Re-examine the Restoration: Fiscal capacity and industrialization in modern China, 1860-1930

Hanzhi Deng, London School of Economics
(h.deng8@lse.ac.uk)
Supervisors: Kent Deng & Debin Ma

Introduction

Explaining the global spread of industrial revolution from England is a long-standing challenge. While other scholars emphasize the role of investment banking (Gerschenkron, 1962), culture (Clark, 1987), trade policy (Harley, 1992), natural resource (Fernihough and O'Rourke, 2014), and human capital (Becker and Woessmann, 2009), this article highlights the importance of fiscal capacity in industrialization. Fiscal capacity is a nexus of political development and economic growth (Johnson and Koyama, 2017), but mechanisms on how fiscal capacity contributes to economic growth are greatly under-studied (Ogilvie and Carus, 2014).

Modern Chinese history offers a perfect case. The early Qing economy enjoyed unprecedented Smithian prosperity with no spontaneous industrialization while changes accelerated only after the 1860s. Instead of considering Western impacts, this article shows how modern industries spread over China from an indigenous perspective. Faced with pervasive social disorder in the mid-nineteenth century, the precarious Qing central state delegated its power by acquiescing great local fiscal-military autonomy. Hence local states became self-serving 'stationary bandits' and had stronger incentives for institutional experimentations. They strengthened their capacity by creating a new commercial tax, *lijin*, and with this autonomous revenue they invested in modern industries and further induced the rise of private firms by providing market-supporting public goods. This pattern persisted even after the fall of the Qing Empire. 265 prefectures in China Proper provide significant variation for local fiscal capacity and industrialization, and this article makes the first quantitative breakthrough to examine the positive link between them. To overcome endogeneity, it employs the severity of Taiping Rebellion (1851-64) as an instrument variable for local fiscal capacity. This rebellion was a great threat to the Qing reign; due to the weak capacity of the Qing central state, suppression was delegated to the local who were acquiesced to set up the novel commercial taxation (*lijin*) system. Hence local warfare for suppression was strongly linked to local fiscal capacity while playing no direct role in industrialization.

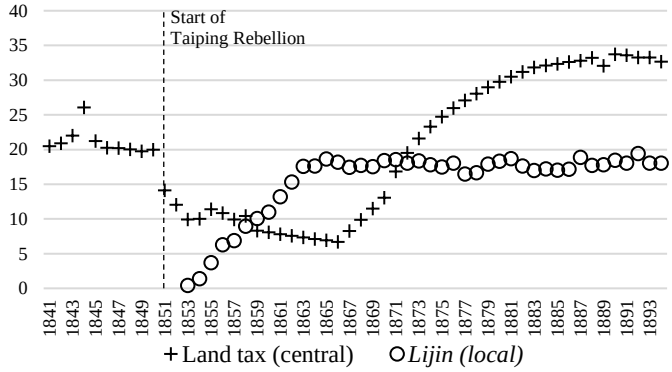
This article speaks to several strands of literature. First, it emphasizes the role of fiscal capacity in triggering industrialization with novel evidence and visits mechanisms including public goods provision (Ogilvie and Carus, 2014) and state-led investments (Bardhan, 2016). It also contributes to the Great Divergence debate by outlining the onset of China's industrialization (Brandt et al., 2014). Second, it complements the state capacity literature which overwhelmingly focuses on the revenue side while overlooking spending. Third, it covers intergovernmental relations by describing how local Chinese states played a developmental role once they became self-serving. Fourth, it analyses the impact of war on economy (Miguel and Roland, 2011) by studying Taiping Rebellion. It challenges the paradigm that China's modernization was merely responses to Western shocks. Instead, indigenous chaos and consequential institutional changes mattered.

