Chapter 12

Post-Crisis Infrastructure Investment and Economic Growth in China

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To offset the negative shock of the 2008 Global Financial Crisis on its economic growth, the Chinese government decided to adopt a large-scale infrastructure investment plan. The focal points of this study are to assess if this plan is economically efficient and how much financial risk this plan would bring to local governments. We first empirically investigate the optimal ratio of infrastructure to production capital using both a parametric method and a nonparametric method, and find that most provinces have already over-invested in infrastructure before 2008. Then, we try to find the dynamic responses of production capital and output, and evaluate the fiscal risks of local governments who raise debts for this large-scale infrastructure investment.

12.1. Introduction

Though China is said to have been mildly affected by the Global Financial Crisis compared to the US and other developed countries, the crisis has nevertheless caused substantial change to China's economic growth pattern. It is well accepted that China's high growth over the past three decades has largely been export-oriented, with the US and other developed countries being its major export markets. With the deterioration from the crisis, China's export growth reduced sharply. In late 2008, the growth rate changed from a positive figure to a negative one for the first time since 1985. Then, in the following first three quarters of 2009, it remained at minus 15%–25%. The gloomy export shock soon contributed to a deep trough in China's GDP growth trajectory. In the first quarter of 2009, its growth rate was only 6.6%, remarkably below the growth rate of over 10% before the financial crisis.

To offset the negative impact of this crisis, the Chinese government launched an economic stimulus plan, i.e., a two-year investment plan with additional funding totaling 4 trillion RMBs. Over a half of this investment was planned to be directed in infrastructure, including railroad, highway, airport, water conservancy construction, upgrading of urban and rural power grids, etc. In addition, the local governments were suggested to increase their infrastructure investment. According to the National Bureau of Statistics of China, the total investment in infrastructure in 2009 was 6.18 trillion RMBs, while this number rose to about 7.2 trillion RMBs. The two numbers were obviously higher than those in previous years.

This reminds us of the similar strategy adopted in 1998 as a response to the Asian financial crisis, which aimed to improve the domestic demand in China. In the hindsight, the "soft-landing" in 1998 worked generally well, yet whether this strategy could be a panacea this time remains a question. Also given the extraordinary size of funding this time, it seems savvy to take the fiscal risk into account. Currently the two-year stimulus plan has come to an end. Hence, it is perhaps a good time for us to tackle these two questions. We try to analyse these two questions in the following means. First, we will empirically investigate the optimal ratio of infrastructure to production capital at the provincial level in China, which can be used to evaluate if the current large-scale infrastructure investment is economically efficient. Second, we try to estimate the dynamic responses of production capital and output to evaluate local governments' fiscal risks caused by the debts raised for this large-scale infrastructure investment.

This paper is structured as follows. First, we review the literature on the relationship between infrastructure investment and economic growth. Second, we discuss the historical investment and stock of infrastructure in the period 1985–2008 in China; and then, we discuss in detail the infrastructure investment and its source of funding in the years of 2009 and 2010 in China. Third, we examine the impacts of the large-scale infrastructure in 2009 and 2010 on Chinese economic growth, from the viewpoint of both short and long runs. Fourth, we discuss the potential fiscal risks that the large-scale infrastructure in 2009 and 2010 would bring to Chinese local governments. The last section gives conclusions of our study and some policy remarks.

12.2. Literature

Research on the role of infrastructure on growth outside China in this area was originally motivated by the observation that US productivity growth slowed dramatically in 1973 and the ratio of investment in public capital relative to private investment had fallen since the late 1960s. Aschauer (1989a) was the first paper that tried to relate infrastructure investment to US economic growth. Since his study, the importance of infrastructure to economic growth has been widely explored, both for developed countries (e.g., Munnell, 1992; Gramlich, 1994; Prud'homme, 2005; Easterly and Rebelo, 1993; Morrison and Schwartz, 1996; Sanchez-Robles, 1998) and for developing countries (e.g., Straub, 2008; Straub *et al.*, 2008; Boopen, 2006). These studies found a strong positive relationship between infrastructure and economic growth. Some recent papers (e.g., Demurger, 2001; Fan and Zhang, 2004) focus on Chinese economy and provide further confirmation.

Yet a number of papers also provide the opposite findings. For example, Holtz-Eakin and Schwartz (1995) and Garcia-Mila, McGuire and Porter (1996) suggested that there was little evidence of an effect from infrastructure to income growth in a panel of US state-level data. Some researches on developing countries also support this view (e.g., Devarajan *et al.*, 1996).

