# SPILLOVER EFFECT OF INFRASTRUCTURE AND REGIONAL GAP IN CHINA

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**Abstract**
Infrastructure provision in backward areas has been proposed by many studies as a cure for widening income gaps in developing countries like China. However, little has been said regarding infrastructure's role as an unpaid production factor or the issue of optimal resource allocation. This paper examines the efficiency side of infrastructure provision in different Chinese provinces and its spillover effect on the non-infrastructure sector with an adapted dual-sector model. Our findings suggest that while the spillover effect on non-infrastructure sector is considerable across different Chinese regions, non-optimality of resource allocation still exists in regional attempts of developing public facilities.
Keyword: Dual-sector model, Infrastructure, Regional gap, Spillover effect
JEL**:** O11, O18

## 1. Introduction

In the two decades of market-oriented reforms, China has been one of the world's fastest-growing economies with per capita incomes more than quadrupling since 1978. However, China's transition to a market-based economy has created new problems, among which is the growing inequality in per capita income between coastal and interior provinces. Achieving balanced growth so as to reduce those disparities appears to be one of the major policy challenges that China is now facing in order to maintain both its current GDP growth rate and social stability.

From this perspective, enhancing the growth potential of inland provinces is necessary either directly, through appropriate economic policies, or indirectly, by facilitating growth spillovers from rapidly developing coastal regions to backward interior provinces (Chen & Fleisher, 1996; Mody & Wang, 1997; Rasier, 1998). Demurger et al. (2002) found that the respective contributions of geographical and policy factors are much larger in coastal provinces than that in central and western provinces. Demurger (2000, 2001) assesses the relationship between infrastructure development and economic growth in China following the framework of endogenous growth theory and indicates that differences in geographical location, transport infrastructure, and telecommunication facilities do account for a significant part of the observed variation in the growth performances of provinces. Fleisher and Chen (1997) use the variables of investment in human capital, transportation infrastructure, and foreign direct investment to represent infrastructure establishment. They show that rate of return to infrastructure investment tend to be lower on average in the interior than in coastal provinces, whereas the return to investment in human capital is about 20% higher in the non-coastal than in the coastal provinces.

Many research concerns have been oriented to address the possible factors that

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determine the characteristics of the interaction between infrastructure investment and aggregate production growth. Easterly and Rebelo (1993) find that infrastructure raises growth by increasing the social returns to private investment, not by promoting private investment itself. Esfahani and Schankerman (1993), develops a circular model to emphasize that infrastructure investment generates immense social benefits which depend on the initial level of market development, the number of incumbent firms, the degree of market competition, and restructuring and entry costs, as good-quality infrastructure can intensify product market competition hence generate positive welfare effect.

There has been increasing numbers of studies and debates concerning the relationship between infrastructure provision and economic growth. However, besides many virtues such as infrastructure's enhancing social returns to private investments or bringing about intensification of market competition, the tremendous benefit trickling down from infrastructure to other industrial activities has not yet received due consideration. Moreover, studies with respect to the importance of infrastructure in China, where regional development disparities have become more conspicuous, haven't provided a very detailed and persuasive picture regarding this linkage.

Our study on infrastructure construction in modern China attempts to push further the discussion of infrastructure construction in the context of developing China. The major contribution of our analysis lies in the stylized discussion on the externality of infrastructure construction as well as the possible non-optimal in resource allocation involved in the process of infrastructure development where mass volume of capital and labor is employed. A dual-sector framework is constructed which views the entire economy as consisted of two integral sectors, one producing infrastructure products and the other modeling the rest of the economy using infrastructure products as intermediate inputs. The rest of the paper goes as follows: section 2 establishes the dual-sector theoretical model, section 3 reports the empirical evidence and its interpretation, and section 4 concludes with policy recommendations.

## 2. The dual sector model

In the dual-sector model, we assume that the economy can be divided into two integral sectors: one produces infrastructure goods using capital and labor as input factors and the other represents the productions in the rest of the economy. Its output is also dependent on the volume infrastructure sector has produced. This effect is referred to as externality, since they are not reflected in market price. Upon this assumption, the dual-sector model can be formulated as:

$$N = F(K_{\mathrm{n}}, L_{\mathrm{n}}, P) \tag{1}$$

$$P = G(K_{\mathrm{p}}, L_{\mathrm{p}}) \tag{2}$$

where N represents the non-infrastructure sector, P represents the infrastructure sector, $K_n$ and $K_p$ denote the capital stock in non-infrastructure sector and infrastructure sector respectively, $L_n$ and $L_p$ also denote labor forces in respective sectors.

