measures the number of persons insured in unemployment insurance divided by the registered (*hukou*) population of a city. Figure 4 illustrates that this variable closely matches national-level coverage figures in the statistical yearbooks. Formal sector coverage measures the number of insured persons divided by the number of formal urban employees in a city. This variable can serve as a proxy for the difference between *de jure* and *de facto* coverage,³⁴ thus pointing to implementation dynamics at local level. Figure 4 illustrates that the coverage trend differs markedly from that reported by Tian (2016, p. 32) for urban formal and informal employees (*chengzhen danwei jiuye ren yuan*). While coverage of formal and informal ur-

ban employees continued to decrease, formal sector coverage reached its minimum in 2014 – the same year in which total formal sector employment peaked – and then started to rise again. This indicates that the decrease of formal employment is accompanied by increasing coverage in the formal sector. But as formal sector coverage rises above 100% in 2018, at least parts of the informal sector or the self-employed are covered as well. The last point becomes obvious when looking at the dependent variables at provincial and city-level.

Figure 5a provides a scatterplot of provincial coverage rates, which indicates that population coverage and formal sector coverage tend to be higher in the coastal provinces.³⁵ Beijing and Shanghai constitute outliers for population coverage due to large numbers of insured employees without a local household registration working in these cities.³⁶ With regard to formal sector coverage, however, their values are much closer to the remainder of provincial units, as this indicator is less affected by migration. Formal sector coverage is frequently above 100%, so there

es affected observations in one year only, and the employment data was replaced by intermediary values of the preceding and following period to fix them. The city of Xuancheng was left out of the sample for the glitches affected multiple periods of observation.

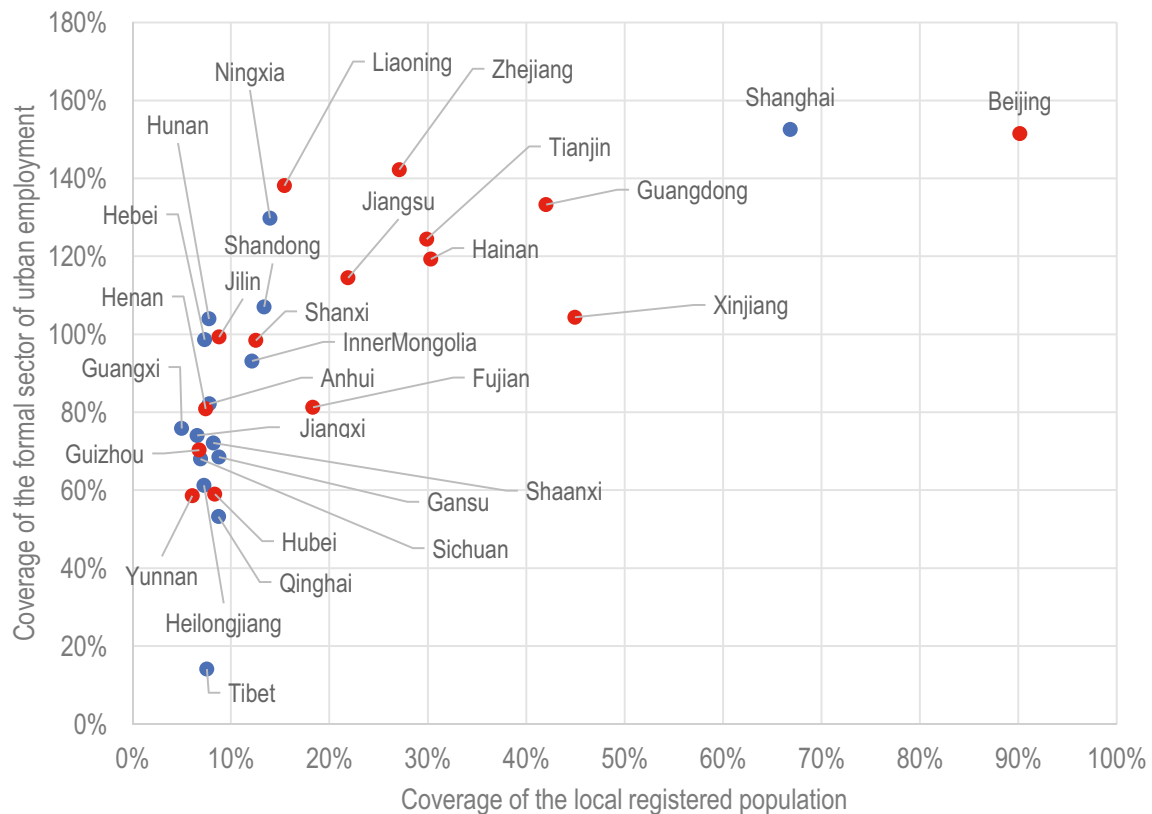
33 Population data taken from: Health Commission (2019).

34 It measures this difference because *de jure* coverage of formal employees in a city is always near 100% in accordance with the working definition. *De facto* formal sector coverage values significantly below 100% indicate implementation gaps, whereas values above 100% may indicate voluntary participation by informal workers or special efforts by local government. Analyzing the scope of the formal sector as a dependent variable would be less analytically fruitful here. While it constitutes a reasonably robust proxy for *de jure* coverage, its development over time would have to be explained with other theoretical approaches. Furthermore, the essence of *de jure* coverage are static group categories to be included, rather than change over time in the number of people that fall into these categories.

35 The figures for the large and sparsely populated provincial units of Tibet, Qinghai and Xinjiang are less representative than those for the more urbanized provinces.

36 The population coverage indicator is influenced by labor migration. On the one hand, formal and insured employees working in a city or province where they are not registered inflate the absolute coverage figures for that particular locality. Furthermore, the movement of people to places where they are not registered leads to slight underestimation of coverage in the sending areas, and slight overestimation of coverage in the destination areas. On the other, however, some three quarters of migrant workers tend to return to the sending areas at least once a year, and many change their destination area frequently. Those typically have their health and pension insurance in the sending areas, rather than the destination areas, among other things due to dysfunctional portability mechanisms (Müller 2017). It therefore makes sense to count about three out of four as part of the sending area for population coverage, which greatly limits the distortion induced by migration.

Figure 5a.
Coverage rates at provincial level (2018)



are more insured than formal employees in some provinces. This indicates that local governments have responded to calls from the center to integrate more migrant workers into unemployment insurance, and that more self-employed and workers in the informal sector may have joined the schemes on a (formally) voluntary³⁷ basis (Giles et al., 2013, p. 129). The red points mark provinces which also allow small family businesses and their employees to enroll, as discussed in section 2.2.³⁸

37 Depending on local government priorities, individuals allowed to voluntarily enroll may or may not be pressured or coerced to enroll (Müller 2016b).

38 Their coverage rates were above average for both indicators. The average population coverage at provincial level was 18.61%, but provinces allowing small family businesses to participate had an average of 24.68%. For formal sector coverage, the total average was 94.32%, and the average for the more inclusive provinces was 105.02%. The smaller scope of this difference is connected

to differences in the scope of the formal sector being picked up by population coverage (see also: appendix 3). Furthermore, migration may have distorted population coverage, because the registered population underestimates the total population in the destination areas and overestimates it in the sending areas.

An exclusive causal attribution of the differences in coverage to the regulatory differences would be problematic. Averages for both indicators are driven up by the coastal provinces, which display other regulatory particularities as well. Most notably, coastal provinces also emphasize skill formation in unemployment insurance benefits to upgrade their economies as noted in section 3.2.3. They have a vital interest in keeping migrant workers in their territories and in upgrading their skills. Their more inclusive coverage regulations thus form part of a larger strategy of economic development, which also involves the mobilization of local governments to propagate the regulations, to mobilize family businesses and migrant workers to enroll, and to organize a framework of skill formation options for employees and the unemployed that is geared to the needs of the local economy. Outside the context of the upgrading coastal economies, such inclusive regulations do not coincide with above-average coverage rates,

In some provinces, formal sector coverage is significantly lower than 100%, pointing to implementation gaps. Population coverage thus measures coverage at large, and suffers from minor distortions due to migration; whereas formal sector coverage constitutes a proxy for the difference between *de jure* and *de facto* coverage, and captures subnational implementation dynamics.

