

Urban shrinkage with Chinese characteristics

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This study exposes and maps a hitherto little-known dimension of China's urban geography – that of shrinkage, directly affecting one in 10 of its cities. Urban shrinkage is revealed to be a growing concern for the most populous country on earth, with the absolute number of shrinking cities rising by 71% from 164 in the 1990s to 281 in the 2000s. By developing its own definition of the city as an urban area (UA) in the Chinese political-administrative context, this paper builds a morphologic taxonomy of China's shrinking cities. This reveals the overall net population loss across Chinese shrinking cities more than doubling since 1990, reaching 7.3 million inhabitants in 2010. Sixty-eight Chinese UAs, mostly in north-eastern China, are found to have been shrinking continuously since 1990. Despite the multifaceted and entangled make-up of urban shrinkage, the paper identifies four distinct causes of this geographical phenomenon in China: (1) state-incubated reindustrialisation and economic restructuring, impacting upon 63% of all shrinking UAs; (2) the country's new economic geography, with the underlying centripetal forces of agglomeration pushing around 34% of all shrinking cities towards marginalisation; (3) state-propelled demographic change, leading to natural population decline in 26% of Chinese shrinking cities; and (4) state-sponsored mega-shrinkage, responsible for urban population loss in almost 20% of all the cases. This study further provides a theoretically informed reflection on the peculiarity of shrinkage in China and its public policy implications.

KEYWORDS

China, decline, mapping, shrinking cities, urban morphology, urbanization

1 | INTRODUCTION

The urban population of the world has been growing rapidly since 1950. Following a long period of stagnation of the urbanisation process in mainland China, the country recently experienced a swift upturn in urbanisation, with the share of urban dwellers rising from just 19.4% of the total population in 1980 to 55.6% in 2015. Today's China is not only the world's most populous nation of 1.4 billion people, but it also has the largest urban population of 758 million, accounting for 20% of the world's total. Fifty-one out of 99 of the world's fastest growing cities are in China (UN, 2015). Rapid urbanisation in China has gone hand in hand with a truly meteoric rise in gross domestic product (GDP), which multiplied 11 times between 1990 and 2015, with an *average* growth rate of 38.7% a year in constant RMB prices (or 108.6% a year in current USD; derived from IMF, 2018). Chinese cities are rightly regarded as engines of economic growth, with the rise of enormous conurbations on the eastern coast reflecting the nation's advance (Wu et al., 2007). Between 2014 and 2050,

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Chinese cities are projected to grow further by 292 million dwellers. According to the National Development and Reform Commission (NDRC, China's central planning agency), the country's small cities alone have expansion plans for housing 3.4 billion people by 2030 – almost all of the world's current urban population (Bloomberg, 2016). To talk about anything but urban growth – let alone urban decline or shrinkage – in this context could appear rather oxymoronic. And yet, this is exactly what this paper sets out to do.

Our research aims are threefold. First, this paper proposes to expand the understanding of world urbanisation trends by uncovering a little known and poorly understood dimension of China's urban geography – that of urban population loss, its causes and preliminary consequences. Second, this paper aims to provide academics, practitioners and policy-makers with novel results about the emergence, evolution and morphologic structure of urban shrinkage in the world's second largest economy. Finally, by employing an economic geography perspective, the paper identifies the drivers of urban shrinkage in China and reflects upon its theoretical implications.

The next section discusses central tenets of key urban growth theories in the context of China's complex transition from centralised planning to a (socialist) market economy. Consequently, this paper redefines the notion of a city in the Chinese context, demarcating urban areas (UAs) from wider political-administrative units of subnational authorities. The paper then turns to the analysis of its substantive empirical findings, including the overall trajectories of urban shrinkage in China and its spatial distribution. The paper then reveals four essentially intertwined drivers of urban population loss in China and concludes with a statement regarding the peculiarity of shrinkage in China, and its meaning for urban geography and public policy.

2 | THEORISING URBAN SHRINKAGE IN THE NON-WESTERN WORLD

First attempts at theorising a then newly emerging phenomenon of urban decline were made in the United States during the outburst of a fiscal crisis in New York City in 1975 (Shefter, 1992). Rust (1975) was among the trend-setters providing various explanations of the urban crisis, ranging from a natural decline common to mining boom towns to socio-economic shifts in population preferences towards a warmer climate, lower taxes and higher land consumption (Bradbury et al., 1982). Concurrently, West European scholars were developing a now classic sequential theory of urban growth and decline, which starts with the initial *urbanisation* (spatial concentration of population and employment), followed by *suburbanisation* (decentralisation of population and employment) and further *deconcentration* of people and jobs towards the wider region (Cheshire & Hay, 1989; Van den Berg, 1982). As emphasised by Cheshire and Hay (1989, p. 48), urban population loss by itself was “neither a necessary nor a sufficient condition for either concern or intervention” for “healthy cities lose population because people wish to live at lower densities.” These urban life *cycle* theories have conceived urban growth to be primarily the result of spatial behaviour of urban actors – households, firms, local authorities. The utility-maximising behaviour of these economic agents was said to focus on increased prosperity for families and the continuation of profits for companies, with public authorities having an influence upon these social welfare and private profit potentials through maintaining and restoring the attractiveness of the core city (Van den Berg, 1999).

Such orthodox explanations of urbanisation were vigorously challenged by radical geographers and planners, who condemned the mainstream scholarship for using “growth” and “decline” as inherently value laden, representationally repressive, and unstable rhetorical devices that serve ideologically to legitimate and politically to sanitise social injustice (Beauregard, 1993). Seeking an alternative explanation, many have turned towards Keynesian theories of uneven economic development and inter-regional self-imbalance, including circular and cumulative causation models developed by Kaldor et al. (Thirlwall, 2013; cf. Richardson, 1978, pp. 318–321).