Following the design of Feder[11], we suppose the ratio of respective marginal factor productivities in the two sectors deviates from unit by a factor of δ, i.e.

$$(G_k / F_k) = (G_L / F_L) = 1 + \delta \tag{3}$$

where the subscripts denote partial derivatives. In the absence of externalities, and for a given set of prices, a situation where $\delta = 0$ would reflect an allocation of resources which maximizes aggregate output. Reason for deviations between sectoral marginal factor productivities could be degrees of competition each sector faces, regulations and constraints such as credit and rationing, or different status of uncertainty involved in respective sectors.

Differentiating equations (1) and (2) to yields

$$\Delta N = F_{\mathrm{k}} I_{\mathrm{n}} + F_{\mathrm{L}} \Delta L_{\mathrm{n}} + F_{\mathrm{p}} \Delta P \tag{4}$$

$$\Delta P = G_{\mathrm{K}} I_{\mathrm{P}} + G_{\mathrm{L}} \Delta L_{\mathrm{P}} \tag{5}$$

Where $I_n$ and $I_p$ are respective sectoral gross investments, $\Delta L_{\mathrm{n}}$ and $\Delta L_{\mathrm{P}}$ are sectoral changes in labor forces, and $F_p$ describes the marginal externality effect of infrastructure on the output of non-infrastructure sector. Denoting Gross Domestic Product by Y, and since by definition Y = N + P, it follows

$$\Delta Y = \Delta N + \Delta P \tag{6}$$

Substituting (4) and (5) into (6), we obtain

$$\Delta Y = F_k I_n + F_L \Delta L_n + F_P \Delta P + G_k I_P + G_L \Delta L_P \tag{7}$$

From (3) we know that

$$G_k = (1+\delta) F_k \qquad G_L = (1+\delta) F_L \tag{8), (9}$$

Substituting (8) and (9) into (7) yields

$$\Delta Y = F_k (I_n + I_P) + F_L (\Delta L_n + \Delta L_P) + F_P \Delta P + \delta (F_k I_P + F_L \Delta L_P) \tag{10}$$

From equation (3) and (5), we can get

$$F_k I_P + F_L \Delta L_P = \frac{1}{1+\delta} \Delta P \tag{11}$$

Defining total investment as I = $I_n$ + $I_P$ and total growth of labor as $\Delta L = \Delta L_n + \Delta L_P$ and substituting equations (11) into (10), we can get

$$\Delta Y = F_k I + F_L \Delta L + \left(\frac{\delta}{1+\delta} + F_P\right) \Delta P \tag{12}$$

Suppose that a linear relationship exists between the real marginal productivity of labor in a given sector and average output per laborer in the economy[12], say

$$F_L = \beta (Y/L) \tag{13}$$

Dividing equation (12) through by Y and after some manipulation it yields

$$\frac{\Delta Y}{Y} = F_k \left(\frac{I}{Y}\right) + \beta \left(\frac{\Delta L}{L}\right) + \left(\frac{\delta}{1+\delta} + F_P\right) \frac{\Delta P}{P} \cdot \frac{P}{Y} \tag{14}$$

This formulation is different from the traditional neo-classical sources-of-growth model in that it has taken the differential of marginal productivities across sectors and inter-sectoral externalities into consideration. The parameter $F_k$ in equation (14) is the marginal productivity of capital in the non-infrastructure sector, $\beta$ is the marginal productivity of labor，$((\delta/(1+\delta)+F_p)$ is the effect of redistribution of productive factors between sectors on the growth of GDP. We define $TL_P$ and $TK_P$ as the social marginal productivity of labor and investment in infrastructure, whose respective expressions are:

$$TL_P = G_L + F_P \times G_L \qquad (15)$$

$$TK_P = G_K + F_P \times G_K \qquad (16)$$

Now we can set out to decompose the factor productivity differential into its components. Suppose that infrastructure affect the production of non-infrastructure sector with constant elasticity, that is,