Figure 5b illustrates the dependent variables at city level. For population coverage, eight observations in two cities are above 100%. These are the cities of Shenzhen and Dongguan in the Pearl River Delta. Both are centers of manufacturing that feature partic-

ularly large numbers of unregistered migrant workers. Formal sector coverage figures illustrate that many cities have more participants of unemployment insurance than formal urban employees. Finally, the city of Dongguan constitutes a drastic outlier, having long been a model as the only Chinese city to extend the Urban Employees' Social Insurance to migrant workers and the rural population (Qiu, 2009).³⁹ These outliers are kept in the sample because they carry meaningful information, but doing so creates the risk of distorting analyses with ordinary least squares (OLS). As figure 6 illustrates, the within effects used for fixed effects models also feature drastic outliers. Therefore, it is important to check whether these outliers unfold an undue influence on the results via vi-

as the inland provinces of Guizhou, Yunnan and Hubei illustrate. Socio-economic conditions and inclusive regulations are thus most likely confounded, with the status of a coastal province facilitating higher coverage rates as well as the probability of more inclusive coverage regulations. The regulations on their own should also facilitate higher coverage, but to a much smaller extent.

³⁹ This explains the extreme value of 1236% on the vertical scale in the plot for 2012. Observations in the following years normalized due to a massive formalization of employment relations. The number of workers in the private sector in Dongguan – including many self-employed – grew much more gradually.

Figure 5b.
Coverage rates at city level (in percent, 2012 – 2018)

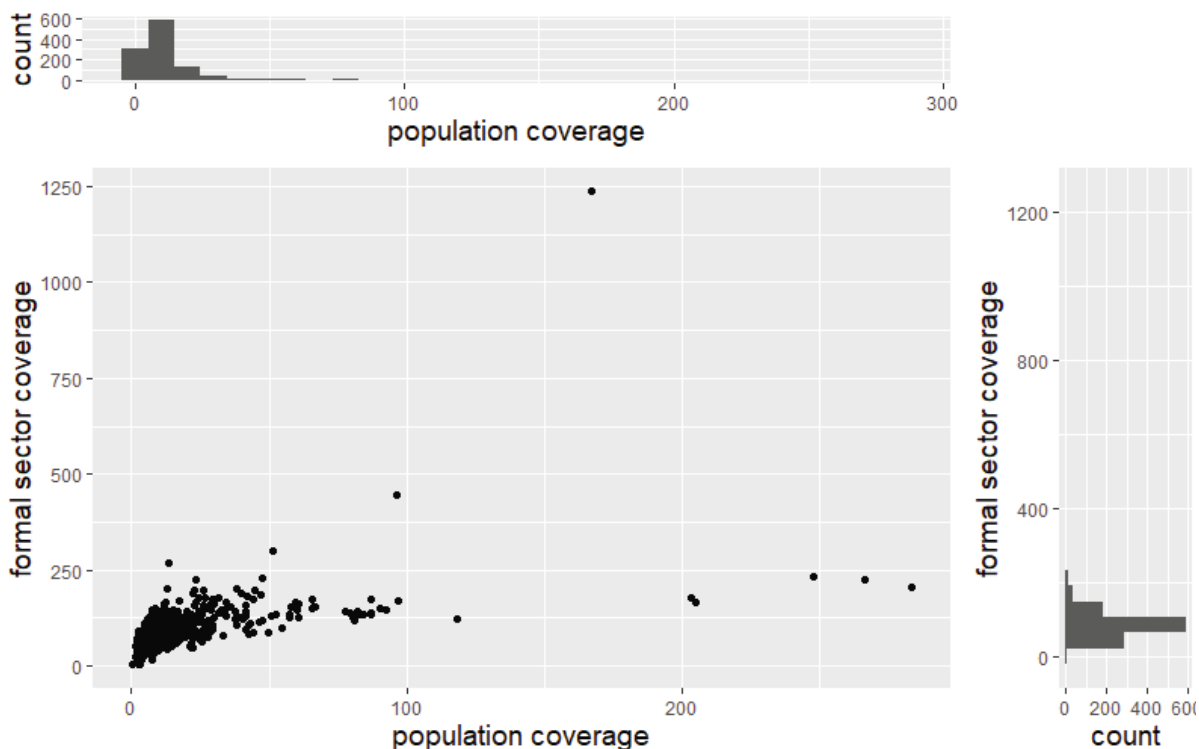
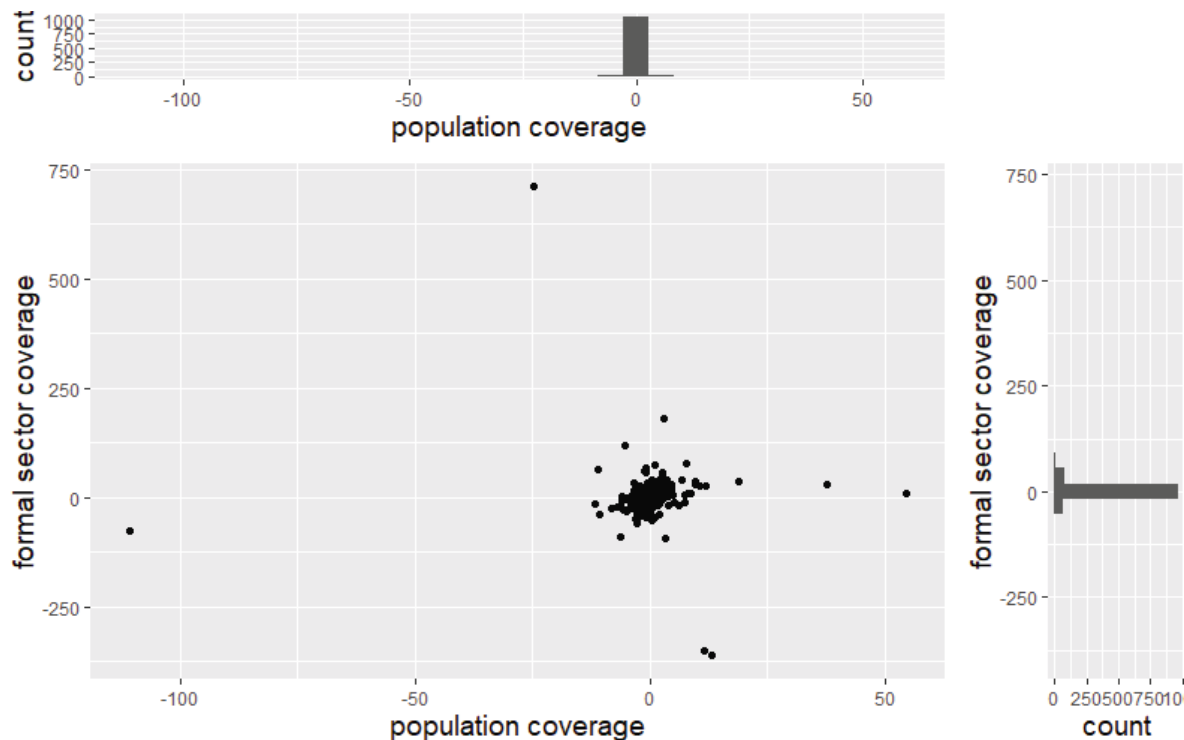


Figure 6.

Within effects of coverage rates (in percent, 2012 – 2018)



sual examination of residuals and controlling Cook's Distance of extreme observations.