Some studies argue that a monotonic relationship between infrastructure and growth may not exist. Fernald (1999) argued that if the post-1973 road growth increased to pre-1973 levels, US productivity growth would not be expected to move up to pre-1973 levels; on the contrary, the massive road-building of the 1950s and 1960s only offered a one-time increase in productivity, rather than a continuing path to prosperity. Bougheas *et al.* (2000) provide a theoretical analysis of the role of infrastructure in growth supported with empirical evidence. They found that in an endogenous growth model in which infrastructure accumulation entails a resource cost, the relationship between the long-run growth rate and the rate of infrastructure accumulation was an inverted-U shape. Using the Summers–Heston dataset covering 119 countries over the period of 1960–1989, the evidence supported their theoretical hypothesis.

In order to understand the exact mechanism of infrastructure as public capital on economic growth, some researchers have tried to explore the relationship between infrastructure and production capital. Theoretically, there exist both complementary and substitutionary relationships between these two kinds of capital. On the one hand, a high level of infrastructure can increase the marginal product of production capital, hence generate a crowd-in effect; on the other hand, infrastructure and production capital will compete with each other for limited resource, which generates a crowd-out effect between them. Aschauer (1989b) empirically proved that although both effects do exist, the former always dominates the latter. Hence, an increase of investment in infrastructure will always lead to more investment in production capital, thus increase the total investment. Serven (1996) also found that the crowd-in effect exists in the long run, while the crowd-out effect exists in the short run. And, Erden and Holcombe (2005) found that the two kinds of capital are complementary in developing countries, but are substitutionary in developed countries.

As a further step, some studies evaluate how the structure between infrastructure and production capital affect economic growth. No matter the methodologies they use, an optimal capital structure lies in the fact that the marginal products of these two capitals must be the same. Khan and Kumar (1997) found that production capital exhibit higher return in most developing countries for most of the time they selected. Aschauer (2000) argued that a ratio of infrastructure to production capital between 60%–80% is most suitable for economic growth of the US, and the US was underinvested in infrastructure for the period 1970–1990, obviously, this conclusion is in contrast with that of Fernald (1999).

Many scholars have argued that a misallocation between production and infrastructural capital might exist in China. Keen and Marchand

(1997) argued that the competition for mobile capital would make policymakers invest too much on infrastructure. Wang and Zhang (2008) and Zhang *et al.* (2008) demonstrated, either theoretically or empirically, the promotion incentive and yardstick competition imposed on Chinese local magistrates are the main reason that local governments strive to invest in infrastructure. Chen (2010) similarly argues that under the decentralised fiscal system, the Chinese local governments will have the motivation to overinvest in infrastructure to attract mobile capital such as FDI, which is supported by their empirical study based on the panel data at provincial level. All these literature imply that infrastructure in China may have already deviated from its desirable size before the 2008 Global Financial Crisis. If so, the current large-scale infrastructure investment may not be efficient. In this paper, we would try to determine the optimal structure between infrastructure and production capital at provincial level to show the efficiency of China's current large-scale infrastructure investment.

12.3. China's infrastructure Investment since 1985

Cai and Treisman (2005) define the infrastructure investment as "any costly action governments take to increase the productivity of capital in their units", and hence include physical infrastructure, education, public health and a system of well-enforced property rights and legal protections on the list of infrastructure. Due to the availability of data, we only measure infrastructure as the physical part, which includes four parts: (1) production and supply of electricity, gas and water; (2) transport, storage and post; (3) information, transmission, computer service and software; (4) management of water conservancy, environment, and public facilities.

Figure 12.1 shows the rapid increase of infrastructure investment in China from a small base in 1985 to a large volume today. On average, the annual growth rate of infrastructure investment has been over 16.5% in the period 1985–2009. Historically high growth of infrastructure investment happens in 1993, 1998 and 2009, with growth rate of 37%, 38% and 44%, respectively. The first investment boom in 1993 is accompanied with a high inflation rate and an immediate "hard landing" in 1994. The second one in 1998 is guided by the government

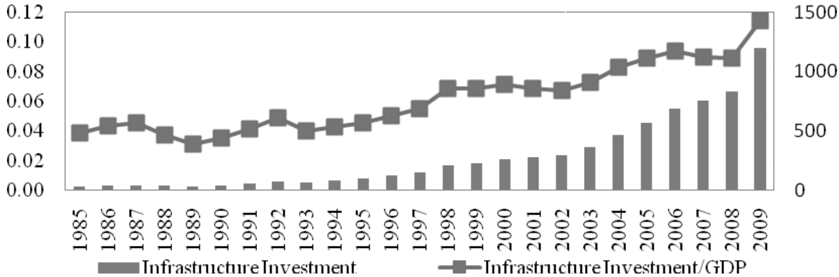

Figure 12.1. Infrastructure investment and its share in GDP (billion of RMB, 1984).
Source: National Statistics Yearbook and the authors' calculation.

to offset the negative shocks from the East Asian financial crisis, and is generally believed to work well. In this study, we are interested in examining the effects of the third boom in 2009. It should be notified that in the period 2003–2006, infrastructure investment has been growing very fast, with an annual growth rate above 20%. As the growth rate of infrastructure investment exceeds the one of GDP in the same periods, the share of infrastructure investment in GDP has increased from about 4% in 1985 to about 11% in 2009.