Data

I construct a dataset for local fiscal capacity at the prefectural level. Although local states delinked themselves from the centre in many aspects, the ideal measure for local fiscal capacity is the scale of novel commercial taxation (*lijin*). *Financial Reports 1908* (Chen, 2015) provided the only cross-sectional image of prefectural *lijin* operation. Fortunately, it experienced no changes since the 1860s so cross-sectional data reflect consistent spatial variation. Since *Reports* contained no reliable *lijin* revenue data, I use the number of *lijin* stations to measure its scale: I locate 768 *lijin* stations nationwide and count them at the prefectural level. This measure is reasonable: since *lijin* was a tariff

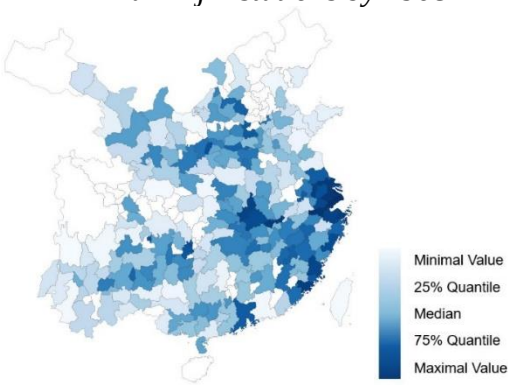
on goods in transit, the location of *lijin* stations must be rational to capture flows of goods; their workloads must be comparable and those with light workloads were abolished.

Figure 1: *Rise of local fiscal capacity (in million silver taels) (1 tael = 37 grams)*



Source: full text.

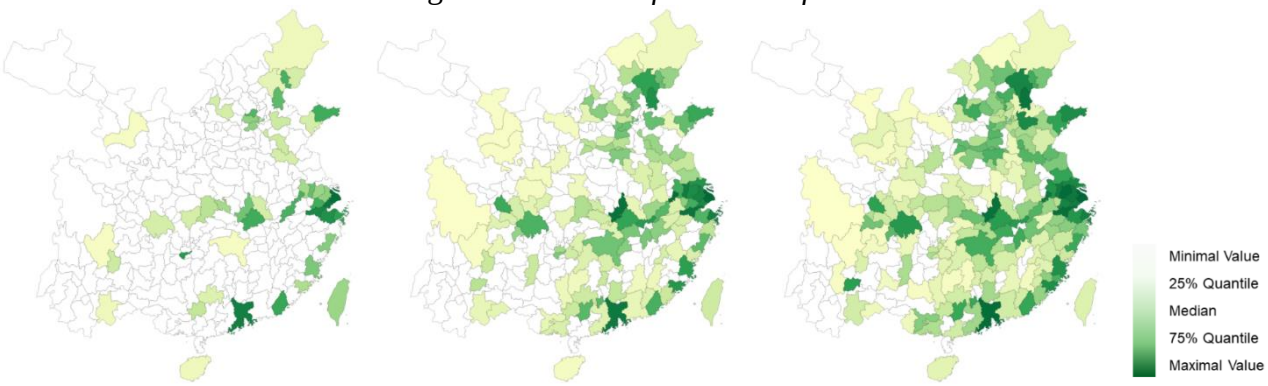
Figure 2: *Density of main lijin stations by 1908*



Source: archives (Chen, 2015).

Meanwhile I employ information of over 4,000 native industrial firms (1860-1927) (Du, 1991) and count them at the prefectural level. Since I can track the establishing year, start-up capital, sector and ownership for a firm, I create a battery of prefectural variables such as number of chemical firms, and number of firms established by 1895, etc. for further discussions.

Figure 3: *Number of industrial firms*



(A) 1895 (B) 1911 (C) 1927

Source: archives (Du, 1991).

Empirical Strategy

I use cross-sectional data to examine the effect of local fiscal capacity on industrialization. The specification is

$$Industrialization_i = \beta_0 + \beta_1 Local\ Fiscal\ Capacity_i + \boldsymbol{W'}_i\boldsymbol{\beta} + \varepsilon_i \qquad [1]$$

where i denotes prefectures. $\boldsymbol{W'}_i$ consists of variables that might affect local industrialization: initial conditions (near coast, near Yangzi River or Great Canal, log land size, longitude, latitude, log 1851 population, and distance to the nearest provincial capital) and other shocks (duration of foreign treaty ports, severity of natural disasters, rebellions, and wars). The error term is robust and clustered at the provincial level. β_1 is the coefficient of my interest and I expect it to be positive.[1]