$$N = F(K_n, L_n, P) = P^{\theta}\Psi(K_n, L_n) \qquad (17)$$

Here, $\theta$ represents the impact of infrastructure sector on the production of non-infrastructure sector. Taking the partial derivative of N with respect to P yields

$$\frac{\partial N}{\partial P} \equiv F_P = \theta \frac{N}{P} \qquad (18)$$

Substituting (18) into (14) renders

$$\frac{\Delta Y}{Y} = F_k(\frac{I}{Y}) + \beta(\frac{\Delta L}{L}) + (\frac{\delta}{1+\delta} + \theta\frac{N}{P})\frac{\Delta P}{P}\cdot\frac{P}{Y} \qquad (19)$$

Note that

$$\theta\frac{N}{P} = \theta\frac{N/Y}{P/Y} = \theta\frac{[1-(P/Y)]}{P/Y} = \frac{\theta}{P/Y} - \theta \qquad (20)$$

After substituting (20) into (19) we obtain

$$\frac{\Delta Y}{Y} = F_k(\frac{I}{Y}) + \beta(\frac{\Delta L}{L}) + (\frac{\delta}{1+\delta} - \theta)\frac{\Delta P}{P}\cdot\frac{P}{Y} + \theta\frac{\Delta P}{P} \qquad (21)$$

According to our assumption, the addition of inter-sector externality parameter $\theta$ will increase the explanatory power of the model. Using information yielded by the estimation of the model, values of $\delta$, $F_p$, and $TK_p$ can be calculated.

## 3. Empirical analysis

We divide 26 Chinese provinces (3 municipalities and the Tibetan autonomous prefecture are excluded from the sample) into three sub-groups either in terms of their similar economic performance on average or their geographical proximity. Provinces that have been enjoying the fastest economic booming coincide with those located alongside the Chinese coastal line[3]. Remote provinces are located in the faraway west and northwestern areas[4]. Remote provinces are the traditionally lagging-behind areas and are also the target of the balanced economic development strategy sponsored by the central

[3] In this paper, the nine provinces of Hebei, Liaoning, Jiangsu, Zhejiang, Fujian, Shangdong, Guangdong, Hainan and Guangxi is defined as Costal Provinces.
[4] The Remote Provinces include Sichuan, Guizhou, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang and Inner Mongolia.

government. The remaining provinces are encompassed in the middle by the coastal and remote areas and therefore are referred to as "central" provinces [5]. Infrastructure construction as well as its spillover effect in the coastal and remote areas is of particular interest for comparison.

Table 1 presents the evolution of the variables during the period 1991-2004. An online Annex includes detailed data for each year. Graph 1 shows the percentage of Employment increase of each region in comparison with the average increase of 22% for all the regions. We may notice a positive evolution of this variable in all the regions, with the top percentage values in Habei, Guangdong, Shandong, Gansu, Guizhou and Fujian.

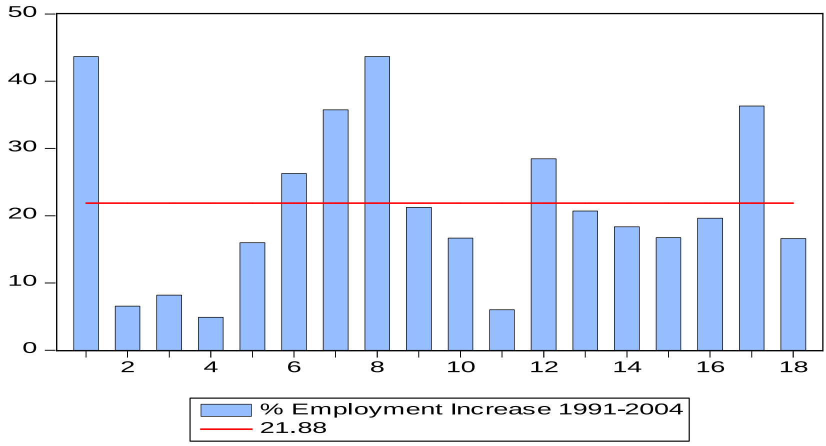
Table 1. Employees, GDP, Infraestructure Output and Investment in Fixed Assets