4.2.2 THE INDEPENDENT VARIABLES

This study uses two indicators regarding state capacity (hypothesis 1): fiscal capacity is measured as the share of local budgetary revenue in local GDP; and administrative capacity is measured as the share of employees in the public administration and social organizations among formal urban employees. The respective indicator is called “public administration and social organization” (*gonggong guanli he shehui zuzhi*). While this group is counted in the broadly defined “urban formal employees” category (*chengshi danwei congye ren yuan*), it nevertheless includes numerous persons who may not be *de jure* covered, such as civil servants and staff of state organs (*guojia jiguan*), their subordinate units, and social organizations such as unions and the women's federations (Tian, 2016, p. 83). Beyond administrative capacity, the indicator can be expected to

pick up some variation connected to public ownership and skill-intensive jobs. Unfortunately, the dataset provides no cleaner alternative to capture the influence of administrative staffing and union networks, which were found to be meaningful factors in previous studies (author; Dong et al., 2016). Therefore, the share of local employees in public administration and social organizations is used as a proxy for administrative capacity.⁴⁰

For socio-economic development (hypothesis 2), the study focuses on changes in per capita GDP over time, and on the scope of formal employment, measured as the number of urban formal employees divided by the registered population. Given the chang-

⁴⁰ The use of proxies can induce multicollinearity under specific circumstances, for example if pure administrative capacity were highly correlated to other predictors. But even in that case, including the proxy would still reduce the bias of correlated predictors, and potentially the error variance, and thus benefit the estimation as a whole; see discussion in: Woolridge (2018, pp. 279–283).

ing growth model and its socio-economic implications, it also controls for changes in the share of industry in local GDP.

Regarding employment and skills (hypothesis 3a and b), this study relies on the share of the respective professional groups among the total number of urban formal employees. The share of skill- and labor-intensive services was calculated following Rozelle and colleagues (2020) using the following sectors:

- » Skill intensive: (1) information transmission, computer services and software; (2) financial intermediation; (3) real estate; (4) scientific research and technical service; (5) education; (6) health and social work; (7) culture, sports and entertainment.
- » Labor intensive: (1) wholesale and retail trades; (2) traffic, transport, storage and post; (3) hotels and catering services; (4) leasing and business services; (5) services to households and other services.

For formal employment in construction and manufacturing, the dataset provides one aggregate category respectively with which the shares were calculated. Some categories of formal urban employees were omitted in this study, including agriculture, mining, and energy. Therefore, the different employment indicators are not perfect linear combinations of one another. Nevertheless, correlations between those indicators should be checked to avoid multicollinearity.

For economic interdependence (hypothesis 4a and b), the shares of exports and imports in provincial GDP in the destination region are used as indicators. These indicators capture regional exposure to global markets, rather than local exposure at city-level.⁴¹ This

41 Data at city level only features imports and exports in the latest editions of the yearbooks, and other indicators of economic interdependence feature missing values that would have reduced the number of cases. Future research should also test the remaining indicators for interdependence

multilevel measurement may induce heteroskedasticity, which should be controlled for in the models.

The study uses three control variables: first, the degree of urbanization was roughly measured as the share of urban registered citizens in the total registered population. Second, the number of industrial enterprises with an annual business revenue of more than 20 million RMB as listed in the yearbook is used as a control, given the import of firm size in previous studies discussed above. Third, the number of (formal) private-sector employees and the self-employed is provided as an aggregate category in the dataset, which is used as a control as well. Finally, dummy variables for the years 2014 to 2018 are fitted to control for national events of particular significance that may have had an influence, and for variables that are trending at national level while not displaying significant local variation.

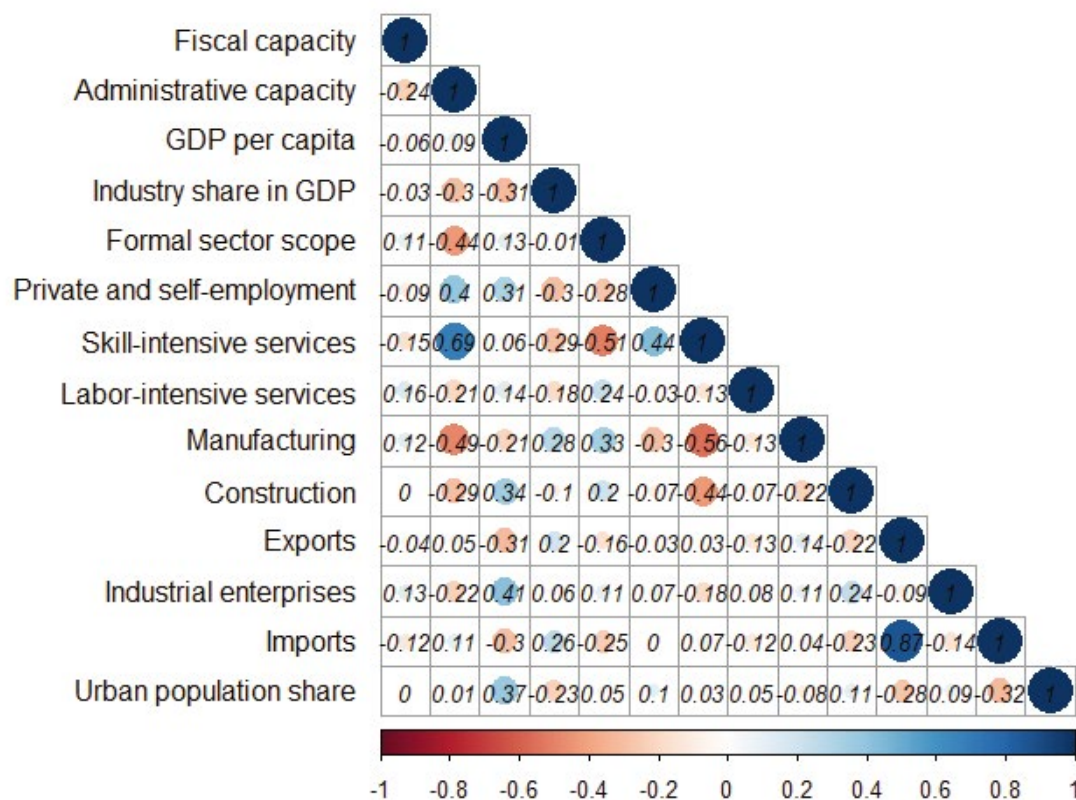
4.2.3 GUARDING AGAINST MULTICOLLINEARITY

Some of the indicators listed above might correlate, which can potentially create distortion in OLS models. Such multicollinearity problems are much debated in statistics and econometrics, and there are no universally agreed upon standards as for when multicollinearity becomes a problem.⁴² In some cases, multicollinearity may be a necessary evil to reduce bias in estimates. As noted above, this study will use a fixed effects model to study change over time, rather than absolute values. Fixed effects models operate with time-demeaned data, meaning that the time-invariant components are left out of the

in nested or multi-level cross-sectional models.

42 On the one hand, one of the crucial assumptions of OLS regression is the absence of perfect multicollinearity to ensure variation in the independent variables. On the other hand, below perfect collinearity, there is little consensus on when exactly multicollinearity becomes a problem. Furthermore, a high level of correlation between predictors per se does not necessarily influence prediction quality. See discussion in: Woolridge (2020, pp. 89–92)

Figure 7.
Correlation plot of time-demeaned variables (within effects)



Note: a matrix of the time-demeaned data has been derived with the function `within()` of the `plm` package. The values were created within a formatted panel dataset and subsequently extracted. The graph was made using the function `corrplot()` of the `corrplot` package.

analysis, as this general equation for a simple fixed effects model indicates:

$$\text{Equation 1: } \ddot{y}_{it} = \beta_1 \ddot{x}_{it} + \ddot{u}_{it} = \beta_1 (x_{it} - \bar{x}_i) + (u_{it} - \bar{u}_i)$$

Fixed effects models aim at explaining the time-variant part of variance (within effects), rather than total variance.⁴³

Figure 7 illustrates the correlations between the independent variables' within effects, which differ from the correlations between the total values used in regular cross-sectional models. There is a strong correlation between the proxy for administrative capacity and the share of employees in skill-intensive services.

This may reflect the skill-intensive nature of many public administration jobs, or the fact that skill-intensive services produce more local tax revenue, which can in turn support more employees in the public administration. Another strong correlation exists between the share of imports and exports in regional GDP, indicating that rising imports and exports coincide at provincial level. This is largely in line with China's role as the workbench of the world. Finally, there are relatively strong correlations (≥ 0.5) between the share of skill-intensive service employees on the one hand, and the scope of the formal sector and the share of employees in manufacturing on the other. To avoid potential distortions, pairs of variables with a correlation greater than 0.5 will be analyzed in separate models, and only be integrated into a final comprehensive

43 Fixed effects models can also be fitted with case-specific dummy variables. In this case, overall R^2 values will be exceedingly high.

model with all controls if their correlation remains below 0.6.