As the National Bureau of Statistics in China only reports the data of investment, we adopt the perpetual inventory method to estimate the stock of infrastructure in China using its investment data. That is,

$$K_{1t} = (1 - \delta_1)K_{1,t-1} + I_{1t} \quad (12.1)$$

where K_{1t} denotes the capital stock of infrastructure at time t and I_{1t} the investment in infrastructure at time t. When estimating the stock of infrastructure in China, we follow Krusell *et al.* (2000) to set δ_1 to be 5%.

The biases of estimated capital stock using the perpetual inventory method could be large in the beginning, but depreciate quickly as time passes by. We collect the data from the year of 1985, and report our estimated stock of infrastructure from the year of 1995. Figure 12.2 shows our estimated stock of infrastructure since 1995: 0.5 trillion of RMB (constant price in 1984) in 1995 and 5 trillion RMB in 2009, with an average of annual growth rate of 18.7%.

Table 12.1 shows us the physical stock of infrastructure in China since 1980. We can see that during the period 1980–2010, highway has been mostly developed. The total length of highway in China in

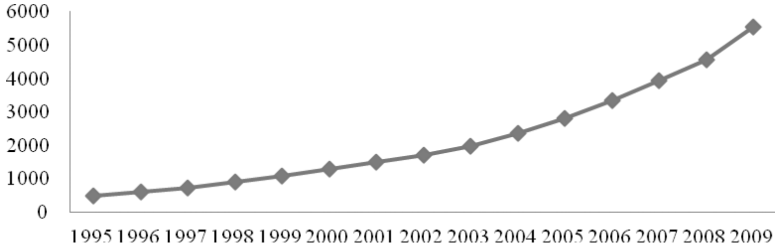

Figure 12.2. Infrastructure capital (billion of RMB, 1984).
Source: National Statistics Yearbook and the authors' calculation.

Table 12.1. Physical stock of infrastructure in China since 1980.

Year	Railroad (10^3 km)	River transportation (10^6 km)	Highway (10^6 km)	Water supply capacity $\left(10^6 \frac{m^3}{day}\right)$	Gas supply capacity $\left(10^6 \frac{m^3}{day}\right)$
1980	53.3	1.08	0.89	29.8	3.7
1985	55.2	1.09	0.94	40.2	5.4
1990	57.9	1.09	1.03	142.2	9.4
1995	62.4	1.11	1.16	192.5	23.6
2000	68.7	1.19	1.40	218.4	26.5
2005	75.4	1.23	3.35	247.2	94.2
2010	91.2	1.24	4.01	270.5	111.0

Source: National Statistics Yearbook, 2010. The 2010 data for water and gas supply are not available. So we report their 2009 data.

2010 is 4.5 times of the one in 1980. Large-scale funding has also been invested in railroad since 1995. The total length of highway has increased 21% in the past 5 years. In the same period, the capacities of water and gas supply have been greatly expanded by 8 times and 29 times, respectively. These high growth rates of infrastructure stock in China are not surprising as they are backed by heavy investment we have discussed before.

12.4. China's Post-Crisis Infrastructure Investment and Its Sources of Funding

When the global financial crisis originated from the US made the global economic growth pessimistic and had an obvious negative shock on Chinese economy in 2008, the Chinese government decides to sustain its stable economic growth via large-scale investment in infrastructure according to the Keynesian theory. In November 2008, the Chinese central government announced a two-year additional investment plan of 4 trillion RMBs, among which the central government would invest directly 1.18 trillion RMBs. According to this plan, 2.1 trillion RMBs would be invested in infrastructure, including railroad, highway, airport, water conservancy construction and upgrading of urban and rural power grids. Under the guidance of the central government, all the local governments increase their infrastructure investment again as they did after the East Asian financial crisis in 1998. According to the National Bureau of Statistics of China, the total investment in infrastructure in 2009 was 6.18 trillion RMBs, while this number rose to about 7.2 trillion RMBs in 2010. These two numbers were obviously higher than those in previous years.