Urban growth was thus conceptualised as a self-enhancing and reinforcing process propelled by local export-led expansion; conversely, a city with increasingly mature, standardised, uncompetitive exports was to face a vicious cycle of cumulative decline (McCann, 2013, pp. 254–264). The ensuing process of economic decline and population loss in such a context could be further aggravated by the observed tendency of cities with high dependence on a particular industry to suffer from excessive political influence of a local industrial élite resistant to change (Friedrichs, 1993). Hassink (2005) and others (Barnes et al., 2004) have dubbed such an outcome negative lock-in – a pathological political, behavioural or institutional trap that hinders the necessary restructuring processes in struggling cities and regions, prolongs the process of decline and lowers the prospects for recovery.

A recent series of large-scale, longitudinal empirical studies of urban population loss in Europe (Turok & Mykhnenko, 2007), the United States (Beauregard, 2009) and beyond (Martinez-Fernandez et al., 2012) has been followed by attempts to conceptualise urban shrinkage in a more universal fashion. One heuristic developed by Haase et al. (2014) attempts to

integrate a number of previous cross-national conceptualisations (Oswalt, 2005; Reckien & Martinez-Fernandez, 2011) into a single parsimonious model (see Figure 1).

This heuristic model itemises key global and regional drivers of urban shrinkage, including economic and demographic decline, suburbanisation, contentious territorial politics and natural environmental disasters, while highlighting their impact on the spatial urban development at the local scale. Population loss is regarded here as the key indicator of urban shrinkage, which, in turn, has a host of direct and indirect negative consequences. As the model shows, urban shrinkage processes are cumulative and could accelerate as the result of an unfavourable governance response. Thus, the impact on a shrinking city of public policies and private decisions taken (or not) by various local, regional, national and supranational actors cannot be overestimated.

The question whether theories of urban growth and decline grounded primarily in the experience of industrially advanced Western capitalist economies are appropriate and relevant in the context of spatial economic development in the non-Western world remains highly contested (Bernt, 2016; Robinson, 2006). On the one hand, there are examples of Western urban shrinkage theories travelling East in an unadulterated form (see Grossmann et al., 2017). On the other hand, as argued by Peck and Theodore (2007), a more nuanced geographical understanding of modern capitalist social formations must uncover the interdependence of varied forms of capitalism in their constitutive local place-based regimes. For example, by adapting an originally Western “Varieties of Capitalism” theory to the Chinese context, Peck and Zhang (2013) revealed a number of distinctive subnational varieties of Sino-capitalism contained within a peculiar model of a nationally reforming socialist-developmental state.

To Marxist economic geographers, the simultaneous processes of urban expansion and shrinkage in contemporary China may represent yet another manifestation of “uneven and combined development” – supposedly a necessary and systematic consequence of the logic of the capitalist mode of production (Dunford & Liu, 2017). As stressed by Peck and Zhang (2013), the hybrid Chinese mode of capitalism combines phenomenal growth capacities with fatal flaws in “a simultaneous and geographical conception of the contradictory coexistence of the integrative principles of market exchange, reciprocity and redistribution,” marrying the elements of centralised party discipline with entrepreneurial localism, *dirigiste* developmentalism and deregulated marketisation (Zhang & Peck, 2016, p. 65). According to this analysis, the gradual evolution of variegated capitalism in China has exacerbated historically deep geographical divides, especially between urban and rural areas, but also inter-regionally. Therefore, what seems fundamental to understanding China’s capitalist modernisation-cum-urbanisation trajectory is how the regional disparities have propelled colossal migration flows of peasant labour. Consequently, the geographical political economic reading of Chinese capitalism raises an empirical question – does its variegated nature generate fundamentally dissimilar urbanisation processes at the local scale? Are certain regional varieties of Sino-capitalism more prone to urban shrinkage?

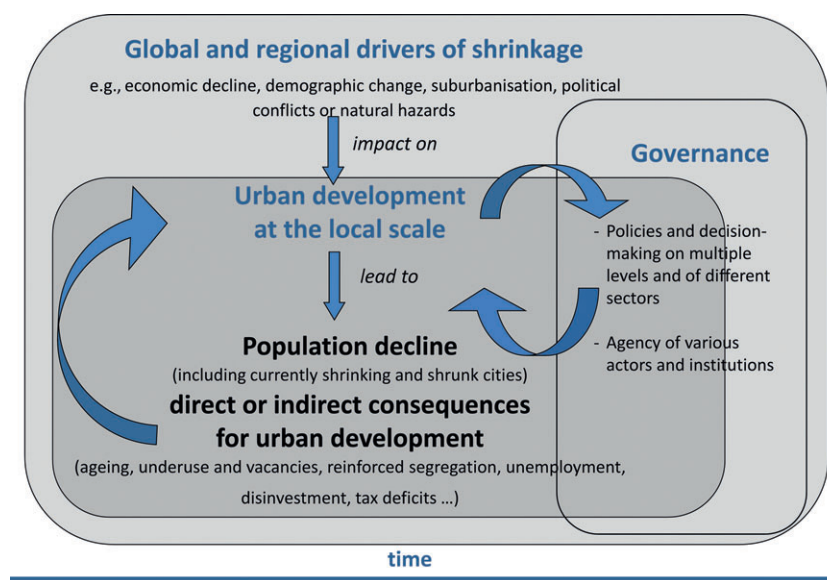


FIGURE 1 Urban shrinkage: a heuristic model. [Colour figure can be viewed at wileyonlinelibrary.com]

Source: Haase et al., 2014: Figure 1

3 | DEFINING CITIES AND URBAN POPULATION IN CHINA: DATA AND METHODS

Before we proceed, we need to define what we mean by the city in the Chinese context and to explain our methodology. This article focuses on population loss as the key indicator of urban shrinkage in China since 1990. In mainland China, this study has had to confront four different administrative types of urban settlement: (1) directly controlled municipalities (DCMs); (2) prefecture-level cities (PLCs); (3) county-level cities (CLCs); and (4) ordinary towns. None of these cities is an exclusively urban entity, but rather a political-administrative unit comprising, typically, both an urban core (roughly comparable to the continuously built-up area) and surrounding peri-urban and rural areas (see Figure 2).