5. RESULTS AND DISCUSSION

The previous section has described the methods and data used in this study. This section presents the results of the empirical inquiry. The first part looks at the models analyzing population coverage, the second part looks at the models analyzing formal sector coverage, and the third part presents a comparative discussion. Table 1 and 2 below present the results of eight models successively analyzing how the indicators connected to the different hypotheses affect the coverage of unemployment insurance among the local registered population and urban formal employees respectively. One set of indicators is introduced at a time, and indicators that strongly correlate are kept in separate models. Each model also features a Breusch-Godfrey test for serial correlation and a Breusch-Pagan test for heteroskedasticity. In almost all cases, the p-value was below 0.05, indicating the presence of serial correlation and heteroskedasticity. Therefore, the tables report standard errors robust against both serial correlation and heteroskedasticity using the `plm::vcovDC()` function in R,⁴⁴ unless they produced smaller values than the regular standard errors. To cope with heteroskedasticity, HC3 standard errors were selected (see discussion in: Angrist & Pischke, 2008, 228ff). Further post-estimation and robustness checks are reported in appendix 2. Model 8 in each table introduces additional control variables, which come with a loss of observations. Therefore, the results are not fully comparable to the previous models.

44 Code: `coeftest (model, vcov=vcovDC (model, type = "HC3"))`

5.1 Population coverage

The results regarding population coverage partially confirm hypothesis one: a rise in fiscal capacity has significant positive effects across all models. Conversely, the significance of administrative capacity disappears when controlling for interdependence. This indicates that local administrations with rising extractive capacity tend to extend unemployment insurance coverage more quickly than local administrations with weak extractive capacity. However, better staffing of the public administration and increasing local embeddedness through labor unions does not seem to affect population coverage.

Second, world market integration has a negative effect on population coverage in all models, both regarding imports and exports. The standard errors are sometimes comparatively high, especially in model 2, where a confidence interval for the coefficient of exports with a 5% error margin includes the value 0. Nevertheless, the results contradict the expectations formulated in hypotheses 4a and b, which were more oriented towards the compensation thesis. During the period of observation, increasing exposure to world markets undermines unemployment insurance coverage. This might indicate that China has entered a stage of socio-economic development which bears closer resemblance to industrialized countries in this respect – not unlike the argument of Rozelle and colleagues presented above about the dualization of the labor market.

Third, changes in GDP per capita originally had a significant positive effect on population coverage, but this effect lost significance once year dummies were introduced. This indicates that both GDP per capita and population coverage display similar trends at national level, but that local variation in trends is not explained by GDP per capita. However, the absence of consistently significant effects of the time dummies does not suggest a confounding variable behind the parallel trends of coverage and GDP growth either.

Appendix 1 provides results without year dummies for comparison. The composition of local GDP, analyzed through the share of industry in local GDP, also did not produce significant effects. The scope of the formal sector was the only predictor with a positive effect in all models where it was tested. This indicates that increases in the scope of formal employment among the population had direct and positive effects on unemployment insurance coverage in Chinese cities, while the effects of GDP growth were more ambiguous.

Fourth, and closely related, the various indicators connected to employment and skills produced no robust results. Only the effects of skill-intensive and labor-intensive service employment were significant in model 8, but confidence intervals for both coefficients with a 5% error margin included the value 0. The additional controls, too, had few significant effects.

5.2 Formal sector coverage

The indicator of formal sector coverage is more closely geared towards explaining the differences between *de jure* and *de facto* coverage, which point to local implementation dynamics. *De facto* coverage can overall be larger, smaller, or equivalent to *de jure* coverage. For *de jure* coverage, the scope of the formal sector of employment relative to the local population serves as a proxy. In case of equivalence between *de jure* and *de facto* coverage, few if any predictors would be expected to display significant effects, and the indicator for administrative capacity should have a negative coefficient, for it captures civil servants who are not insured but are nevertheless counted as formal employees.

But there was a strong and significant positive effect for administrative capacity across all models in which it was tested. Fiscal capacity on the other hand was not significant in any model. This indicates that a

well-staffed public administration and a high density of social organizations such as labor unions increases formal sector coverage. Some employees in state organs and social organizations also contribute to coverage directly if they themselves are insured. Their jobs mostly resemble skill-intensive services, thus the correlation between the two indicators illustrated in figure 7 above. But even if skill-intensive services are controlled for, the public administration indicator remains positive, significant, and numerically larger than 1.⁴⁵ So even if all employees in the public administration and social organizations were covered, there would still be an additional positive effect on other employees. Nevertheless, the indicator constitutes but a rough proxy and more research is needed to procure better indicators about administrative capacity.

Second, economic interdependence does not seem to play an important role for formal sector coverage. Only the coefficient for imports in model seven was significant, but the respective confidence interval included the value 0. Third, neither GDP per capita nor the share of industry in local GDP had a significant effect on formal sector coverage. This indicates that the difference between *de jure* and *de facto* coverage does not depend on interdependence or economic development per se.

Rather, the structure of employment in the labor market had an important influence. As model 6 indicates, an increase in formalized employment in construction and manufacturing had a significant negative effect on

45 The public administration indicator is strongly correlated to skill-intensive employment, which is why it was left out of model 7 and 8. Had it been included in model 7, controlling for skill-intensive employment would have reduced the public administration coefficient to 2.903, with a standard error of 1.425 and a significance level of 0.042. The indicator remains significant, but the strength of its coefficient is reduced considerably. R^2 would have increased to 0.287, and the small scope of this increase is an indicator that multicollinearity does not distort the model.

Table 1.

Fixed effects models for population coverage.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
State capacity								
Fiscal capacity (revenue_share)	0.509** (0.213)	0.504** (0.201)	0.464** (0.181)	0.527** (0.211)	0.497** (0.195)	0.500*** (0.190)	0.485*** (0.185)	0.536** (0.219)
Administrative capacity (public_admin_share)	-0.177** (0.088)	<i>-0.123</i> <i>(0.085)</i>	<i>-0.124</i> <i>(0.085)</i>	0.303 (0.192)	0.282 (0.183)	0.274 (0.197)		
Socio-economic factors								
GDP per capita (log) (GDPpc_adj_ln)				<i>0.205</i> <i>(1.935)</i>	<i>0.171</i> <i>(1.932)</i>	<i>0.888</i> <i>(1.974)</i>	<i>0.704</i> <i>(2.018)</i>	<i>1.816</i> <i>(2.276)</i>
Industry share in GDP (GDP_sec2)				<i>0.008</i> <i>(0.061)</i>	<i>0.011</i> <i>(0.061)</i>	<i>-0.003</i> <i>(0.062)</i>	<i>-0.012</i> <i>(0.065)</i>	<i>-0.015</i> <i>(0.065)</i>
Share of formal urban employment in the population (formal)				0.462** (0.181)	0.446** (0.173)	0.457** (0.178)		0.559*** (0.208)
Interdependence								
Share of exports in provincial GDP (export_share)		-0.257* (0.134)		-0.221*** (0.085)		-0.233*** (0.084)		-0.227*** (0.081)
Share of imports in provincial GDP (import_share)			-0.354** (0.141)		-0.272*** (0.091)		-0.352** (0.150)	
Employment and skills								
Manufacturing share in formal urban employment (manufacturing_share)						0.014 (0.049)		<i>-0.024</i> <i>(0.063)</i>
Construction share in formal urban employment (construction_share)						<i>-0.07</i> <i>(0.048)</i>		<i>-0.105</i> <i>(0.072)</i>
Skill-intensive service share in formal urban employment (skill_share)							-0.065 (0.078)	<i>0.183*</i> <i>(0.100)</i>
Labor-intensive service share in for- mal urban employment (labor_share)							-0.114 (0.088)	<i>-0.336*</i> <i>(0.184)</i>
Additional controls								
Share of urban registered population in total population (pop_urban_share)				<i>0.039</i> <i>(0.036)</i>	0.031 (0.036)	<i>0.035</i> <i>(0.036)</i>	-0.001 (0.056)	<i>0.005</i> <i>(0.038)</i>
Number of large industrial enterprises (log) (lnd_enterprise_ln)								<i>-1.087</i> <i>(0.975)</i>
Private and self-employment (employ_priv_self_share)								<i>0.001</i> <i>(0.004)</i>
Year 2014	<i>0.716*</i> <i>(0.430)</i>	<i>0.673</i> <i>(0.425)</i>	<i>0.22</i> <i>(0.430)</i>	<i>0.047</i> <i>(0.510)</i>	<i>-0.26</i> <i>(0.514)</i>	<i>0.145</i> <i>(0.516)</i>	<i>0.357</i> <i>(0.554)</i>	<i>0.577</i> <i>(0.563)</i>
Year 2016	<i>1.264***</i> <i>(0.413)</i>	<i>0.573</i> <i>(0.462)</i>	<i>-0.236</i> <i>(0.548)</i>	<i>-0.094</i> <i>(0.737)</i>	<i>-0.588</i> <i>(0.760)</i>	<i>-0.11</i> <i>(0.742)</i>	<i>-0.162</i> <i>(0.810)</i>	<i>0.327</i> <i>(0.802)</i>
Year 2018	<i>2.357***</i> <i>(0.419)</i>	<i>1.658***</i> <i>(0.439)</i>	<i>1.371***</i> <i>(0.444)</i>	<i>0.644</i> <i>(1.211)</i>	<i>0.584</i> <i>(1.208)</i>	<i>0.564</i> <i>(1.212)</i>	<i>1.167</i> <i>(1.258)</i>	<i>0.677</i> <i>(1.300)</i>
Observations	1,131	1,131	1,131	1,131	1,131	1,131	1,131	1,075
Cities	284	284	284	284	284	284	284	283
R ² (within)	0.053	0.078	0.09	0.195	0.199	0.198	0.094	0.238
Breusch-Godfrey Test (Serial correlation)	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05
Breusch-Pagan Test (Heteroskedasticity)	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05