Table 12.2 shows the division of infrastructure investment into four categories. In 2009, the investment in the four categories increases by 31.3%, 46.8%, 19.9% and 46.9%, respectively. In 2010, although we do not have the data for rural area, we can see that the infrastructure investment in urban area has already exceeded the total one in 2009.

Although the Chinese government started to allow private capital to be directly invested in infrastructure, the amount of private

Table 12.2. China's infrastructure investment during 2006–2010 (billion of RMBs, current price).

Year	Category I	Category II	Category III	Category IV	Total	% of total fixed asset investment
2006	859	1214	188	815	3075	28.0
2007	947	1415	185	1015	3562	25.9
2008	1100	1702	216	1353	4372	25.3
2009	1444	2498	259	1987	6187	27.6
2010	1454	2782	239	2226	6701	27.8

Source: National Statistics Yearbook, 2010. The 2010 data do not include the rural area. Category I includes production and supply of electricity, gas and water; Category II includes transport, storage and post; Category III includes information, transmission, computer service and software; Category IV includes management of water conservancy, environment, and public facilities.

Table 12.3. Sources of funds for infrastructure investment (billion of RMBs, current price).

Year	State budget	Domestic loan	Foreign funds	Self-raised funds	Others	All
2008	474	1133	43	2104	309	4064
2009	717	1654	41	2823	470	5705

Source: National Statistics Yearbook, 2009 and 2010.

investment in infrastructure is still very limited. The primary investors of infrastructure investment are still the central and local governments. Sources of funds for infrastructure investment include funds from the State budget, domestic loans, self-raised funds and others. According to Table 12.3, funds from the State budget account for 11.67% and 12.56% of the total infrastructure investment in 2008 and 2009. By carefully excluding the funds from extra-budgetary funds of both central and local government, Huang *et al.* (2011) estimate that around 65% of funds invested in infrastructure in 2008 and 2009 were raised via debts by local governments' financing platforms, such as Urban Construction & Investment Corporations, and via other channels. These invisible debts would be paid back finally using local governments' fiscal revenue in the future.

Self-raised funds, the biggest source of funds for infrastructure investment, are mainly composed of two parts. One is governments' extra-budget revenue, including the revenue from assigning the use of State-owned land. And the other one is local governments' invisible debts, which include (1) the bank loans as equity funds for the construction projects; (2) the bonds that the central government issue for local governments; (3) equity investment through trust; (4) the medium-term bill that "investing or financing platform" companies issue to banks; (5) banks' bridge loans or (6) the enterprise bond that "investing or financing platform" companies publically issue with local governments' fiscal guarantee.

There is no doubt that in the short run, as most of the large-scale infrastructure investment is financed via governments' debts, local governments' debt service ratios would increase. According to the estimation of Huang *et al.* (2011), if around 65% of funds invested in infrastructure came from visible and invisible government debts in 2009 and 2010, China's governments have raised additional debts of around 8.5 trillion RMBs for infrastructure investment. According to the data provided by Liu *et al.* (2010), by the end of 2009, the loans (not including bills) that China's financial sector had issued to local financial platforms was 7.9 trillion RMBs, among which 3.7 trillion RMBs was newly issued in 2009. They predict that the invisible debts of local governments would achieve its peak in 2011. They also predict that the repayment of principal and interests will account for more than 20% of local governments' revenue in 2012, and this debt service ratio would continue for the following several years.

12.5. Short-Run Effects of Post-Crisis Infrastructure Investment

As mentioned earlier, most of the investment in infrastructure in China is undertaken by central and local governments. And around 65% of governments' infrastructure investment is financed via debt. One main concern in this study is to investigate the effect of the extra infrastructure investment on Chinese economic growth and hence the growth potential of Chinese local government's fiscal revenue. In this section, we analyse the short-run effects on economic growth of post-crisis infrastructure investment in China. And we check long-run effects on economic growth of post-crisis infrastructure investment in the next section.

To make our analysis as simple as possible, we follow Huang *et al.* (2011) to assume the extra infrastructure investments in 2009 and 2010 are 0.97 trillion RMB and 1.13 trillion RMB, respectively. They simply divide the total extra 2.1 trillion RMB investment infrastructure investment into these two numbers according to the ratio of total infrastructure investment in 2009 and 2010. As we have seen, the total infrastructure investments in 2009 and 2010 are 6.2 trillion RMB and 7.2 trillion RMB, respectively.

First, we check how much the extra infrastructure investment in 2009, as a demand itself, has stimulated GDP growth in that year. If we assume that the investment multiplier is 1.5, the extra 0.97 trillion RMB lead to an extra GDP of 1.43 trillion RMB in that year. Given that the GDP growth rate is 9.2% and the increase in GDP is 2.89 trillion in 2009, we can estimate that the extra infrastructure investment contributes 4.5 percent of GDP growth in 2009, which is almost half of GDP growth in that year.