Another well-known data-related issue relates to the Chinese mandatory household registration system – the *Hukou*. Estimating the population size of a city using *Hukou* data includes many people who are registered but no longer live in the locale, and exclude those who live in the locale, but lack the local *Hukou* permit (Chan, 2007). An alternative approach is to focus on the long-stay population and include all who are long-term residents of a locality at the time of the census. Currently, there are two census ward levels (enumeration districts) used to count the long-stay population (i.e., residents for six months and longer). The first uses the overall administrative boundary of a local authority, thus potentially overestimates the urban long-stay population by covering inhabitants living in rural parts of the municipality. An ostensibly more accurate method is to count the long-stay population within the primary urban area. However, the criteria for defining primary urban areas have not been consistent over time (Kamal-Chaoui et al., 2009). Given these limitations, the ideal way to establish the actual population of Chinese UAs would be to count the long-stay population within the functional boundary of each city (the *de facto* city), rather than its administrative boundary (the *de jure* city). Such an exercise, however, presents a potentially insurmountable task, given that the detailed population breakdown figures below the town level, which would be necessary for defining its functional boundary, are not officially available, if at all.

Based on the available published population census data, this article has taken the following approach to estimate the population size of Chinese cities:

1. In the case of 853 inner-city boroughs (usually called urban districts) of large cities, this study has considered each a part of the *de facto* city and, thus, has used the aggregate long-stay population figures covering their administrative

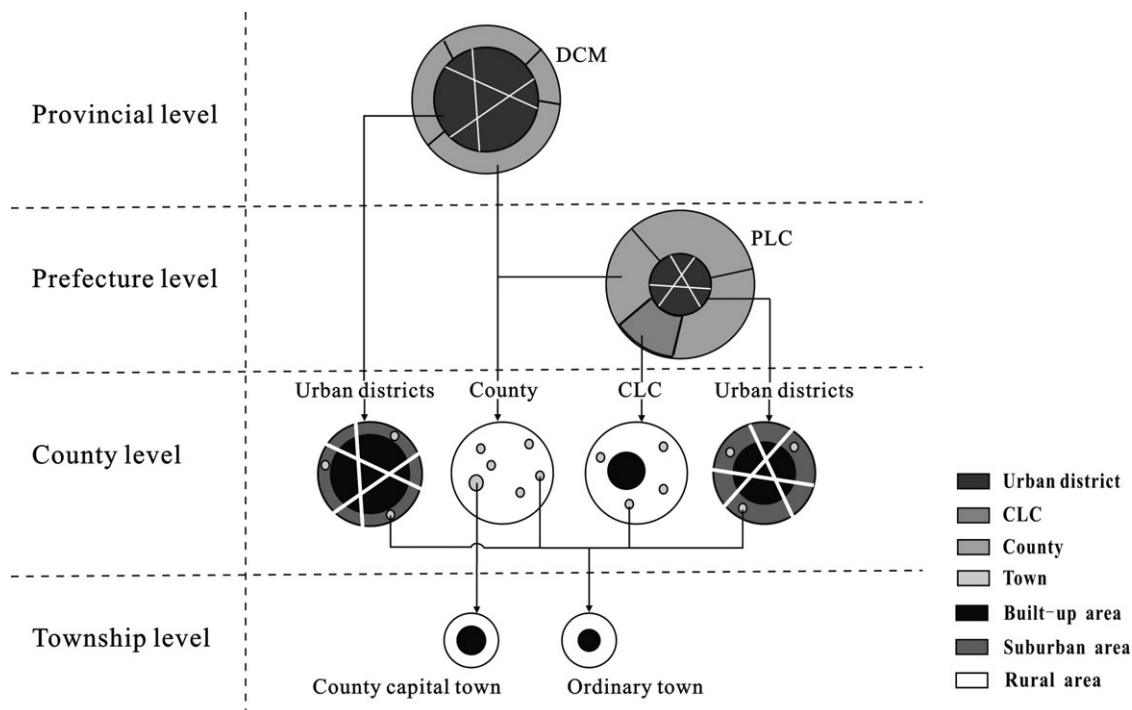


FIGURE 2 A multi-scalar perspective on Chinese cities: delimiting urban areas within political-administrative units of subnational authorities. Urban districts of directly controlled municipality (DCM) and prefecture-level cities (PLC) are separated by straight white lines, with an arrow pointing to a more detailed picture of these urban districts at a lower scale (country level). Similarly, ordinary towns (light grey dots at the county level) are then zoomed into (see arrows pointing downwards) at a lower scale (township level).

boundaries. We have treated the population change in each inner-city borough individually and separately, teasing out the spatially uneven attributes of urban shrinkage (see Figure 3).

- In the case of 370 CLCs and 1,633 counties, we have found that UAs were scattered within the kernels of CLCs and across nearly 20,000 towns below the county level. This study did not have resources and/or access to all the necessary population data, and information about boundary changes, to enable us to measure the long-stay population of each city individually. Hence, we have had to use the aggregate long-stay population residing in the UAs of cities and towns as the total urban population of their respective municipality. This style of aggregating the number of urban residents at the local scale does not allow one to identify the smallest of shrinking cities; yet, it helps to establish long-term trends of urban population growth or decline in individual CLCs and counties – a big step towards a secure basis for further research (cf. Long & Wu, 2016).

China's rapid urbanisation period was split into two-decade-long intervals, with the population data derived from the National Population Census of China (by county) in 1990, 2000 and 2010 (NBSC, 1992; PSO, 2003; PSO, 2012). The Census data only cover the mainland customs territory and exclude temporary foreign residents. In terms of statistical adjustments, this study has had to deal with a number of significant changes in administrative type occurring between 1990 and 2010, especially between counties, CLCs and inner-city boroughs. To make the data directly comparable, we have used the long-stay population figures within the same boundaries. To maintain some continuity, we have had to redraw the administrative boundaries of most county-level units of analysis, based on the central government's official information about administrative boundary adjustments (Central People's Government, PRC, 2006; XZQH, 2016) and population data of the lower tier units (NBSC, 2002). Profound boundary changes in some regions have fragmented the time-series data and made them non-comparable over time; as a result, 32 shrinking cities had to be removed from the sample. The overall process of collecting, processing, adjusting and clearing the data has consumed six person-months of effort.