Note: *p<0.1; **p<0.05; ***p<0.01; Due to prevalent serial correlation and heteroskedasticity, this table reports doubly robust standard errors (HC03). If the robust standard errors produced smaller values than regular standard errors, the regular standard errors and significance estimates are reported and the affected estimates are written in purple italics.

Table 2.

Fixed effects models for formal sector coverage.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
State capacity								
Fiscal capacity (revenue_share)	1.476 (1.150)	1.486 (1.150)	1.609 (1.226)	1.38 (1.120)	1.532 (1.212)	1.341 (1.080)	<i>0.98</i> <i>(0.951)</i>	1.5 (1.035)
Administrative capacity (public_admin_share)	6.819** (2.930)	6.720** (2.838)	6.658** (2.805)	6.932** (3.044)	6.902** (3.023)	4.155*** (1.572)		
Socio-economic factors								
GDP per capita (log) (GDPpc_adj_ln)				21.758 (20.496)	22.453 (20.178)	14.606 (13.607)	11.04 (13.951)	<i>6.593</i> <i>(15.098)</i>
Industry share in GDP (GDP_sec2)				<i>-0.644</i> <i>(0.432)</i>	<i>-0.61</i> <i>(0.429)</i>	<i>-0.168</i> <i>(0.414)</i>	<i>-0.057</i> <i>(0.412)</i>	<i>0.085</i> <i>(0.434)</i>
Interdependence								
Share of exports in provincial GDP (export_share)		0.476 (0.626)		0.544 (0.693)		1.000 (0.856)		1.099 (0.771)
Share of imports in provincial GDP (import_share)			1.066 (0.811)		1.193 (0.915)		1.343* (0.806)	
Employment and skills								
Manufacturing share in formal urban employment (manufacturing_share)						-2.773* (1.434)		-1.711* (0.920)
Construction share in formal urban employment (construction_share)						-0.909*** (0.324)		0.4 (0.628)
Skill-intensive service share in formal urban employment (skill_share)							5.132*** (1.959)	3.850*** (1.446)
Labor-intensive service share in for- mal urban employment (labor_share)							-0.087 (0.482)	-0.315 (0.763)
Additional controls								
Share of urban registered population in total population (pop_urban_share)				<i>0.339</i> <i>(0.255)</i>	0.412 (0.288)	<i>0.319</i> <i>(0.242)</i>	0.3 (0.254)	0.277 (0.290)
Number of large industrial enterprises (log) (lnd_enterprise_ln)								<i>-4.741</i> <i>(6.475)</i>
Private and self-employment (employ_priv_self_share)								0.101 (0.069)
Year 2014	-5.373* (2.812)	-5.293* (2.811)	-3.877 (2.856)	-9.378*** (3.580)	-7.842** (3.610)	-6.075* (3.445)	-4.594 (3.507)	-6.907* (3.738)
Year 2016	-5.690** (2.697)	-4.411 (2.859)	-1.173 (3.352)	-12.311** (5.615)	-8.793 (5.349)	-6.188 (4.963)	-4.035 (5.130)	-7.205 (5.329)
Year 2018	-4.648 (4.722)	-3.353 (3.985)	-1.68 (3.062)	-18.179 (14.369)	-16.637 (13.228)	-13.336 (11.022)	-6.525 (8.915)	-13.202 (11.282)
Observations	1,131	1,131	1,131	1,131	1,131	1,131	1,131	1,075
Cities	284	284	284	284	284	284	284	283
R ² (within)	0.191	0.193	0.198	0.198	0.204	0.279	0.273	0.323
Breusch-Godfrey Test (Serial correlation)	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05
Breusch-Pagan Test (Heteroskedasticity)	P = 0.53	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05

Note: *p<0.1; **p<0.05; ***p<0.01; Due to prevalent serial correlation and heteroskedasticity, this table reports doubly robust standard errors (HC03). If the robust standard errors produced smaller values than regular standard errors, the regular standard errors and significance estimates are reported and the affected estimates are written in purple italics.

formal sector coverage.⁴⁶ Furthermore, an increase in formalized skill-intensive service employment had a very strong and significant positive effect on formal sector coverage. Only an increase in formalized labor-intensive service employment did not have any significant effect. Given that these indicators only capture formalized employment, the construction and manufacturing coefficients could point to an increasing usage of atypical but formalized work relationships such as subcontracting that do not provide coverage. The positive effect of skill-intensive service employment indicates that if new employment in this sector is formalized, then it disproportionally often comes with unemployment insurance coverage. Furthermore, given that the coefficient was above 1, additional formal employees in high-skilled services also affect the coverage of other (formal or informal) employees. For example, they may consume more professional and more expensive services in child care, elderly care, dry-cleaning, transport and gastronomy than the average person, which raises the probability of their service providers also being covered by unemployment insurance.⁴⁷ The opposite could apply to manufacturing. Overall, the difference between *de jure* and *de facto* coverage was strongly affected by the sectors in which people were employed.

While most additional controls did not have any significant effects, the year dummy for 2014 had a significant effect in all models except 3 and 7. These results should

be interpreted carefully, given that the robust standard errors turned out smaller than the regular standard errors which have been reported, and which are probably a bit too low. Nevertheless, 2014 marks an important turning point in China's socio-economic development, given that the formal sector peaked and began to decline. Conversely, formal sector coverage started to increase, while total unemployment insurance participation continued to rise. More research is needed to identify relevant policy events at national level that may have sparked or reinforced this change.

5.3 Comparative summary and discussion

After the previous sections presented the findings for the independent variables separately, this section contrasts the findings for the different working hypotheses, while referring to what the indicators measure. It is important to keep in mind the differences in the underlying reference categories of total registered population and formal sector employees. The total registered population includes a very diverse set of social groups, whereas formal sector employees are much more representative – although not entirely equivalent to – the urban middle class, which also includes entrepreneurs and civil servants.⁴⁸ As discussed in section 4.2.1, population coverage followed an overall increasing trend, whereas formal sector coverage developed inversely to the scope of the formal sector: the latter peaked in 2014 and then entered a stage of gradual decline, whereas coverage reached a local minimum in 2014 and then rose again. Overall, population coverage increases were driven by the extension of the formal sector, fiscal capacity and interdependence, whereas formal sec-

46 A confidence interval with a 5% error probability for the manufacturing coefficient encompassed the value 0, both in model 6 and 8. As for model 6, this situation was remedied after removal of an outlier, decreasing the coefficient to -0.775 with a robust standard error of 0.303 and a significance level of 0.011 (see appendix 2).