Two possible concerns arise – measurement error for local fiscal capacity, and mutual causality between local fiscal capacity and industrialization. Hence I introduce a major political threat to the Qing reign, Taiping Rebellion, and employ local warfare severity as an instrument for local fiscal capacity. Although numerous wars and unrests might facilitate the late Qing local autonomy, Taiping Rebellion was distinctive. Rebels declared opposition to the Qing rule in 1851 and disturbed social

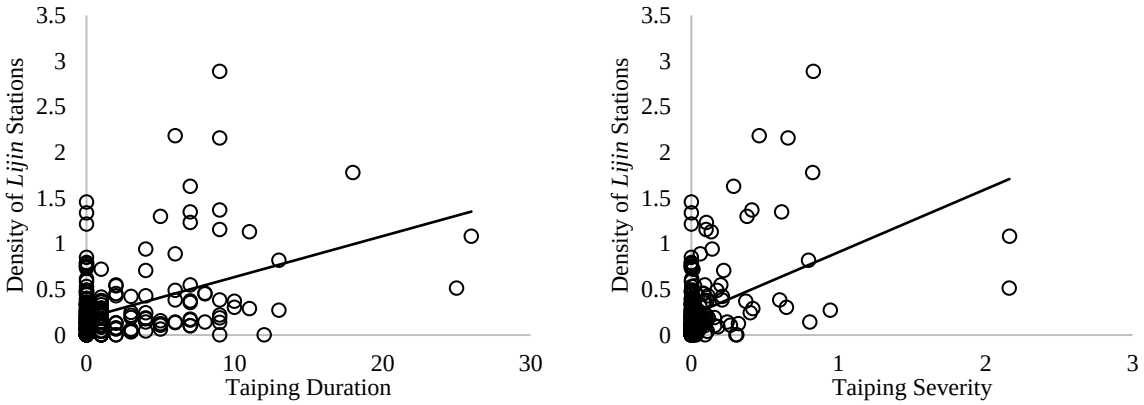
[1] The full text provides negative binomial and Tobit regressions as robustness checks.

order of most provinces for a decade. However, their guerrillas never established a closed border, and their expansion strategies were under-unplanned. Hence the variation of warfare among regions is evident. I quantify battles monthly at the prefectural level (Guo, 1989) and generate two measures for Taiping impact: 'duration' that counts the number of months in war, and 'severity' that aggregates all military actions by different weights. With this instrument for local fiscal capacity, I conduct 2SLS regressions, and the first-stage specification is

$$Local\ Fiscal\ Capacity_i = \alpha_0 + \alpha_1\ Taiping\ Rebellion_i + \boldsymbol{W}'_i\boldsymbol{\alpha} + e_i \qquad [2]$$

Both conditions for the instrument are fulfilled. There is a strong relevance between Taiping-related warfare and local fiscal capacity. Widespread warfare profoundly reshaped the Qing central-local relations. Local governors and gentry legitimately set up militias and built fortifications which went out of central control. Hence the independent local fiscal systems represented by the novel commercial tax *lijin* were created to finance local troops. Where there was severer Taiping-related warfare, the local was acquiesced to collect more *lijin*. The spatial variation of local *lijin* operation was frozen after the rebellion was suppressed and showed great continuity during modern times of China. Figure 4 provides evidence for this relevance, and table 1 gives the first-stage results.

Figure 4: *Taiping warfare and local fiscal capacity*



Source: full text.

Exclusive restrictions are also fulfilled. The Taiping impact on a specific region was random to its initial conditions (Guo, 1989). Meanwhile, I rule out other channels and propose that Taiping Rebellion brought industrialization only through 'fiscal capacity' channel. First, high wages were not observed. Although Taiping Rebellion caused disastrous casualties, I capture no steady increase of wages: post-Rebellion real wages of urban unskilled labour never exceeded the eighteenth-century level (Allen et al., 2011) and could not drive the capital-intensive production. Second, the laissez-faire economic recovery was resilient but agrarian without urbanization. Population growth and migration were evident after the rebellion, but most peasants merely claimed the ownerless lands. Third, some studies argue that the Qing state generated alternative incomes by exam quota sales (*juanna*) so people were more incentivized to invest in exam preparation due to quota expansion, which led to quick human capital accumulation. This was highly questionable. The fiscal role of *juanna* was minimal. Meanwhile, massive sales diluted the value of titles, so it was doubtful whether people still held great enthusiasm for the costly Confucian education. From evidence on human capital for China (Baten et al., 2010), the decline of age heaping was observable but irrelevant: it was firstly witnessed in 1870 birth cohort, and when they were adults, industrialization had lasted for 30 years. Finally, no evidence indicates that the Qing state launched legal reforms to protect private properties or enforce contracts instantly after the rebellion.