<i>Type of shrinkage</i>	<i>Time period</i>		<i>Number of urban areas</i>
	1990–2000	2000–2010	
			Continuously shrinking cities (inner-city boroughs), 1990-2010
<div> <div></div> Growing UAs <div></div> Shrinking UAs </div>			
A)	3	13	0 city
B)	5	10	3 cities: Jixi (4/6 boroughs were shrinking); Shuangyashan (3/4 boroughs were shrinking); Yichun, Heilongjiang province (13/15 boroughs were shrinking)
C)	5	6	3 cities: Beijing (Xicheng, Chongwen);Tianjin (Heping); Shanghai (Luwan, Jingan, Hongkou)
D)	11	13	5 cities: Tangshan (Kaiping); Zhengjiang (Dantu); Nanchang (Wanli); Nantong (Tongzhou); Hegang (Nanshan, Xingan, Xingshan)
E)	14	28	13 cities: Shijiazhuang (Jingxingkuangqu); Tangshan (Guye); Zhangjiakou (Xiahuayuan); Baotou (Shiguai); Chengde (Yingshouyingzikuangqu); Benxi (Nanfen); Fuxin (Qinghemmen); Chongqing (Jiangjin, Hechuan); Huludao (Nanpiao); Qiqihaer (Angangxi, Nianzishan); Zigong (Yantan); Pingxiang (Xiangdong); Tongren (Wanshan)
F)	8	9	3 cities: Baishan (Jiangyuan); Ezhou (Huanrong); Leshan (Jinhekou, Shawan)
G)	13	18	4 cities: Fushun (Dongzhou); Liaoyuan (Xian); Jiaozuo (Zhongzhan); Neijiang (Dongxing)

FIGURE 3 Urban morphology of shrinkage: prefecture-level cities and directly controlled municipalities, China (1990–2010).

4 | URBAN MORPHOLOGY AND CHINESE SHRINKAGE TRAJECTORIES, 1990–2010

Since 1990, China has undergone a process of rapid urbanisation, doubling the overall share of its urban residents to 50% by 2010. At the same time, the country has also experienced a loss of urban population across a growing number of UAs. This has followed three basic trajectories: of *recent shrinkage* in 181 UAs (where positive population growth in the 1990s was followed by negative growth in the 2000s); urban *resurgence* in 96 UAs (describing negative population growth during the 1990s, followed by positive growth in the 2000s); and *long-term shrinkage* in 68 UAs, experiencing continuous urban population loss since 1990 onwards. Overall, while in the 1990s, 164 UAs (or 6.8% of China's total) experienced the process of urban shrinkage, in the 2000s, that number grew by over 71% to 281 UAs, or 10.2% in total (see Table 1). The aggregate net urban population loss across China's shrinking cities has more than doubled, from 3.2 million in the 1990s to 7.3 million in the 2000s.

The way we have defined city in the Chinese context allows this paper to analyse basic geographic attributes of shrinking cities in China, including the layout and patterns of population loss within each urban area in question. An illustration of urban morphology of shrinkage across China's largest conurbations is presented in Figure 3. Figure 3 depicts two types of urban morphology. One is of complete shrinkage, an all-embracing process of population loss affecting the entire urban settlement structure (category A in Figure 3, with shrinking areas coloured in grey). The other type is of partial shrinkage (categories B–G), with some sections of the city shrinking and others growing (coloured in black). Of note, category A is the least frequent type of Chinese urban shrinkage morphology. Category C exclusively covers China's political, commercial and financial capitals. Another noteworthy grouping is composed of mining and resource-depleted cities (e.g., Yichun, Shuangyashan, Hegang, Fuxin, Fushun, Baishan and Liaoyuan in north-east China; Jiaozuo in Henan province; and Pingxiang in Jiangxi province) which are heavily present in categories B, E, F and G. (For further discussion, see Sections 6.1 and 6.3 below).

5 | MAPPING CHINA'S URBAN SHRINKAGE

The most common urban shrinkage trajectory in China during the whole 1990–2010 period involves recent shrinkage, covering 59 UAs in north-eastern China, 64 UAs in western China, 32 UAs in central China and 26 UAs on the eastern coast. The

TABLE 1 Urban shrinkage in China: emerging trends, 1990–2010

	Urban districts	CLCs	Counties	Total
1990–2000				
All urban areas	602	331	1,493	2,426
Shrinking UAs	94	11	59	164
Average population loss	26,800	20,500	7,600	19,500
Total population loss	2,522,000	225,000	451,000	3,198,000
2000–2010				
All urban areas	791	346	1,623	2,760
Shrinking UAs	145	65	71	281
Average population loss	31,000	32,100	10,200	26,000
Total population loss	4,492,000	2,089,000	725,000	7,306,000
1990–2010				
All urban areas	593	331	1,493	2,417
Shrinking UAs	56	6	6	68
Average population loss	50,300	93,300	11,500	50,700
Total population loss	2,818,000	560,000	69,000	3,447,000

Notes. In 2010, there were 2,856 county-level local government UAs in China, including 853 inner-city boroughs (urban districts), 370 county-level cities (CLCs) and 1,633 counties.

The bottom part of the table covers all UAs that were continuously shrinking between 1990 and 2010.

Source: Authors' own work.

second trajectory of shrinkage involves long-term shrinkage and includes 34 UAs from the north east, 14 from the west, six from central China and 14 from the eastern coast; in two-thirds of these long-term shrinking UAs, the process of population loss has recently intensified. The third case, and the most common trajectory, was one of urban resurgence, in which 58.5% of previously shrinking cities – chiefly in western and central China – returned to population growth in the 2000s.