47 If administrative capacity were controlled for in model 7, the effect of skill-intensive service employment would shrink to 4.120 with a robust standard error of 1.462 and a significance level of 0.005. This indicates that only a small part of the effect is connected to the proxy for administrative capacity.

48 The former are mainly listed under private sector and self-employment, while the latter are under the formal urban employees category.

tor coverage – or the difference between *de jure* and *de facto* coverage – was driven by administrative capacity and the employment structure in the formal sector itself. In some ways, the results for the different dependent variables are reverse mirror images.

H1: An increase in local fiscal and administrative state capacity facilitates a rise in de facto unemployment insurance coverage.

Hypothesis 1 has been confirmed by the analysis, although different forms of state capacity appear to be of different relevance for different types of coverage. Fiscal capacity – i.e., a rising share of local GDP that local governments extract as fiscal revenue – improves population coverage, but does not influence formal sector coverage. A plausible interpretation is that the consolidation of tax authority over economic actors facilitates the collection of unemployment insurance premiums from companies that did not previously pay taxes or premiums. Administrative capacity – a rising share of urban formal employees in the public administration and social organizations such as labor unions – appears to increase formal sector coverage. However, the indicator is but a rough proxy and more research is needed to confirm this point.

H2: De facto coverage of unemployment insurance is rising faster in cities with faster economic growth and a faster-growing formal sector.

This hypothesis was mostly falsified. Growth in local per capita GDP did not have a significant effect on formal sector coverage. For population coverage, both variables were trending in the same direction at national level, but variations in population coverage growth between Chinese cities were not significantly explained by differences in GDP per capita growth. Only growth

in the share of formal employees among the local population had a significant positive effect on population coverage. Interestingly, growth in formal employment rates was negatively correlated to growth in administrative capacity and skill-intensive employment (see figure 7), which in turn both facilitated growing formal sector coverage. This might indicate that in cities where the formal sector is extended, the share of new formal employees being insured tends to be above population coverage, but below *ex ante* formal sector coverage. This would point to increasing reliance on atypical work relationships and could allow for concurrent increases in population coverage on the one hand, and decreases in formal sector coverage on the other. As aggregate formal employment at national level has been decreasing, such trends would be locally specific.

Overall, as noted above, formalized employment has been declining since its peak in 2014, and the dummy for that year had significant effects in the models analyzing formal sector coverage. The stagnation and decline of formal employment has potentially adverse consequences for social mobility and the growth of the urban middle class, which in turn is a critical support group for the authoritarian regime. In the same year, the central government adjusted unemployment insurance to include subsidies for stable employment and struggling companies in the benefit package. While this is an effect rather than a potential cause of the change, it provides qualitative evidence of a core argument of socio-economic theories: the use of social policy to cope with social problems arising as consequences of economic development.

However, the political priorities in this reaction appeared to be shaped by particular preoccupation with the selectorate, i.e., the urban middle class. Given its limited coverage, unemployment insurance does often not reach those groups with the highest risk of unemployment, including aging migrant workers and university graduates. The tran-

sition of labor from industry to – mostly labor-intensive – services coincides with a transition from formal to informal forms of work, and often with decreasing income. This is particularly true for migrant workers who lack marketable skills that could help them enter formal employment (Rozelle & Hell, 2020). Aging migrant workers face elevated risks of unemployment and need skill development to avoid income losses in the transition. But while unemployment insurance provides means to cope with these problems, it often does not cover these people. Instead, it is running surpluses, premium levels are being lowered, and its spending is increasingly channeled into subsidizing companies, formal employees, and their skill formation. On the one hand, this is in line with the assumed preferences of companies and the urban middle class as discussed in section 3.1.1. On the other, however, a more broadly inclusive unemployment insurance could not only ease the transition from industry to services, but also facilitate higher incomes after the transition, assuming there are effective measures of skill formation to support. The more inclusive implementation styles in coastal provinces, where formal sector coverage is mostly above 100%, could indicate that the pressure for economic upgrading reinforces attempts to cope with these problems.

H3a: An increase in the share of employees in skill-intensive service sectors in a locality's economy facilitates a rise in de facto unemployment insurance coverage.

H3b: An increase in the share of employees in labor-intensive services and construction in a locality's economy facilitates a fall in de facto unemployment insurance coverage.

The results largely confirm hypotheses 3a and 3b, but only regarding formal sector coverage. Increases in formal sector coverage were strongly driven by rising employment shares in skill-intensive services. Conversely, rising shares of employment in

manufacturing or construction decreased coverage. Given the discussion of actor-centered approaches in section 3.1.2, it is plausible to assume that the interests of entrepreneurs are represented at city governments, and that sector-specific differences between *de jure* and *de facto* coverage are linked to employers' interests. As figure 7 above illustrates, the scope of the formal sector displays slight positive correlations with employment growth in manufacturing and construction. This might indicate a rise in formalized atypical work relationships driving growth of the formal sector in some cities. Conversely, a growth in skill-intensive service employment is negatively correlated to the scope of formal employment. This indicates that different cities tend to experience either the former or the latter type of dynamic. Both are compatible with the general scenario of rising absolute participation and concurrently falling relative coverage of urban formal and informal employees described above. But overall, better indicators for the service sector are needed to gain a more detailed picture of the labor market dynamics. Most notably, it would be important to understand the extent to which the apparent rise in economic activity outside of formal employment is due to either the rise of independent professions such as lawyers, or due to the rise of atypical and precarious forms of work.

H4a: An increase of the share of exports in a locality's GDP facilitates a rise in de facto unemployment insurance coverage.

H4b: An increase of the share of imports in a locality's GDP facilitates a rise in de facto unemployment insurance coverage.

Finally, increases in economic interdependence – measured as the shares of imports and exports in provincial GDP respectively – had negative effects on population coverage, but not on formal sector coverage. While this finding appeared counter-intuitive at first, the falsification of hypothesis 4a and b makes

sense when we reconsider the time of analysis and the methods. There are huge and entrenched differences in socio-economic development between China's provinces, which have been reinforced by economic interdependence and have allowed coastal provinces to become pioneers of social insurance reform and the extension of coverage. As a result, they have higher absolute coverage rates, as Figure 5a above illustrates. But the analysis here abstracts from time-invariant differences such as long-standing hierarchies and focuses instead on trends since 2012. During this time, growing economic interdependence had an eroding effect on population coverage, which may point to the effects of automation and outsourcing in export manufacturing. Overall, more indicators need to be considered to get a more precise picture of the effects of interdependence in future research.

6. CONCLUSION

The aim of this study was to determine the causes of unemployment insurance coverage expansion in Chinese cities during the second decade of the 21st century. It tested a series of working hypotheses inspired by theories regarding the connection between welfare state development and state capacity, socio-economic development, economic interdependence, and skills and employment. These hypotheses were tested using fixed effects models and a dataset of Chinese prefectural cities, covering more than 90% of the population. The results are two-fold: population coverage was facilitated by local expansion of formal employment and fiscal capacity, but undermined by growing economic interdependence at regional level. Regarding the formal sector, growth in skill-intensive service employment and administrative capacity facilitated increases in coverage. Conversely, employment in construction had a negative effect on formal sec-

tor coverage. So overall, rising state capacity and formal employment – most notably in skill-intensive services – are driving forces of unemployment insurance coverage, whereas world market integration appears to undermine it.

The findings of this study are preliminary and highlight the need to consider additional data. To some extent, these indicators are yet to be defined and collected. With regard to political actors and institutions, they include the composition of legislative and consultative organs at local level, the density of union coverage in different localities, the occurrence of protests, strikes and corruption scandals, preference structures of local governments (including cadre evaluations), and the density of entrepreneurs' associations and employers' organizations. More generally, better proxies for administrative capacity would be desirable. With regard to socio-economic development at large, more precise indicators for international interdependence, the scope of public ownership at local level, and the sectoral structures for private and self-employment are needed, as well as proxies for local economic development beyond GDP figures. Some of this data can be collected through existing sources such as surveys and yearbooks. A substantial part, however, needs to be generated via web scraping and other techniques.