Second, given that the GDP growth rate is 10.3% and the increase in GDP is 3.72 trillion in 2010, we can estimate that the extra infrastructure investment in 2010 contributes 4.7% of GDP growth in 2010, which is 46% of GDP growth in that year.

As we know, net export is an important growth engine of Chinese economy. The negative shocks of global financial crisis on Chinese economy are mainly reflected in the decline of its net export. In 2009, the net export of China is 196 billion US dollar, reduced by 34.2% compared with its net export in 2008; in 2010, the net export of China further is reduced to 183 billion US dollars. In 2006 and 2007, the growth of net export contributes 2% and 2.5% of GDP growth in China, respectively. In 2008, this number reduces to 0.8%. And in 2009 and 2010, this number turns out to be negative: −3.7% and −0.23%, respectively. Thus, we can see that additional large-scale investment when facing big negative external shocks is a necessary policy to keep a stable growth of economy.

12.6. Long-Run Effects of Post-Crisis Infrastructure Investment

In the last section, we have examined the short-run effects of additional infrastructure investment, as a demand itself, on Chinese economic growth. However, another important property of infrastructure investment is that it builds up the stock of infrastructure and can help generate more output in the future. In this section, we examine the long-run effects of additional infrastructure investment on Chinese economic growth.

12.6.1. *Definition of investment efficiency*

Following Huang *et al.* (2011), we measure investment efficiency by the relative marginal products of infrastructure and production capital. If we denote output as y, infrastructure as k_1, and production capital as k_2, an investment efficiency index can be defined as

$$E = \frac{\frac{\partial y}{\partial k_2}}{\frac{\partial y}{\partial k_1}} \tag{12.2}$$

where low-case letter denotes the variable is measured by per capita.

Allocation between infrastructure and production capital is perfectly efficient only when the marginal product of infrastructure is equal to the one of production capital. The larger the difference between the two marginal products, the more misallocation between infrastructure and production capital, and the less efficiency of investment.

12.6.2. *Ratio of infrastructure to production capital*

Following Huang *et al.* (2011), investment in production capital here is calculated as the total investment minus the investment in infrastructure and residential investment. We aim to accurately estimate capital stock over the period 1995–2009. It is very important to note, as Huang *et al.* (2011) has pointed out, that the prices of goods invested in production capital increase much slower than the prices of goods invested in infrastructure in China since 1985, which is neglected in the literature. Following Greenwood *et al.* (1997) and Krusell *et al.* (2000), we can interpret this relative price decline as reflecting technological change specific to producing production capital. Therefore, we calculate the stock of production capital using the following equation:

$$K_{2t} = (1 - \delta_2)K_{2,t-1} + \frac{I_{2t}}{P_{2t}} \tag{12.3}$$

where K_{2t} denotes the stock of production capital, I_{2t} the investment in production capital and P_{2t} is the relative price of production capital to infrastructure capital. The depreciation rate for production capital, δ_2, is set to 10%.

We exclude Sichuan, Chongqing, Hainan and Xizang from our sample due to lacking data, and divide all the remaining 27 provinces in our sample into three groups by their GDP per capita, i.e., the economic development level. Figure 12.3 shows us the ratio of the