Figure 4 maps the spatial distribution of China's shrinking cities, reflecting both the current official categorisation of mainland China into four planning macroregions and the geo-demographic west–east dividing line proposed in the 1930s by Chinese population geographer Hu Huanyong (1935). According to the 2010 census data, west of the *Hu* line accounts for 56% of the national territory, yet it is home to only 6% of the total population. Currently, more than half of the 84 million people inhabiting the west side of the *Hu* Line live in rural, relatively underdeveloped, poor areas. Consequently, almost all of inner Chinese labour migration takes places *within* the east side of the *Hu* Line: in 2010, 95% of all in-migrants and 96% of all out-migrants originated from the east side of the *Hu* Line (Qi et al., 2015).

Therefore, the geographical incidence of urban shrinkage has primarily been to the east of the *Hu* line, rising there by 77%, and accounting for 82% of China's shrinking cities in total. Across China's four planning macroregions (see Figure 4), urban shrinkage has become most prevalent in the north east, affecting 52 UAs in the 1990s and 94 UAs in the 2000s, and in the west (53 UAs and 94 UAs, respectively). The corresponding figures for central China stood at 27 and 46. In eastern China, the number of shrinking cities grew rather moderately from 32 in the 1990s to 47 in the 2000s. This mapping exercise shows over two-thirds of Chinese shrinking UAs to be located in the north-eastern and western regions (67% in total). Four-fifths of the most severely shrinking UAs, with rates of urban population loss of over 1% per year, were located in those two macroregions.

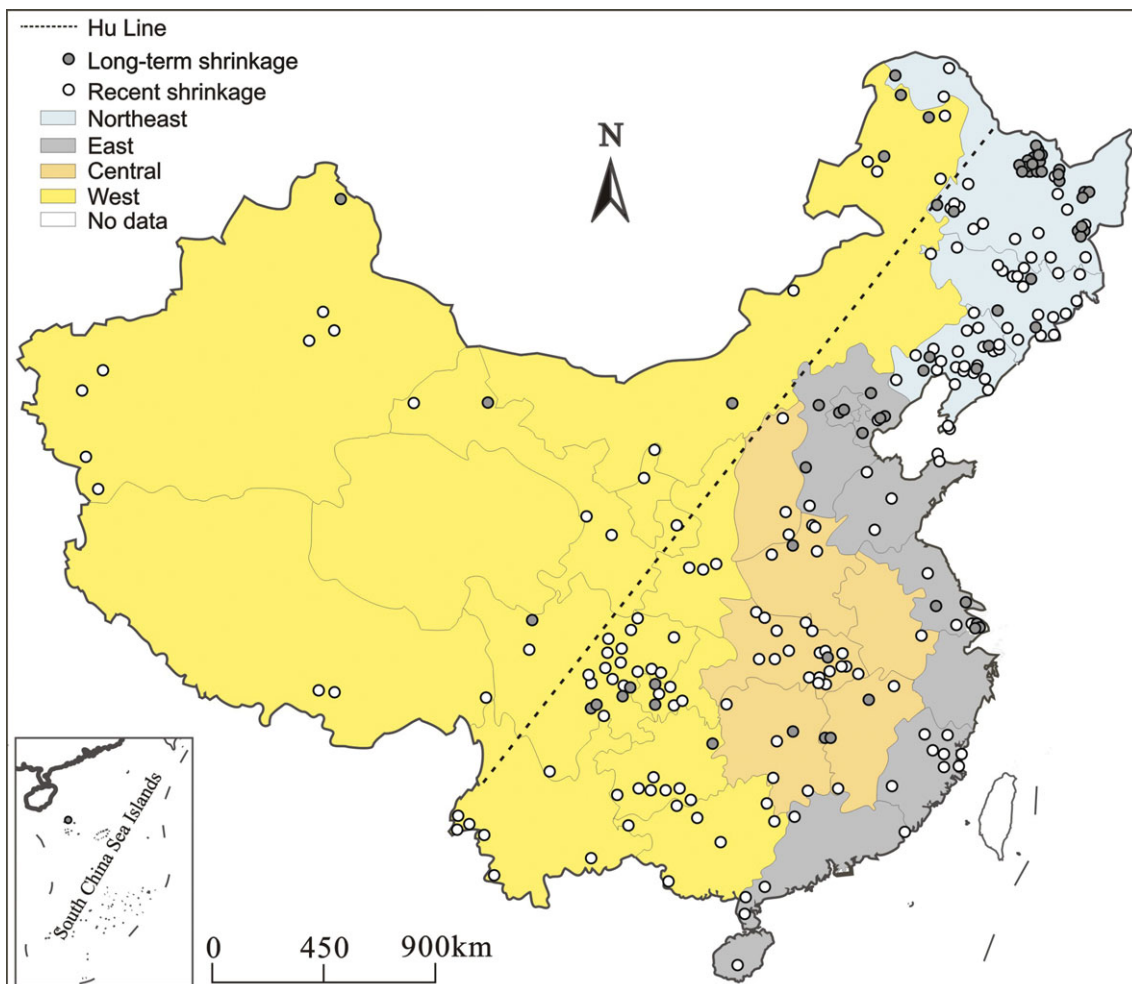


FIGURE 4 China's shrinking cities: long-term (1990–2010) and recent (2000–2010) urban shrinkage patterns.

6 | DRIVERS OF URBAN SHRINKAGE IN CHINA

The heuristic model of urban shrinkage developed by Haase and others (see Figure 1) has provided us with five key exogenous (global and regional) drivers of urban shrinkage, including economic decline, demographic change, a shift in land-use patterns, political conflicts and natural environmental disasters directly affecting cities. This heuristic model does not answer this paper's research question in itself, but rather helps us to create the means to answer the question of urban shrinkage with Chinese characteristics through the prism of economic, demographic, environmental, political and administrative planning factors.

6.1 | State-incubated restructuring: Turning Communist industrialisation legacies into high-tech manufacturing assets

Economic decline, industrial restructuring and deindustrialisation – a localised decline in industrial activity – have long been considered a key driver of urban shrinkage across the West (Oswalt, 2005). Nevertheless, as Rowthorn and Wells (1987) argued, deindustrialisation is not a negative event in itself, but is often an inevitable consequence of mechanisation and technological improvements, resulting in faster growth of labour productivity in manufacturing than in services. Notably, deindustrialisation should not inevitably lead to local economic and population decline, if the rise of the tertiary service sector is sufficient to absorb the former industrial workforce.