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APPENDIX

Appendix I: Results for population coverage without year dummies

Table
Fixed effects models for population coverage.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
State capacity								
Fiscal capacity (revenue_share)	0.512* (0.282)	0.506** (0.241)	0.421** (0.202)	0.502** (0.205)	0.436** (0.171)	0.486** (0.198)	0.463** (0.186)	0.557** (0.237)
Administrative capacity (public_admin_share)	-0.052 (0.126)	-0.039 (0.097)	-0.016 (0.096)	-0.094 (0.081)	-0.061 (0.072)	0.295 (0.186)		
Socio-economic factors								
GDP per capita (log) (GDPpc_adj_ln)				2.626*** (0.990)	2.714*** (0.974)	1.921* (0.982)	2.870** (0.906)	2.688** (1.188)
Industry share in GDP (GDP_sec2)				-0.050 (0.034)	-0.031 (0.035)	-0.014 (0.033)	-0.044 (0.035)	-0.032 (0.037)
Employment and skills								
Share of formal urban employment in the population (formal)						0.459*** (0.178)		0.562*** (0.209)
Manufacturing share in formal urban employment (manufacturing_share)						0.009 (0.049)		-0.012 (0.061)
Construction share in formal urban employment (construction_share)						-0.073 (0.047)		-0.084 (0.067)
Skill-intensive service share in for- mal urban employment (skill_share)							-0.051 (0.081)	0.198** (0.098)
Labor-intensive service share in for- mal urban employment (labor_share)							-0.117 (0.086)	-0.310* (0.161)
Interdependence								
Share of exports in provincial GDP (export_share)		-0.312** (0.124)		-0.244* (0.137)		-0.219*** (0.079)		-0.218*** (0.077)
Share of imports in provincial GDP (import_share)			-0.361*** (0.130)		-0.299** (0.145)		-0.304** (0.146)	
Additional controls								
Share of urban registered population in total population (pop_urban_share)				0.014 (0.047)	0.002 (0.053)	0.034 (0.036)	-0.001 (0.055)	0.006 (0.037)
Number of large industrial enterprises (log) (lnd_enterprise_ln)								-1.180 (0.920)
Private and self-employment (employ_priv_self_share)								0.001 (0.004)
Cities	284	284	284	284	284	284	284	283
Observations	1,131	1,131	1,131	1,131	1,131	1,131	1,131	1,075
R ² (within)	0.016	0.061	0.072	0.075	0.084	0.197	0.220	0.236
Breusch-Godfrey Test (Serial correlation)	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05
Breusch-Pagan Test (Heteroskedasticity)	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05	p < 0.05

Note: *p<0.1; **p<0.05; ***p<0.01; Due to prevalent serial correlation and heteroskedasticity, this table reports doubly robust standard errors (HC03). If the robust standard errors produced smaller values than regular standard errors, the regular standard errors and significance estimates are reported and the affected estimates are written in purple italics.

Appendix 2. Post-estimation checks

1. UNBIASEDNESS OF ESTIMATES

This section uses model 6 for population and formal sector coverage respectively to perform a series of routine post-estimation checks, beginning with checks regarding the unbiasedness of the model. The issue of multicollinearity has been discussed above and will be omitted here. Random sampling is usually regarded as an underlying assumption of OLS, but it does not fully apply to cross-section-time-series data, which directly represents the underlying population. The data here comprises most of China's prefectural cities and covers more than 90% of the population. As the variable for exports was measured at provincial level, an adjustment of the standard errors to correlation of errors across cities should be considered.

As the following equations illustrate, both models are linear in parameters. Please note that the equations refer to time-demeaned data as described in equation 1 above.

$$\text{Equation 2: Coverage}_{\text{population}} = \beta_1 * \text{revenue_share}_{it} + \beta_2 * \text{public_admin_share}_{it} + \beta_3 * \text{GDPpc}_{it} + \beta_4 * \text{GDP_sec2}_{it} + \beta_5 * \text{pop_urban_share}_{it} + \beta_6 * \text{formal}_{it} + \beta_7 * \text{manufacturing_share}_{it} + \beta_8 * \text{construction_share}_{it} + \beta_9 * \text{export_share}_{it} + \text{year}_t + u_{it}$$

$$\text{Equation 3: Coverage}_{\text{formal sector}} = \beta_1 * \text{revenue_share}_{it} + \beta_2 * \text{public_admin_share}_{it} + \beta_3 * \text{GDPpc}_{it} + \beta_4 * \text{GDP_sec2}_{it} + \beta_5 * \text{pop_urban_share}_{it} + \beta_6 * \text{manufacturing_share}_{it} + \beta_7 * \text{construction_share}_{it} + \beta_8 * \text{export_share}_{it} + \text{year}_t + u_{it}$$

The unbiasedness of the estimates depends on the linearity of the model in parameters and the zero-conditional mean of the errors. Both can be checked visually with plots of the fitted values against the residuals, as illustrated in figure 8 and 9. The clouds in both figures display a linear trend clustered around the value 0 on the vertical axis, with some distortion induced by outliers towards the right. The outliers need further investigation.

Outliers can induce bias in OLS models, which is why it is important to check their influence. Figure 10 and 11 illustrate plots of the leverage of individual observations against the standardized residuals. In both models, there are a few observations with high leverage, but their residuals are close to 0. Cook's Distance constitutes a common measure for the influence of outliers: as a rule of thumb, outliers with a value bigger than 1 require treatment. The population coverage model features one outlier with a value of 0.94, which is left untreated here. The formal sector coverage model features an outlier with a value of 1.55, which requires treatment.

Figure 12 presents a screenshot of the results of the estimation with robust standard errors. Please consider the differences in the significance star coding compared to the results presented in the tables above. The most substantial difference is the smaller but still negative estimate for the manufacturing coefficient, the confidence interval of which now does not include the value 0 anymore. The increased significance of the

Figure 8 and 9.
Fitted values and residuals

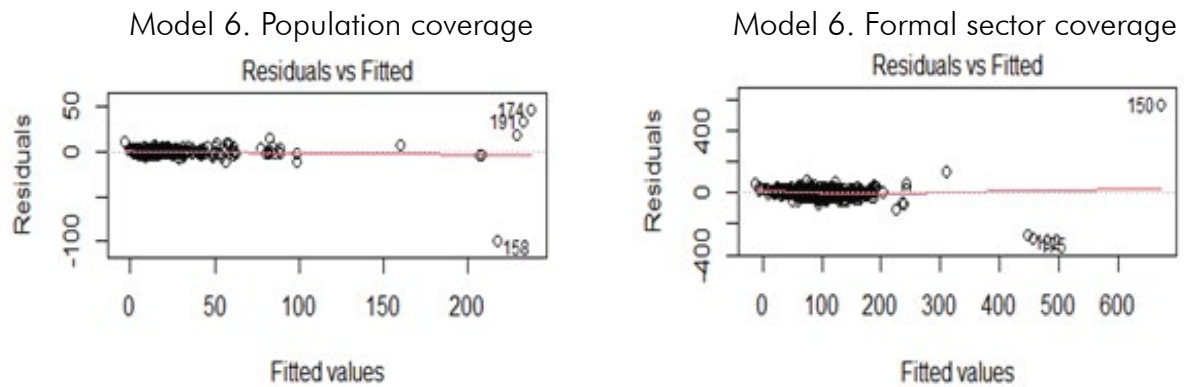


Figure 10 and 11.
Outlier diagnostics

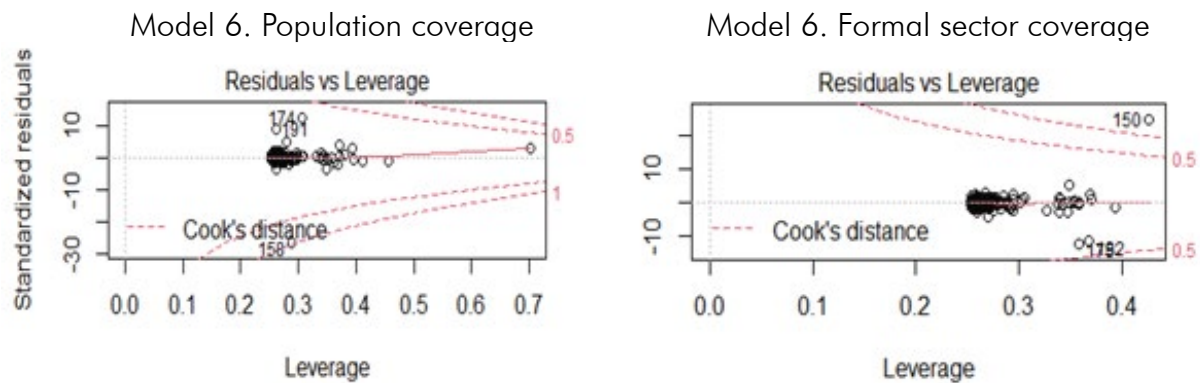


Figure 12.
Screenshot of revised model 6 (formal sector coverage) estimates with robust standard errors