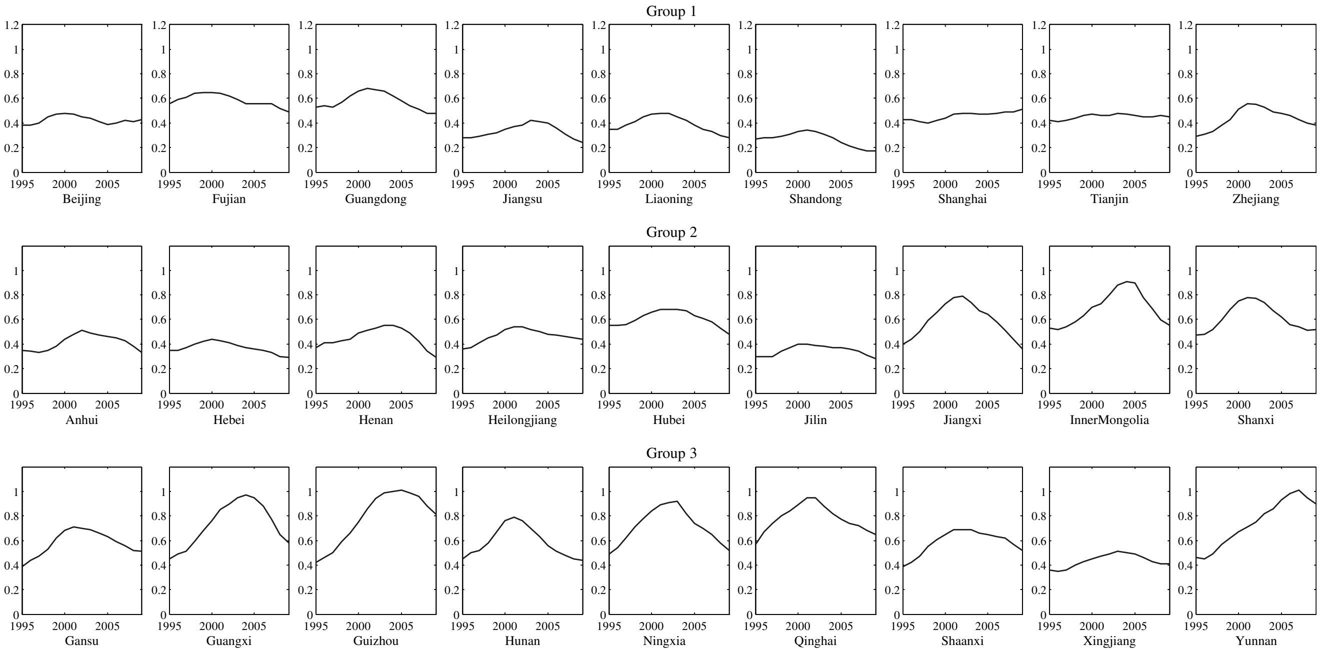

Figure 12.3. Ratios of infrastructure to production capital.

Source: Fig. 2 in Huang *et al.* (2011).

stock of infrastructure to the one of production capital at provincial level during 1995–2009. It is interesting to find that this ratio is obviously higher for those provinces in the least developed group than those in the most developed group.

12.6.3. *Investment efficiency in China*

We examine China's investment efficiency at provincial level using a nonparametric method here. In this method, we first assume that output per capita is determined by production capital per capita and infrastructure per capita. Then we estimate this output function using a special nonparametric method called the local linear regression method. As pointed out by Huang *et al.* (2011), this method is the most suitable one for our study since it estimates the output function as well as its partial derivatives, which can be used to measure the marginal products of infrastructure and production capital. Compared with the parametric method that that can only deliver us a fixed optimal ratio between infrastructure and production capital across regions and over time, the nonparametric method allows us to measure the investment efficiency dynamically by directly measuring the marginal products of infrastructure and production capital using the panel data.

Figure 12.4 shows us the investment efficiency in China. A line above 1 means the marginal product of production capital is greater than the one of infrastructure. In other words, it means that infrastructure is overinvested. We can see that in our most developed group, Beijing, Shanghai and Tianjin are close to the efficient line with slightly more investment in infrastructure; Jiangsu and Shangdong are obviously short of infrastructure; while Guangdong and Fujian are overinvested in infrastructure; Zhejiang is initially short of infrastructure while Liaoning is initially overinvested in infrastructure. It is very interesting to find that for most of the provinces in the least developed group (except Xingjiang), infrastructure is overinvested.

12.6.4. *Impulse responses of post-crisis infrastructure investment*

Other than the short-run effects of additional infrastructure investment on GDP growth, it is also important to study the long-run effects