Results

I use the density of *lijin* stations to measure local fiscal capacity and predict the log number of industrial firms by 1911. Both OLS and IV columns in table 1 give significant results. The IV

columns use the Taiping duration to instrument local fiscal capacity, and the lower panel reports the first-stage results where the F-statistics are satisfactory. With these results I estimate the marginal effect of local fiscal capacity on industrialization. In column 4, if the density of *lijin* stations increase by one unit, the number of firms will increase by 1.8 times. Given the median prefectural land size 12,140 km^2, an extra *lijin* station leads to a 15 percent increase (1/12140*1000*1.8) of firm number.

Table 1: *Local fiscal capacity and industrialization*

	Y = *Log (Number of Industrial Firms by 1911)*			
	(1) OLS	(2) OLS	(3) IV	(4) IV
Local Fiscal Capacity	1.648***	0.705***	2.565***	1.804***
	(0.194)	(0.157)	(0.531)	(0.621)
Controls		Yes		Yes
Observation	265	265	265	265
Adjusted-R^2	0.355	0.684	0.245	0.602
			Corresponding First Stage	
			Y = *Local Fiscal Capacity*	
Taiping Duration			0.041***	0.022***
			(0.006)	(0.005)
Controls				Yes
Adjusted-R^2			0.172	0.500
F-Stat			56	23

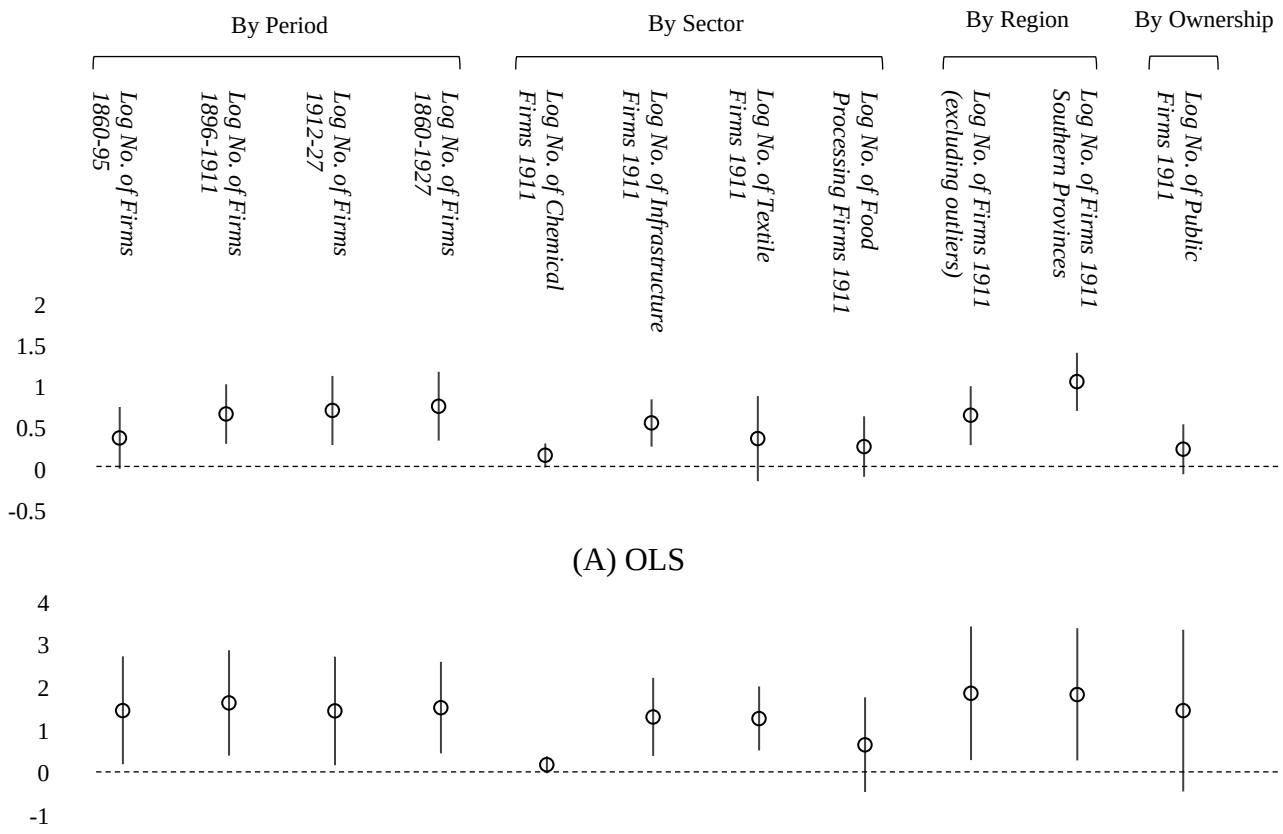
Note: the entries are corresponding coefficients. Robust standard errors clustered by province are in parentheses. *, ** and *** denote statistical significance at 10%, 5%, and 1% level.