In the Chinese case, however, industrial restructuring has become the primary driver of urban shrinkage over the past 25 years: exactly 63% of all shrinking UAs during the 1990s (104 UAs out of 164) and 2000s (178/281) were located in traditional centres of nationally strategic industries, including coal, steel, energy generation and petrochemicals. Moreover, 84% of all *continuously* shrinking UAs belong to the category of old industrial cities. During China's transition from a centrally planned to a (socialist) market economy, these industrial cities have struggled to adapt to shifts in corporate governance structures, growing global competition and market demand preferences (no longer being sustained by copious state orders). Many forestry and mining-based cities have also had to cope with natural resource depletion (see Figure 3). As large state-owned industrial enterprises were free to draw direct government aid, tax credits and subsidies, in addition to generous loans from state-owned banks, many have accumulated debt and overcapacity, leading to further stagnation and decline (Peck & Zhang, 2013, pp. 382–385; Wang et al., 2013).

Unlike structural adjustment policies practised in the West, the Chinese state's response to deindustrialisation has been to force economic restructuring of heavily industrialised cities through reindustrialisation aimed at high-technology manufacturing production. Many cities have had to engage in economic growth promotion that sometimes led to necessary capital investment for upgrading urban transport, information and communication technologies, city infrastructure and other fixed assets. In turn, the central government was ready to provide generous financial support: as of August 2015, it had cumulatively provided 32 billion yuan (around US\$5.2 billion) to promote the regeneration of resource-depleted cities in north-eastern China (NDRC, 2015). Furthermore, the Strategy for Revitalizing the Old Industrial Base in north-east China, adopted by the central government in 2003 alongside similar strategies for other regions, was aimed at upgrading the existing industrial sectors and incubating high-technology start-ups (NDRC, 2007). By mid-2015, the three north-eastern provinces had cumulatively received 567.6 billion yuan (US\$91 billion) of central government investment (NDRC, 2015).

As a result, China's old industrial cities have experienced an unusual economic revival, with GDP and wage growth rates outstripping that of other cities (He, 2014). The industrial revitalisation programmes undertaken to turn the old industrial legacy of the Mao era into today's high-tech manufacturing assets have helped to accelerate economic growth. Nevertheless, they have failed so far to reduce the overreliance of those urban economies on heavy industries (Zhang, 2008). Instead of economic diversification, the role of heavy industries in China's old industrial cities has actually increased, reaching in 2010 70.1% of GDP and 78.4% of total industrial output (Li & Zhang, 2012). The share of state-owned industrial enterprises in total output has also increased, from 70% in 2000 to 93% in 2010 (He, 2014, pp. 158–161).

At the same time, there has been little concerted effort to make these cities improve their relative appeal and become attractive locations to visit, and pleasant places to live, potentially failing to build a solid foundation for new economic growth. China's old industrial cities have begun to experience a whole host of socio-economic problems, ranging from deindustrialisation-driven unemployment (Wang et al., 2013) to accelerated ageing (Zhang, 2010), municipal budget deficits (Wu et al., 2015), the underuse of social and technical infrastructure (Andrews-Speed & Ma, 2008) and a rise in residential segregation (Wei et al., 2011). Air pollution has greatly intensified, with coal import consumption increasing from 75.4 million tons (Mt) in 2003 to 237.6 Mt in 2012, and the energy-related industrial CO₂ emissions rising from 464.5 Mt to

822.8 Mt, respectively. Hence, the fortunes of these cities, including their population growth prospects, continue strongly to depend upon the ability of the single-party state to keep the industrial sector afloat, while it struggles to rebalance the export- and investment-led growth model towards domestic consumption and a low-carbon economy (Nolan, 2014; Yueh, 2013). The outcome of recent reindustrialisation attempts does not bode well for many shrinking cities in China (He et al., 2017; Turner, 2016).

6.2 | China's new economic geography: State-mediated core–periphery dynamics

Regional varieties of Chinese state-led capitalism on their own have not generated divergent urbanisation processes at the local scale. On the one hand, there are many incidences of urban shrinkage in remote and relatively isolated Chongqing – the urban region that is often celebrated as a renovated model of “socialist developmentalism” (Liu et al., 2016). At the same time, a considerable number of shrinking UAs have appeared in Guangdong – a prosperous and rapidly growing province, reportedly China's most attractive destination of interprovincial migration. The striking difference between Chongqing and Guangdong varieties of Sino-capitalism (see Zhang & Peck, 2016) cannot explain the similarity of their shrinkage dynamics.

We have also investigated the relationship between regional growth and urban shrinkage patterns. According to these data (see Figure S1), in the 1990s–2000s, Chinese shrinking UAs were spread across all types of regional economies: They could be found in *surging ahead* regions like Guangdong, Jiangsu and Tianjin (in which GDP per capita and growth rates were both above the national average); in *catching-up* regions like Hebei and Guangxi (with lower than average GDP per capita, but higher than average growth rates); in *losing ground* regions like Heilongjiang and Liaoning (with GDP per capita higher than the national average, but with a growth rate lower than the national average); and finally, in *lagging behind* regions like Sichuan, which were both poor and growing slowly. Hence, neither the economic fortunes of a particular territory nor its regional growth model can provide an adequate explanation of China's divergent urban development.

Zooming further into the map of urban shrinkage (Figure 4), one notices a peculiar clustering of shrinking UAs along provincial and national boundaries. Indeed, we have found that a third of all shrinking UAs in China – 36% in the 1990s and 32% in the 2000s – were located in inner peripheral areas and remote national borderlands. While the established urban shrinkage heuristics cannot help us here, the *new economic geography* (NEG) theory could. NEG was first to theorise how – depending on transportation costs, economies of scale, and the share of manufacturing in national income – a country could evolve from initially having an even spatial distribution of economic activity into containing an industrialised urban core and an agricultural rural periphery (Krugman, 1991). Despite its many “aggressively unrealistic” assumptions (Krugman, 2011, p. 4), the NEG core–periphery model seems to account for the colossal rural out-migration towards China's fast-growing export-orientated industrial clusters, located in major urban centres near the ports and transport hubs on the eastern coast.