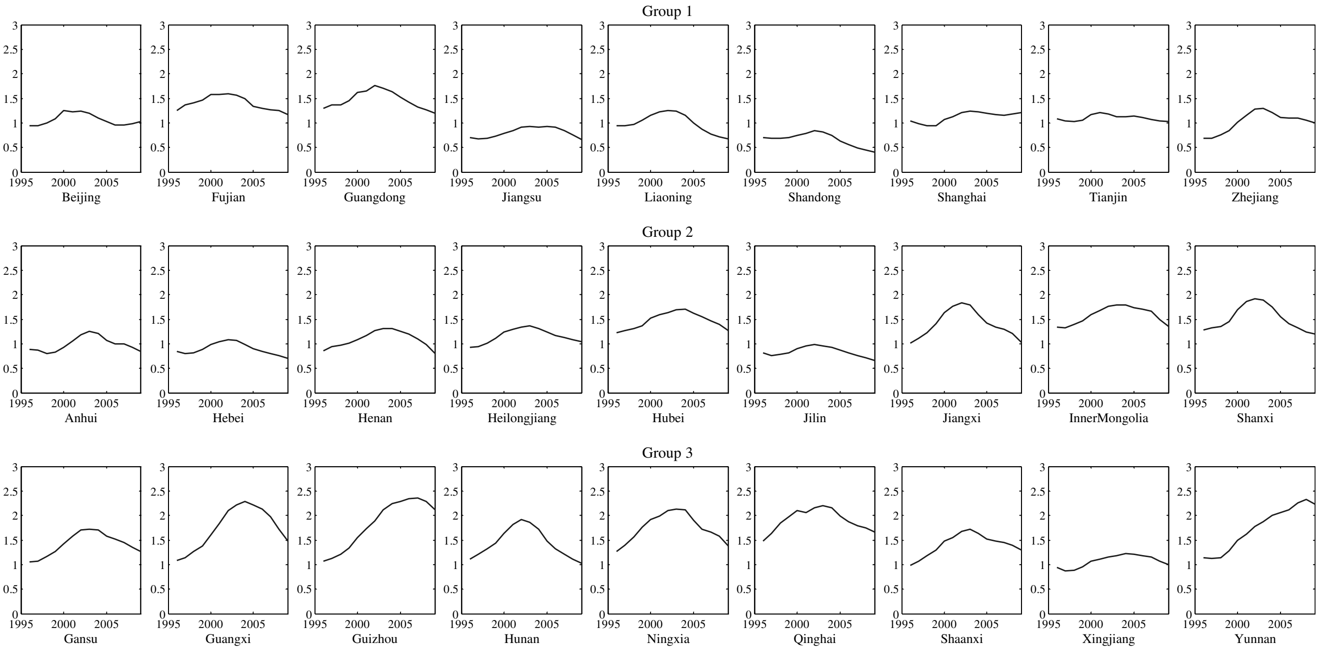

Figure 12.4. Investment efficiency in China.

Source: Fig. 3 in Huang *et al.* (2011).

of additional infrastructure investment on GDP growth as additional infrastructure investment now builds up more stock of infrastructure in the future, which is an input to generate output. Generally, we can examine the long-run effects of additional infrastructure investment on GDP using the following equation:

$$\frac{dy}{dk_1} = \frac{\partial y}{\partial k_1} + \frac{\partial y}{\partial k_2}\frac{\partial k_2}{\partial k_1}. \tag{12.4}$$

That is, the effects of additional infrastructure investment on GDP can be decomposed into two parts. One is the direct effect of additional infrastructure investment on GDP, $\frac{\partial y}{\partial k_1}$. And the other one is the indirect effect that works through its effect on production capital investment, $\frac{\partial y}{\partial k_2} \times \frac{\partial k_2}{\partial k_1}$.

In the beginning of 2010, the real infrastructure stock is 5.55 trillion RMB, which is measured by the 1984 price. However, without the extra infrastructure investment in 2009, the real infrastructure stock would be 5.36 trillion RMB. We assume the extra infrastructure investment in 2009 is a one-time shock and does not affect the investment decision of infrastructure in the future. This assumption, together with the Eq. (12.1), governs the impulse responses of K_{1t} to the extra infrastructure investment in 2009.

Huang *et al.* (2011) believe that the investment decision of production capital can be affected by three factors: (1) the growth rate of GDP per capita, which also reflects technological growth partially; (2) the ratio of infrastructure to production capital in the previous year; (3) tax rate. Basically, the first two factors positively affect the investment of production capital, while the last factor has a negative effect on it. So, they use a linear regression model to empirically estimate how the investment and stock of production capital are affected by an increase of infrastructure investment.

With the impulse responses of K_{1t} and K_{2t} estimated in the above, one can examine the impulse responses of output y_t. Figure 12.5 shows us the impulse response that we estimate for the extra infrastructure investment in 2009. Here, to make our analysis simple, we only focus on the case of 2009. One can similarly estimate the impulse response for the extra infrastructure investment in 2010, and combine them with

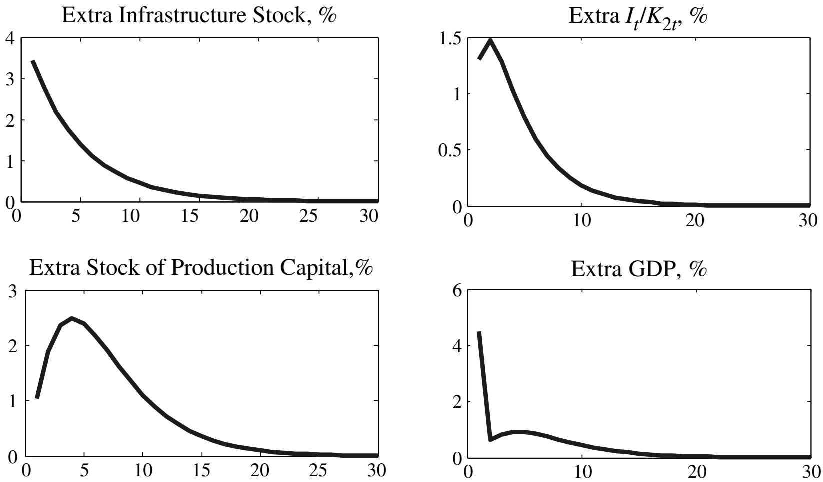

Figure 12.5. Impulse response to the extra infrastructure investment in 2009.
Source: Fig. 4 in Huang *et al.* (2011).

those for 2009. Of course, this will add up much complexity of our analysis.