| Region | Employees 1991 | GDP 1991 | Infrastructure output 1991 | fixed assets 1991 | Employees 2004 | GDP 2004 | Infrastructure 2004 | fixed Assets 2004 |
|---|---|---|---|---|---|---|---|---|
| Hebei | 32592 | 1893.3 | 138.5 | 478.2 | 46819 | 16039.5 | 1351.6 | 6025.53 |
| Inner Mon. | 9629 | 359.7 | 26.8 | 100.7 | 10261 | 2712.1 | 243 | 1808.9 |
| Liaoning2 | 19383 | 1200.1 | 96.2 | 318 | 20973 | 6872.7 | 613 | 3000.1 |
| Jiangsu | 42730 | 1601.4 | 80.3 | 440 | 44825 | 15512.4 | 973.8 | 6827.6 |
| Zhejiang | 25794 | 1081.8 | 60 | 239.8 | 29920 | 11243 | 835 | 6059.8 |
| Fujian | 14365 | 619.9 | 55.1 | 145.62 | 18140 | 6053.1 | 601.4 | 1899.1 |
| Shandong | 42193 | 1810.54 | 98.97 | 439.8 | 57281 | 15490.73 | 990.65 | 7629 |
| Guangdong | 32592 | 1893.3 | 138.5 | 478.2 | 46819 | 16039.5 | 1351.6 | 6025.53 |
| Guangxi | 21708 | 518.6 | 38.7 | 89.7 | 26318 | 3320.1 | 286.4 | 1254.9 |
| Hainan | 3181 | 120.5 | 7.7 | 45.6 | 3711 | 790.1 | 66.8 | 325.3 |
| Sichuan | 44251 | 1016.31 | 60.96 | 204.3 | 46910 | 6556.01 | 435.24 | 2648.5 |
| Guizhou | 17015 | 295.9 | 13.98 | 58.44 | 21860 | 1591.9 | 99.64 | 869.25 |
| Yunnan | 19895 | 517.41 | 23.7 | 98.32 | 24014 | 29595 | 212.56 | 1330.6 |
| Shaanxi | 16400 | 466.8 | 31.5 | 124.9 | 19410 | 2883.5 | 277.5 | 1544.2 |
| Gansu | 13024 | 271.4 | 12.5 | 68.6 | 15205 | 1558.9 | 84.3 | 756 |
| Qinghai | 2452 | 75.1 | 4.5 | 23.9 | 2933 | 465.7 | 36.7 | 318.1 |
| Ningxia | 2192 | 71.78 | 4.2 | 28.81 | 2988 | 460.35 | 29.9 | 380.85 |
| Xinjiang | 6385 | 335.92 | 22.64 | 124.93 | 7445 | 2200.15 | 138.49 | 1161.52 |
| Total | 365781 | 14150 | 914.75 | 3508 | 445832 | 139385 | 8628 | 49865 |

Note: Total Employment (thousand people), GDP, Infrastructure Output and Total Investment in Fixed Assets (100 million Yuan). Percentage of total employment increase 21.88%.

[5] The same regression technique was not applied to the central provinces due to data constraint over the same time period.

Graph 1. Percentage of Employment increase in Chinese regions 1991-2004




Note: See order of regions in table 1. Top % change: 1.Hebei, 8. Guangdong.

As argued in the preceding discussion of the dual-sector model, we can use equation (14) and equation (21) to estimate the impact of infrastructure provision on the other sector as well as on the overall economic performance. We estimate with panel data of 18 provinces in both coastal and remote areas over 14 consecutive years. Both fixed- and random-effect estimations are reported in Table 2.[6] The data regarding the infrastructure output is the combined value of the production in transportation, telecommunication, and public storage capacities. The data measuring the production of the regional economy is the GDP of each year. The total employees and total investment in fixed assets in each province are used to represent the amount of labor force and investment respectively. Data are collected from annual Statistical Yearbooks of China from 1991-2004.