In economic geography terms, agglomeration is considered to be “a quasi-universal feature of human existence” (Scott & Storper, 2015, p. 6), the key attribute of cities “involving the gravitational pull of people, economic activities and other related into interlocking, high-density, nodal blocks of land use” (Storper & Scott, 2016, p. 1116). Agglomeration economies, thus, serve as “a critical hinge point” (Scott & Storper, 2015, p. 6) around which production, trade, and urbanisation processes revolve, leading to industrial clustering, further geographical concentration of population and economic activities, and, eventually, a rise in social–spatial disparities (Baldwin & Forslid, 2000). Therefore, China's new economic geography is rendered explicable through the functioning of agglomeration and urbanisation economies. Chinese and foreign firms produce more efficiently, and (migrant) Chinese workers enjoy higher welfare (nominal wages) by being close to large (foreign) markets, while large urban areas (close to the foreign markets) are in turn those where more firms and workers locate (Puga, 2002).

Despite rapid growth, China's core–periphery development gap remains vast, with poor connectivity and accessibility hindering trade and foreign direct investment outside its major metropolitan areas on the eastern coast, and its provincial capitals. Indeed, the gap between the average provincial per capita GDP and that of their respective peripheral border areas increased from 1069 yuan (US\$185) in 1992 to 13,235 yuan (US\$2,124) in 2012 (Zhang et al., 2015). It is contended that – if left to the play of market forces alone, with free and unrestricted capital, labour and land markets – the workings of agglomeration and urbanisation economies would have generated a far greater concentration of economic activity on China's eastern coast than is observed today (Eggleston, 2015).

6.3 | State-sponsored mega-shrinkage: Altering the natural and the built environment

Unlike national core–periphery dynamics, politics and governance do feature rather prominently in contemporary models of urban shrinkage (see Figure 1). Yet the political system and state institutions enjoy a much more central presence in

Chinese societal development. Moreover, some of the most spectacular instances of urban shrinkage in China have been the direct result of state intervention through programmes of planned resettlement. The population loss in inner-city boroughs of Beijing, Shanghai, Tianjin and other mega-cities (depicted in category C, Figure 3) has been actioned through so-called inner-city renewal programmes officially aimed at dedensification, the formation of central business districts and the upgrading of city centre functions. According to official estimates, about 160,900 households were displaced during urban regeneration in central Beijing in the 1990s, with another 244,000 households relocated in the period 2001–2004 (UCC, 2000; UPCB, 2007). In Shanghai, around 1,200,000 households were relocated from inner-city boroughs to the outskirts between 1990 and 2008 (Ren, 2011). In Tianjin, planned resettlement away from the city centre affected more than 470,000 households between 1994 and 2003 (Li et al., 2004).

At least in Beijing, urban functions have been significantly upgraded during the relocation of inner-city residents in the run up to the 2008 Olympic Games (Feng et al., 2009). The ageing demographic structure of Beijing inner-city boroughs has also improved, with the proportion of over-65s declining sharply. According to the latest Coordinated Development Plan for Beijing, Tianjin and Hebei, the nation's capital will continue promoting population loss of up to 15% by 2020 to reduce overcrowding, congestion and environmental pollution. Thus, China's inner-city population decline is very different from the Western flight of the (white) middle classes to suburbs, propelled by car ownership and transport infrastructure improvements. City centres in key Chinese UAs remain a very attractive residential proposition for the local élite.

Indeed, it is the market value of prime city centre land that could be the principal *raison d'être* for state-sponsored shrinkage. Since the late 1980s, local government in China has been allowed to commodify state-owned urban land and marketise it through leasing the land-use rights to the private sector and converting the land-use designation for a fee to real estate developers (Liu et al., 2016). The land-generated revenues were used by municipalities to finance urban infrastructure and to further leverage extra-budgetary borrowing initiatives (Huang & Du, 2017; Pan et al., 2017). As a result, local government in China has been directly incentivised to bring more land under its control through land grabbing (Shin, 2016).

In a typical scenario described by Liu et al. (2016), this process has involved the appropriation of rural village-owned land for the maximum fee of 60,000 yuan per mu (around US\$53,000 per acre) and the conversion of the existing land-use rights into more profitable use. Following the construction of basic infrastructure, these land-use rights may be sold to a developer for as much as 6 million yuan per mu (US\$5.3 million per acre). The 100-fold difference between the initial and final transactions explains overplanning on the magnitude mentioned in the Introduction, with China's local authorities assembling land purportedly to house 3.4 billion of fictitious new inhabitants. Chinese local government's craving for more land-based income also explains why most shrinking cities have continued to expand physically: Type B shrinking UAs (Figure 3) grew by a quarter in size between 1990 and 2010. China's state-sponsored shrinkage has effectively allowed local government and Party leaders to realise their personal career ambitions by boosting extensive growth.

Another aspect of China's state-sponsored shrinkage concerns public infrastructure mega-projects aimed at exploiting the nation's natural resources. Nearly 1.3 million people were displaced in Hubei and Chongqing provinces during the 1992–2009 construction of the Three Gorges hydroelectric dam (3GPCC, n.d.). Around 350,000 people, mainly in Henan and Hubei provinces, were relocated during the South–North Water Diversion canal construction in 2005–2012 (Zhang & Li, 2014). In remote mining towns facing acute economic decline and depopulation following natural resource depletion (type E UAs in Figure 3), China's central government has enacted a public programme to relocate the entire population. By 2015, 680 million yuan (US\$111 million) had already been spent on the first 10 mining resettlement projects (Lu, 2014).