12.7. Fiscal Risks of the Post-Crisis Infrastructure Investment in China

To evaluate the fiscal risks of the post-crisis infrastructure investment in China, we again focus on the year of 2009 and ignore the year 2010 for simplicity. And we assume the tax rate that local governments can collect in the future is 0.18, the average rate in 2009.

Following Huang *et al.* (2011), we discount and sum up all the extra fiscal revenue in the next 30 years, and compare this value to the extra infrastructure investment in 2009. Figure 12.6 shows us the percent of extra debt that could be paid back using the extra fiscal revenues in the future: only 50% of the new debt would be paid back within 5 years, and only 75% within 10 years. Thirty years later, there will be still 12% left unpaid using extra fiscal revenue. In other words, if the local governments need to pay back the debt, they need additional funds, either from extra-budget revenue (mostly land revenue) or from new debts.

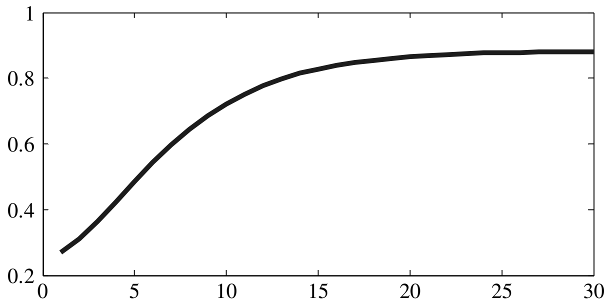

Figure 12.6. Ratio of debt paid back by extra fiscal revenue.
Source: Fig. 4 in Huang *et al.* (2011).

In our evaluation of fiscal risks, we make the assumption that all the current extra infrastructure investment in 2009 is raised via debts just for analytical simplicity. We have to admit that we ignore two facts by making this strong assumption. First, self-raised funds, the biggest source for infrastructure investment, include local governments' revenue by assigning the use of State-owned land. If a large part of the extra infrastructure investment in 2009, say 50%, comes from the local governments' revenue by assigning the use of State-owned land, the fiscal risks of local governments can be significantly reduced. They can pay back their debts within 5 years using their extra fiscal revenue. Second, if local governments can pay back a large part of their debts using their extra revenue from assigning the use of State-owned land, the fiscal risks of local governments can also be significantly reduced.

In terms of the data provided by Shaoshi Xu, the minister of Ministry of Land and Resource, governments' revenue by assigning the use of State-owned land are respectively 1.59 trillion RMB in 2009 and 2.7 trillion RMB in 2010. As no official data are available regarding how this revenue is used, we assume that around 50% of this revenue is used for infrastructure investment (This ratio in Beijing, announced by Beijing Fiscal Bureau, was 64.6% in 2009). If so, only around 20% of the total infrastructure investments in 2009 and 2010 come from local governments' revenue by assigning the use of State-owned land.

Although the revenue from assignment of the right to the use of state-owned land has increased very quickly during the last few years, we believe this trend will slow down or even go negative in the following years since the central government has already intensified the control on the real estate market in 2011 and is planning to impose more restrictions on how to use such kind of revenue. As a result, the ability that local governments pay back their debts using their extra revenue from assigning the use of state-owned land will be limited in the future.

In summary, although local governments' revenue from assigning the use of state-owned land could help to reduce their fiscal risks, we must not be too optimistic about its ability of reducing the extra fiscal risks that local governments would face.

12.8. Conclusions and Discussions

The extra large-scale infrastructure investment successfully helps China offset the negative shocks from the 2008 global financial crisis in the short run. We estimate that it contributes to 4.5% of China's GDP growth in 2009. However, this policy is not economically efficient as China had already been overinvested in infrastructure before 2008. Moreover, the fiscal risks that this extra large-scale infrastructure investment policy brings to local government are very obvious. Even after considering local governments' revenue from assigning the use of state-owned land, we still need to be cautious about the extra fiscal risks that the current extra infrastructure investment has brought.

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