As robustness checks, I replace the density of *lijin* stations with the number of *lijin* employees and the estimated annual *lijin* revenue to measure local fiscal capacity. I also change measures of local industrialization based on other materials: Zhang (1992) provided data by 1916; Liu (1937) provided a nationwide cross-sectional image reflecting the cumulative industrial achievements on the eve of Second World War.[2] Regarding the instrument, I change the measure of Taiping warfare in the first-stage regressions. All checks give significant results, affirming the robust impact of local fiscal capacity on industrialization over the decades: several profound political changes occurred at the central level but did not affect the nature of local political economy.

Meanwhile, I generate other dependent variables and subsamples to verify this relationship. The specification stays the same, and figure 5 maps coefficients of local fiscal capacity. Two panels present OLS and IV results, respectively. First, I count the numbers of established firms for different truncated periods such as 1860-95 as dependent variables. The temporal effect of local fiscal capacity is persistent. Second, I investigate whether this effect is heterogenous for various industries. In general, heavy industries are more strongly associated with local fiscal capacity. Third, my narrative may be invalid if the north-south disparity of China alone explains the variation, so I restrict the sample to southern provinces only. I also consider dropping the highly developed cities like Shanghai and Canton. Results are robust for these subsamples. Finally, I narrow the scope down to public firms only and confirm the robust relationship.

[2] The full text provides other placebo tests. First, could other fiscal resources trigger industrialization? I use 1820 per capita land tax burden at the prefectural level to predict industrialization; I also consider other de jure central resources for local expropriation such as salt taxation. None are linked to industrialization. Second, I replace the number of native firms with that of foreign firms and run the tests. The results are insignificant: local fiscal capacity can only explain the rise of Chinese-owned industries.

Figure 5: *Local fiscal capacity and industrialization: Other dependent variables and subsamples*



Note: Circles are coefficients for *Local Fiscal Capacity*, and lines denote 95% confidence intervals.

Mechanisms

Figure 6 provides suggestive evidence on relevant mechanisms. Panel A exhibits the spill-over effect from public to private industrial firms. Introduction of technology was costly, and the official-led firms, sponsored by local *lijin*, took the lead. Then private firms could enjoy external economy of scale through accumulation and dissemination of knowledge and skill. Panel B plots the total number of firms to that of infrastructure firms (telegraph, electricity, water, and transport), indicating the contribution of infrastructure in overall industrialization largely backed-up by local fiscal resource.[3] Panels C to E offer evidence on how *lijin* was invested in modern public goods to facilitate industrialization: local states provided security by investing in defence; they also supported telegraph and railway with local fiscal resource. For most provinces, over 60 percent of *lijin* was spent on local industries, defence, public projects and administrative affairs (Luo, 1936).