Table 2 Regression results for coastal and remote Chinese provinces

| | | $F_k$ | β | γ | η | θ |
|---|---|---|---|---|---|---|
| Coastal | Fixed | 0.138(3.248) | 0.319(2.191) | 2.525(3.306) | | |
| | | 0.132(3.163) | 0.299(2.094) | | -3.178(-1.199) | 0.383(2.242) |
| | Random | 0.138(3.315) | 0.299(2.235) | 2.824(4.217) | | |
| | | 0.137(3.322) | 0.315(2.347) | | 0.509(0.290) | 1.683(1.401) |
| Remote | Fixed | 0.360(3.955) | 0.182(1.094) | 1.630(3.184) | | |
| | | 0.350(3.837) | 0.189(1.142) | | 3.266(2.316) | -0.088(-1.245) |
| | Random | 0.321(3.520) | 0.047(0.287) | 1.6999(3.428) | | |
| | | 0.318(3.481) | 0.0497(0.303) | | 2.213(1.900) | -0.029(-0.488) |

6 In table 1, $\gamma = \frac{\delta}{1+\delta} + F_P$, $\eta = \frac{\delta}{1+\delta} - \theta$

As shown by the regression results, the outcomes yielded by fixed-effect model and random-effect model regarding both equation (14) and equation (21) do not differ too much from each other. Shaded area in Table 2 corresponds to the regression results obtained from estimating equation (21), or the decomposed form of equation (14). Associated with each random-effect estimates are the *z* values in the parentheses. Fixed-effect estimates are reported in accompany with respective *t* statistics, accordingly. Using the valid estimates derived from the dual-sector model enables us to develop a more detailed picture regarding the relative efficiency of factor utilization in both sectors as well as the benefits spilling over from the infrastructure sector to the non-infrastructure sector. The value of key parameters is reported in Table 3.

Table 3. Calculated Values of Parameters

| | $1+\delta$ | $F_P$ | $F_k$ | $G_k$ | $TK_P$ | $TL_P$ |
|---|---|---|---|---|---|---|
| Coastal | 1.202 | 2.142 | 0.138 | 0.166 | 0.702 | 1.52 |
| Remote | 1.0 | 1.699 | 0.350 | 0.350 | 0.864 | -- |

Referring to Table 2, we find that the random-effect model suggests that both capital and labor bear a positive as well as statistically significant contribution to the economic performance in Coastal provinces. The results do not show great difference between the estimates of equation (14) and its decomposed form, equation (21). Increase in capital investment counts for 0.138 (0.137 in the decomposed equation) to the economic growth while the coefficient associated with labor input is 0.299. This result implies an immense social benefit enjoyed by the whole community in the coastal region. From Table 3, we find that the social marginal return associated with investment of capital in the infrastructure sector ($TK_p$) is around 0.7, which is far exceeding the marginal productivity of capital investment in the non-infrastructure sector ($F_k$=0.138). Within the infrastructure sector itself, capital investment also enjoys a sound rate of return ($G_k$=0.166), which is greater than the corresponding number in the other sector.

According to our model speculation, it suggests that the infrastructure sector shows a better efficiency in utilizing capitals, the ratio being 1.2:1 (0.166:0.138). From Table 3 we also find that the inter-sectoral spillover effect ($F_p$ =2.14) is quite consequential. As long as the whole society is to appreciate the output growth in the non-infrastructure sector, it also has to celebrate the important role played by the humble “intermediate inputs” previously unidentified from the infrastructure sector.

The results we obtained regarding the coastal area are virtually in accordance with our expectation. Coastal areas are the privileged regions to receive foreign investments, technological innovation, favorable terms of trading, and a variety of other institutional establishments. Infrastructure construction has witnessed the fastest development in provinces like Jiangsu, Guangdong, and Fujian. Some intuitive implications can be drawn from the above results for the coastal regions. It seems to us that in coastal areas infrastructure development can have a great influence on the growth of regional economy since it not only facilitates the production process in the remaining industrial sectors but also generates significant social consequences enjoyed by the whole community. More specifically, we found that capital investment can receive higher rate of return in infrastructure sector than in non-infrastructure sector.

When we look at the results yielded from remote provinces in Table 2 we find that capital investment in the non-infrastructure sector receives a marginal rate of return (Fk) as high as 0.3. These results are largely consistent with previous studies that examine the growth story of modern China. Development in infrastructure sector's output contributes to the overall economic growth by a degree of around 1.63, which is quite huge by all measures. Like the situation in the coastal regions, infrastructure development also generates immense social benefits to remote provinces. Not surprisingly, the calculated value for spillover effect between the infrastructure sector and the non-infrastructure sector is considerable ($F_p$=1.699), which again demonstrates that output from the infrastructure sector, if properly used by other industrial sectors, can greatly promote the output from the remaining of the economy. However, in contrast to costal provinces, the sectoral marginal productivities of capital do not show apparent differences between infrastructure and non-infrastructure sectors. This fact reflects a certain degree of underdevelopment or inadequate utilization of infrastructure in this area. Underdevelopment of infrastructure in remote area is a chronicle problem that hampers interior provinces from achieving higher income growth. In an area where the existing public facilities are so scarce that the effect of economy of scale is not fully realized, infrastructure sector spills little externalities to the other industrial sector. On the other hand, inadequate utilization of existing infrastructure is also a reality in those backward regions. These two aspects may have together contributed to the phenomenon we observed in remote provinces regarding the efficiency of productive factors across two sectors.