t test of coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
revenue_share	0.732758	0.568822	1.2882	0.1980318	
public_admin_share	2.453949	0.462655	5.3041	1.452e-07	***
GDPpc_adj_ln	3.338705	7.108853	0.4697	0.6387245	
GDP_sec2	-0.224414	0.183535	-1.2227	0.2217751	
pop_urban_share	0.074386	0.156467	0.4754	0.6346220	
manufacturing_share	-0.775219	0.302697	-2.5610	0.0106107	*
construction_share	-0.868428	0.287615	-3.0194	0.0026097	**
export_share	0.112255	0.332239	0.3379	0.7355438	
as.factor(year)2014	-5.048566	1.339110	-3.7701	0.0001747	***
as.factor(year)2016	-4.075268	2.623997	-1.5531	0.1207838	
as.factor(year)2018	-0.611488	4.371758	-0.1399	0.8887946	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Figure 13.
Outlier diagnostics for the revised model

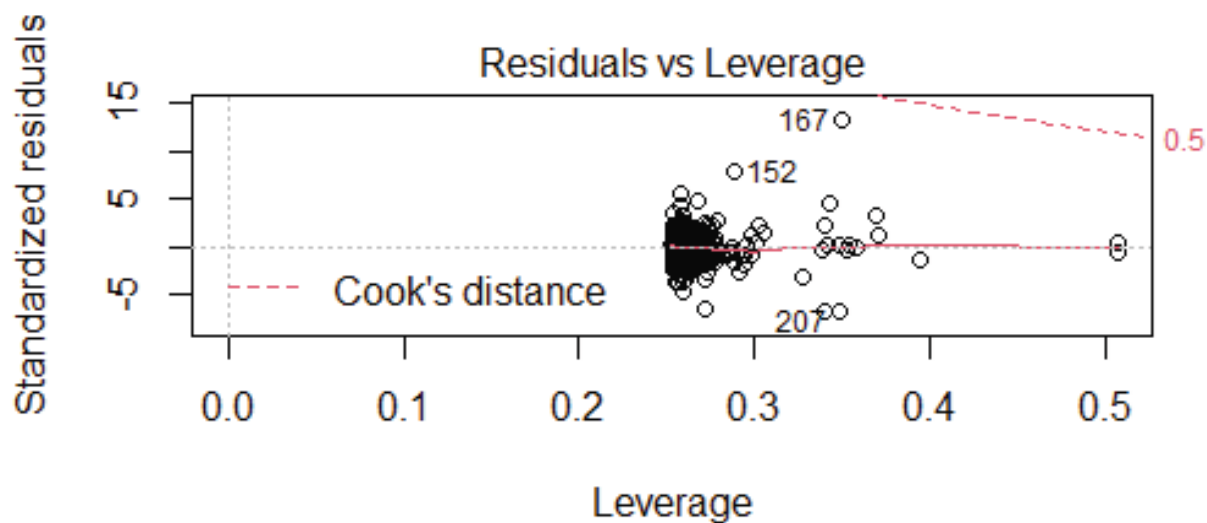


Figure 15 and 16.
Fitted values and standardized residuals

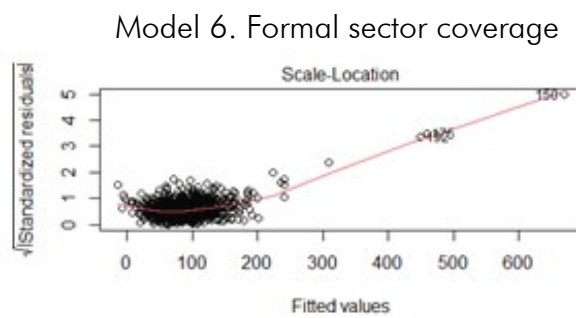
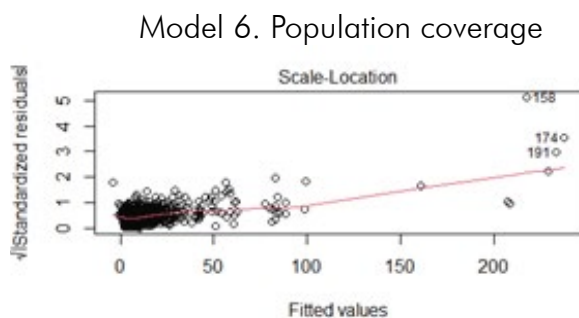
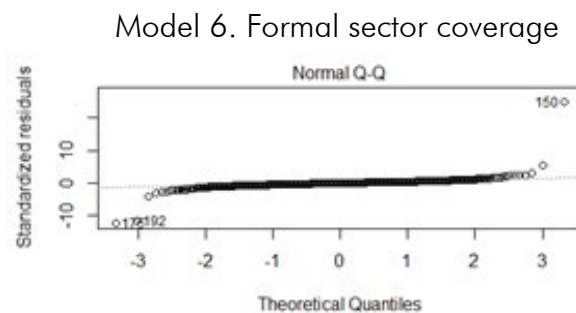
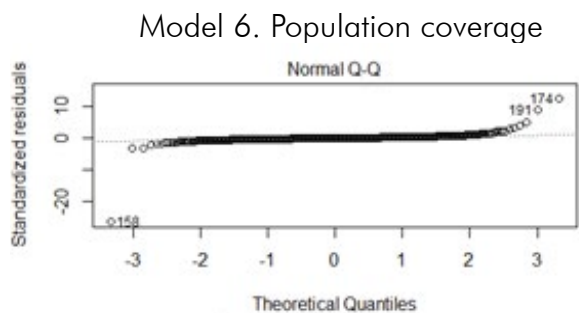


Figure 17 and 18.
Normal distribution of errors



2014 dummy should be interpreted carefully, given that regular standard errors were larger than the robust standard errors reported here. As figure 14 illustrates, no additional influential outliers appear in the revised model.

2. VALIDITY OF VARIANCE ESTIMATES

To attain unbiased variance estimates and for OLS to be the Best Linear Unbiased Estimator (BLUE), the assumptions of homoskedasticity – a constant variance of errors over all estimates – and absence of serial correlation – a correlation of errors across time periods – are required in addition to the points discussed in the previous section. As noted in the respective tables, homoskedasticity was tested via a Breusch-Pagan test, which mostly featured very low p-values for both models and thus pointed to heteroskedasticity problems. In addition, a visual inspection of the plots of fitted values and standardized residuals in figures 15 and 16 illustrate the heteroskedasticity problems.

Finally, the normal distribution of residuals can be inspected via plots of standardized residuals and theoretical quantiles. As figures 17 and 18 indicate, the errors are mostly – but not fully – normally distributed, for they do not always follow the dashed line. This is in line with the problems of heteroskedasticity and serial correlation already detected. In a survey-based study, a violation of the assumption of normally distributed errors would call into question the generalizability of the models to the underlying population. As this study is based on cross-section-time-series data, the import of this violation is limited.

Appendix 3.

Figure 19.
Overview of courage by province