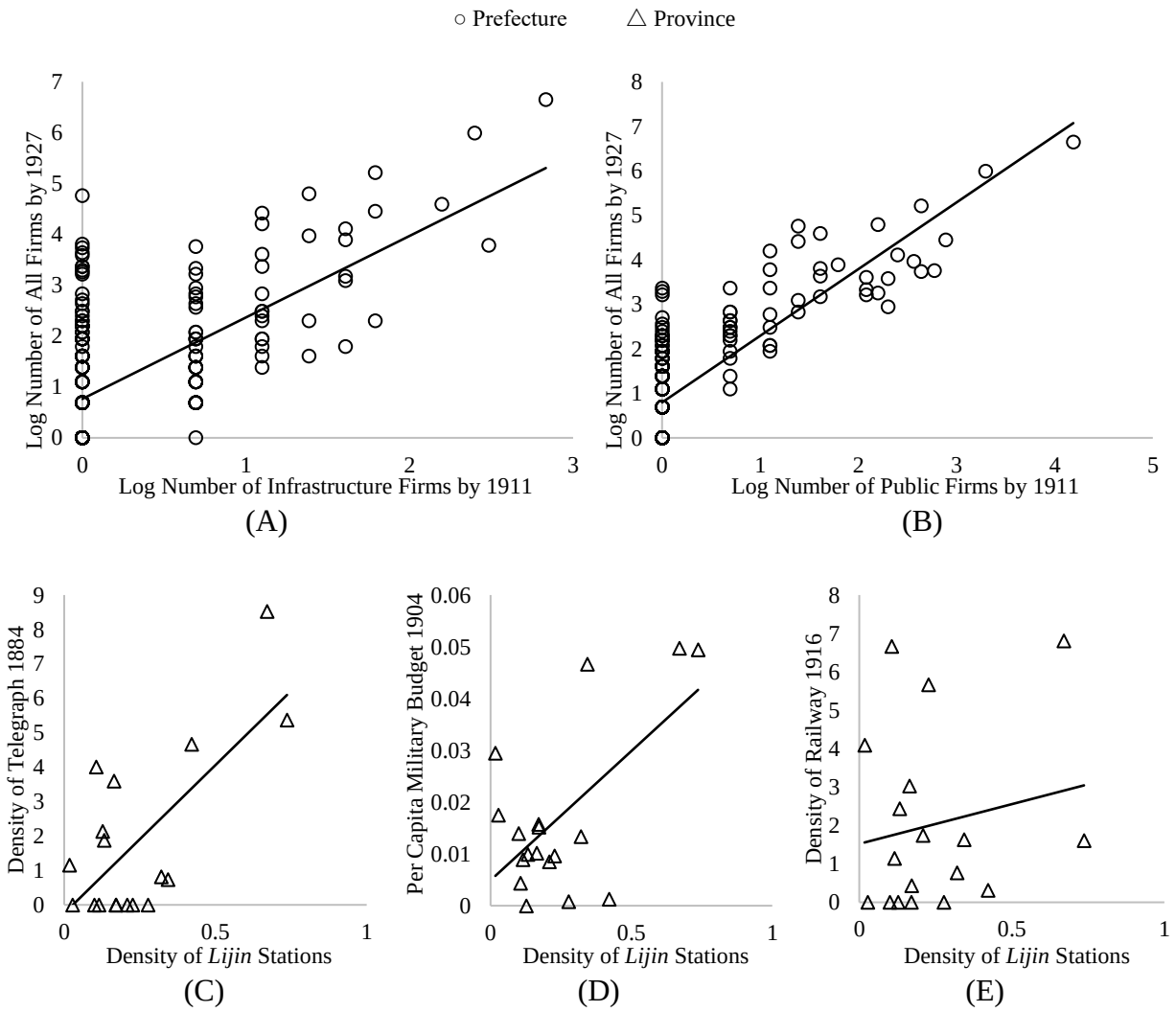
Conclusion

Both the Qing statemen and historians described China's onset of industrialization as a remarkable 'restoration' after the mid-nineteenth-century crisis. However, this article demonstrates the misuse of this term: the fiscal changes in the 1860s were a watershed, and the consequential industrialization fundamentally differed from the pre-1850 Smithian economy. This article provides an institutional explanation for the novel industrialization: with the withering central state, the local states cultivated autonomous fiscal resources, *lijin*, and established modern industries autonomously in the following decades for local encompassing interests. I establish a prefectural-level dataset to examine this link and employ Taiping warfare as an instrument of local fiscal capacity for a causal identification. The conclusion holds in various robustness checks. I visit mechanisms including the spill-over effect from public to private firms, and how *lijin* was invested in local public goods like infrastructure and

[3] The full text provides regressions. It also discusses how official-led financial services mitigated financial constraints of industries.

defence. These findings contribute to a spectacular literature by highlighting the role of fiscal capacity in industrialization.

Figure 6: *Mechanisms: Spill-over effect and public goods*



Source: Full text.

References

Allen, R. C., Bassino, J.-P., Ma, D., Moll-Murata, C., and Van Zanden, J. L., 2011, Wages, Prices, and Living Standards in China, 1738-1925: In Comparison with Europe, Japan, and India, *Economic History Review*, 64: 8-38.

Bardhan, P., 2016, State and Development: The Need for a Reappraisal of the Current Literature, *Journal of Economic Literature*, 54(3): 862-92.

Baten, J., Ma, D., Morgan, S., and Wang, Q., 2010, Evolution of Living Standards and Human Capital in China in Eighteen-Twentieth Centuries: Evidence from Real Wages, Age-Heaping, and Anthropometrics, *Explorations in Economic History*, 47(3): 347-59.