Now let us continue to discuss the contrast drawn between the coastal and the remote provinces to form a roundabout view on the national level. As shown in Table 2 and Table 3, both the coastal and the remote areas show great social benefit with respect to the output growth in the infrastructure sector. Developing infrastructure facilities in these two regions can be expected to yield positive social-economic outcomes to the entire community. The spillover effect between sectors, the central concern of our model, shows large and significant existence in both coastal and remote areas. Industrial sectors in both regions have become the beneficiaries of using infrastructure goods as intermediate inputs.

The number in the remote territory, however, is smaller than its coastal counterpart, which may suggest that a greater portion of industrial growth was driven by infrastructure development in coastal region. Sectoral productivity comparison shows contrasting evidence that in the coastal area marginal productivity of capital investment is about 20 percent higher in the infrastructure sector than in the non-infrastructure sector. It verifies that encouraging infrastructure construction in coastal area will be a more profitable conjecture. In remote area, however, factor productivities do not show strong deviation between the two sectors. Returns to factor investment in either sector seems to be equalized, yet in absolute terms they still exceed the marginal productivity of capital invested in the infrastructure sector in the coastal areas.

This result may justify the rationale behind the governmental strategy of encouraging more capital investment to be shifted from the coastal to the interior regions.

Given the even greater social marginal productivity of capital investment (0.86) in the infrastructure sector in the remote provinces, developing infrastructure facilities in these areas should win priority. For coastal areas, they have already passed the preliminary stage of infrastructure development whereas even low provision of public facilities can still bring about significant contributions to the overall economic performance. As the marginal returns to factors in coastal areas are now lingering about a relatively smaller value, it may not be as profitable to launch costly public projects in coastal provinces as in the past. Emphasis should now be placed on the quality as well as efficiency of these mass investments in the coastal areas.

## 4. Conclusion

In this paper, we divide the economy into two productive sectors, one producing infrastructure goods to serve the daily operation of the other non-infrastructure sector. This specification allows us to look into the spillover effects transferable between infrastructure network and other industrial activities, about which little quantitative attempt has been made to estimate its magnitude. Meanwhile, our analytical framework makes it possible to compare the efficiencies of capital investments in different sectors. These are the two major contributions our dual-sector model has brought up to the discussion of the mechanism through which infrastructure affects overall economic performances.

The dual-sector model is used to analyze regional growth disparity in modern China. Our major findings for the coastal and remote provinces suggest that in both coastal and remote provinces, infrastructure has generated tremendous spillover effects between sectors and massive benefits to the whole society. For the first time we have developed some concrete idea about the magnitude of these elusive characteristics of infrastructure. Capital investment receives positive and significant returns whether it is invested in the coastal or the remote areas. However, remote provinces seem to be more attractive since the rate of return to capital investment in either infrastructure or non-infrastructure sector is higher than in the coastal areas. This justifies the government's “Opening Up the West” strategies in favor of the western regions.

The most dramatic outcome arises while sectoral comparison of factor efficiencies is taken into consideration. Empirical evidence tends to suggest that coastal provinces have a more efficient infrastructure sector while the discrepancies between sectoral efficiencies in remote provinces are not apparent. The equalized pattern obtained between sectoral efficiencies in the remote areas is of particular interest because it leads us to address the poor interaction between infrastructure network and other social-economic activities in the remote west due to either inadequacies in both sectors or under-utilization of loosely connected facilities, forfeiting the potential benefits arising from economies of scale.

With these understandings, we call for discretion in introducing infrastructure facilities to tackle the economic backwardness in the remote provinces. These costly projects should not be implemented for its own sake. Rather, policy packages that include designs for a sound institutional environment may help build a healthy interaction between infrastructure network and local economic conditions. Quality and quantity of infrastructure provisions in remote areas deserve equal emphasis.