Overall, these state-sponsored mega-shrinkage projects have led to the displacement of around 8.9 million people. Discounting villages in rural areas destroyed or submerged in the process of dam and canal construction, and allowing for various statistical discrepancies, we can report that China's shrinkage-inducing government interventions were responsible for 27.6% of the total *net* urban population loss in the 1990s and for 11.6% of urban shrinkage in the 2000s. The Chinese single-party state has thus become a key driver of urban shrinkage.

6.4 | State-propelled demographic change

Demographic change in the form of population ageing and low fertility rates has long been recognised as a crucial driver of urban shrinkage worldwide (Matanle & Rausch, 2011; Mykhnenko & Turok, 2008). In China, the impact of demographic change is beginning to be felt as well. Since the 1980s, urban population growth has been fuelled by extensive rural-to-urban migration rather than natural population growth in cities (Wang & Huang, 2014). By 2010, the overall size of China's floating population living and working outside their registered localities reached 261.4 million, or 20% of the country's total population (elaborated from NBSC, 2011). This historically unprecedented influx of labour migrants into the cities has obviously masked the demographic impact of national restrictive birth control measures, including the one-child

family policy (Greenhalgh, 2008). Nevertheless, the population growth targets set by central government for the 10th and 11th Five-Year Plans were missed by well over 50% (Wang, 2012). In the 2000s, demographic change emerged as the third most important driver of urban shrinkage in China, gradually surpassing the impact of state-sponsored mega-shrinkage. The number of shrinking cities with negative natural population change has almost tripled, rising to 74 UAs by 2010 (or 26% in total), most in north-eastern China.

Looking further ahead, the experience of other traditional Chinese communities that have undergone rapid capitalist modernisation could be telling. In a recent study, Lin (2014, p. 197) ascribed Taiwan's ensuing demographic decline not only to government policies, but also to profound social changes, including:

The rise of environmentalism and feminism, the increased education levels and labour participation of women, postponement of marriage, declined nuptiality, high cost of childbearing, the balance of work and family life, fear of losing freedom, and shift in family values.

7 | CONCLUSION

Empirically, this paper has exposed a little-known dimension of China's urban geography – that of shrinkage, directly affecting one in 10 of its cities. Urban shrinkage is revealed to be a growing public policy concern for the Chinese Communist party-state, with the absolute number of shrinking UAs rising by 71%, from 164 in the 1990s to 281 in the 2000s, including 68 UAs which have been depopulating continuously since 1990, mostly in the north east. By proposing its own definition of the city in mainland China, this paper has also developed a morphologic taxonomy of its urban shrinkage patterns. Furthermore, despite the multi-causal nature of urban shrinkage, this paper has identified four distinct drivers of this geographical phenomenon in China: (1) state-incubated reindustrialisation, impacting upon 63% of all shrinking cities; (2) the country's new economic core–periphery dynamics, pushing around 34% of all shrinking cities towards marginalisation; (3) state-propelled demographic change, leading to natural population decline in 26% of shrinking UAs; and (4) state-sponsored mega-shrinkage, responsible for urban population loss in almost 20% of all cases.

Theoretically, the distinctiveness of China's political transformation over the last 40 years, the character of its state and the continental size of its rapidly developing spatial economy have posed a major challenge to the existing Western(-centric) conceptualisations of urban growth and decline. Any hope of advancing a global account of urban shrinkage, meaningfully applicable everywhere at all times, is doomed by the complexities of China's spatial development. Two out of four drivers of urban shrinkage in China listed above – economic and demographic decline – were uncovered using a previously developed heuristic. Indeed, especially across the old industrial cities of north-eastern China, urban population loss has had a much more Western-like flavour, with well anticipated negative consequences, including decay, negative natural population growth and out-migration.

Nonetheless, the critical distinctiveness of urban shrinkage in China relates, first and foremost, to its *state-compelled, government-driven* nature. The central government's role in comprehensive spatial planning is overriding, though its effects have been rather ambivalent. While the stated objectives of state-sponsored mega-shrinkage were about the creation of an aesthetically attractive and greener built environment, China's state-funded reindustrialisation efforts have led to an opposite effect. The short-termism of Chinese local government actors – fixated on the extraction of land-based income – has added another layer of specificity to the understanding of urban shrinkage across the mainland.

Another theoretical conclusion is that a new heuristic of urban shrinkage, applicable in a rapidly developing emerging market economy context like China's, should be built at least partly on the assumption that the process may lead to a *positive* beneficial impact on urban social development – a notion that Western scholars continue to struggle with (e.g., Hollander, 2018, p. 106). More grounded research on the impact of China's shrinkage-inducing public policies is needed to aid such a project. Similarly, more research is vital to discover the full range of direct and indirect consequences of urban shrinkage at the local scale. Moreover, the new heuristic of urban shrinkage must fully incorporate the NEG core–periphery thinking, modelling the agglomeration of the nation's labour force into a few mega-cities. Indeed, in the light of these core–periphery dynamics, China's state-sponsored mega-shrinkage projects ought to be seen as the visible hand of the Communist party state mediating the excesses of agglomeration and urbanisation economies unleashed previously by the invisible hand of the market.

Policywise, this paper concludes that as the relentless pressure of demographic change and industrial restructuring continues to mount, Chinese policy-makers may find it increasingly difficult to confront the challenges of urban shrinkage, especially in north-eastern China. They would also have to face up to the colossal political dilemma of liberal market-based capitalism – whether to continue resisting the inexorable centripetal forces of economic agglomeration, by trying to reverse the causes of urban population loss in western China and across the inner peripheries. When Chinese party-state leaders decide that the costs of intervening into the market-led dynamics of spatial economic development have become *excessively* detrimental to national growth, productive efficiency and individual equity, urban shrinkage processes in the country shall inevitably accelerate.

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DATA ACCESSIBILITY

This publication is supported by multiple datasets, which are openly available at locations cited in the reference section. All data created during this research are provided in full in the results section of this paper and as supplementary information accompanying this paper.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Figure S1. The unevenness of urban shrinkage in China: concentration of shrinking cities in individual provinces, grouped by economic development dynamics (GDP per capita and GDP annual growth rates), 1990s and 2000s.

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