Becker, S. O. and Woessmann, L., 2009, Was Weber Wrong? A Human Capital Theory of Protestant Economic History, *Quarterly Journal of Economics*, 124(2): 531-96.

Brandt, L., Ma D. and Rawski T. G., 2014, From Divergence to Convergence: Re-evaluating the History behind China's Economic Boom, *Journal of Economic Literature*, 52(1): 45-123.

Chen, F., 2015, *Wanqing Caizheng Shuomingshu* (*Compilation of Late Qing Financial Reports*), Hubei People's Press.

Clark, G., 1987, Why Isn't the Whole World Developed? Lessons from the Cotton Mills, *Journal of Economic History*, 47: 141-73.

Du, X., 1991, *Minzu Zubenzhuyi Yu Jiuzhongguo Zhengfu* (*National Capitalism and Old Chinese Government*), Shanghai Social Sciences Academy Press.

Fernihough, A. and O'Rourke, K. H., 2014, Coal and the European Industrial Revolution, *The Institute for International Integration Studies Discussion Paper Series* iiisdp439, IIIS.

Gerschenkron, A., 1962, *Economic Backwardness in Historical Perspective*, Harvard University Press.

Guo, Y., 1989, *Taipingtianguo Lishi Dituji* (*The Atlas of Taiping Rebellion*), China Maps Press.

Harley, C. K., 1992, International Competitiveness of the Antebellum American Cotton Textile industry, *Journal of Economic History*, 52: 559-84.

Johnson, N. D. and Koyama, M., 2017, States and Economic Growth: Capacity and Constraints, *Explorations in Economic History*, 64: 1-20.

Liu, D., 1937, *Zhongguo Gongye Diaocha Baogao* (*Reports on China's Industries*), Research Institute of Economic Statistics.

Luo, Y., 1936, *Zhongguo Lijinshi* (*The History of the Lijin in China*), Commercial Press, 2010.

Miguel, E., and Roland, G., 2011, The Long-Run Impact of Bombing Vietnam, *Journal of Development Economics*, 96(1): 1-15.

Ogilvie, S. and Carus, A.W., 2014, Institutions and Economic Growth in Historical Perspective, *CESifo Working Paper 4861*.

Zhang, Y., 1992, *Jindai Zhongguo Gongye Fazhanshi* (*The History of Modern Chinese Industrial Development*), Taipei Laureate Books.