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On line Annex at the journal Website: http://www.usc.es/economet/aeid.htm

# APPENDIX

| Hebei | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 3259,2 | 1893,3 | 138,5 | 478,2 |
| 1992 | 3367,21 | 2447,5 | 174,3 | 921,75 |
| 1993 | 3433,91 | 3431,9 | 232,2 | 1629,87 |
| 1994 | 3493,15 | 4516,6 | 334,2 | 2141,15 |
| 1995 | 3551,2 | 5734 | 427,8 | 2327,22 |
| 1996 | 3641,3 | 6519,1 | 497,7 | 2327,64 |
| 1997 | 3701,9 | 7315,5 | 629,3 | 2298,14 |
| 1998 | 3783,87 | 7919,1 | 688,8 | 2668,13 |
| 1999 | 3796,32 | 8464,3 | 745,2 | 3027,56 |
| 2000 | 3989,32 | 9662,2 | 908,5 | 3233,7 |
| 2001 | 4058,63 | 10647,7 | 1073,8 | 3536,41 |
| 2002 | 4134,37 | 11735,6 | 1157,8 | 3970,69 |
| 2003 | 4395,93 | 13625,9 | 1207,7 | 5030,57 |
| 2004 | 4681,89 | 16039,5 | 1351,6 | 6025,53 |

| Inner Mongolia | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 962,9 | 359,7 | 26,8 | 100,7 |
| 1992 | 976 | 421,7 | 32,7 | 149,2 |
| 1993 | 1008,2 | 532,7 | 46,1 | 217,4 |
| 1994 | 1033,4 | 681,9 | 53,6 | 251 |
| 1995 | 1029,4 | 832,9 | 67,1 | 273,1 |
| 1996 | 1039 | 984,8 | 83,4 | 275,5 |
| 1997 | 1050,3 | 1099,8 | 101,7 | 317,5 |
| 1998 | 1050,3 | 1192,3 | 108,6 | 350,2 |
| 1999 | 1056,7 | 1268,2 | 121,6 | 383,4 |
| 2000 | 1061,6 | 1401 | 142,6 | 430,4 |
| 2001 | 1067 | 1545,8 | 162,8 | 496,4 |
| 2002 | 1086,1 | 1734,3 | 188,1 | 715,1 |
| 2003 | 1088,1 | 2150,4 | 216,8 | 1209,4 |
| 2004 | 1026,1 | 2712,1 | 243 | 1808,9 |

| Liaoning2 | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 1938,3 | 1200,1 | 96,2 | 318 |
| 1992 | 1957,8 | 1473 | 111,5 | 436,8 |
| 1993 | 2006,1 | 2010,8 | 127,4 | 718,3 |
| 1994 | 2009,3 | 2461,8 | 160,2 | 888 |
| 1995 | 2027,8 | 2793,4 | 176,9 | 885 |
| 1996 | 2031,8 | 3157,7 | 194,6 | 876,1 |
| 1997 | 1967,1 | 3582,5 | 248,5 | 953,7 |
| 1998 | 1958,8 | 3881,7 | 272 | 1052,6 |
| 1999 | 1994,4 | 4171,7 | 314,5 | 1102,3 |
| 2000 | 2052 | 4669,1 | 350,5 | 1267,7 |
| 2001 | 2069,3 | 5033,1 | 394,5 | 1421 |
| 2002 | 2025,3 | 5458,2 | 425,4 | 1605,6 |
| 2003 | 2018,9 | 6002,5 | 495,7 | 2082,7 |
| 2004 | 2097,3 | 6872,7 | 613 | 3000,1 |

| Jiangsu | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 4273 | 1601,4 | 80,3 | 440 |
| 1992 | 4315,1 | 2136 | 100,6 | 711,7 |
| 1993 | 4339,8 | 2998,2 | 144,1 | 1144,2 |
| 1994 | 4362,8 | 4057,4 | 187,2 | 1331,1 |
| 1995 | 4385,2 | 5155,3 | 253,5 | 1680,2 |
| 1996 | 4387 | 6004,2 | 314,9 | 1949,5 |
| 1997 | 4388,8 | 6680,3 | 369,5 | 2203,1 |
| 1998 | 4389,9 | 7200 | 435,8 | 2535,5 |
| 1999 | 4390,7 | 7697,8 | 484,9 | 2742,7 |
| 2000 | 4418,1 | 8582,7 | 557,4 | 2995,4 |
| 2001 | 4434,3 | 9511,9 | 644,9 | 3303 |
| 2002 | 4458 | 10631,8 | 717,8 | 3849,2 |
| 2003 | 4468,7 | 12460,8 | 821,5 | 5535,8 |
| 2004 | 4482,5 | 15512,4 | 973,8 | 6827,6 |

| Zhejiang | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 2579,4 | 1081,8 | 60 | 239,8 |
| 1992 | 2600,4 | 1365,1 | 80 | 361,2 |
| 1993 | 2615,9 | 1909,5 | 110,3 | 683,8 |
| 1994 | 2640,5 | 2666,9 | 147,2 | 1006,4 |
| 1995 | 2621,5 | 3524,8 | 204,6 | 1357,9 |
| 1996 | 2625,1 | 4146,1 | 234,9 | 1617,5 |
| 1997 | 2619,7 | 4638,2 | 288,9 | 1694,6 |
| 1998 | 2612,5 | 4987,5 | 321,8 | 1847,9 |
| 1999 | 2625,2 | 5364,9 | 364,9 | 1886 |
| 2000 | 2726,1 | 6036,3 | 428,3 | 2267,2 |
| 2001 | 2796,7 | 6748,2 | 503,7 | 2776,7 |
| 2002 | 2858,6 | 7796 | 602 | 3596,3 |
| 2003 | 2918,7 | 9395 | 700,9 | 4993,6 |
| 2004 | 2992 | 11243 | 835 | 6059,8 |

| Fujian | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 1436,5 | 619,9 | 55,1 | 145,62 |
| 1992 | 1489,61 | 784,7 | 70,5 | 227,55 |
| 1993 | 1531,42 | 1128,3 | 101,9 | 368,45 |
| 1994 | 1553,57 | 1675,7 | 139 | 538,86 |
| 1995 | 1567,1 | 2145,9 | 196,5 | 681,17 |
| 1996 | 1594,36 | 2560,1 | 245,7 | 790 |
| 1997 | 1613,41 | 2974,5 | 298,7 | 898,47 |
| 1998 | 1621,87 | 3286,6 | 347,3 | 1048,52 |
| 1999 | 1630,85 | 3550,2 | 392,9 | 1040 |
| 2000 | 1660,19 | 3920,1 | 444,1 | 1082,47 |
| 2001 | 1677,79 | 4253,7 | 468,5 | 1134,48 |
| 2002 | 1711,32 | 4682 | 491 | 1230,76 |
| 2003 | 1756,71 | 5223 | 532 | 1507,87 |
| 2004 | 1814,03 | 6053,1 | 601,4 | 1899,1 |

| Shandong | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 4219,3 | 1810,54 | 98,97 | 439,8 |
| 1992 | 4302,6 | 2196,53 | 120,18 | 601,5 |
| 1993 | 4379,3 | 2779,49 | 141,35 | 892,5 |
| 1994 | 4382,1 | 3872,18 | 214,36 | 1108 |
| 1995 | 5207,4 | 5002,34 | 297,71 | 1321 |
| 1996 | 5227,9 | 5960,42 | 364,71 | 1558 |
| 1997 | 5256 | 6650,02 | 424,36 | 1792,2 |
| 1998 | 5287,6 | 7162,2 | 442,2 | 2057 |
| 1999 | 5314,7 | 7662,1 | 490,9 | 2222,2 |
| 2000 | 5441,8 | 8542,44 | 553,17 | 2542,7 |
| 2001 | 5475,3 | 9438,31 | 668,49 | 2807,8 |
| 2002 | 5527 | 10552,06 | 667,75 | 3509,3 |
| 2003 | 5620,6 | 12435,93 | 724,62 | 5328,4 |
| 2004 | 5728,1 | 15490,73 | 990,65 | 7629 |

| Guangdong | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 3259,2 | 1893,3 | 138,5 | 478,2 |
| 1992 | 3367,21 | 2447,5 | 174,3 | 921,75 |
| 1993 | 3433,91 | 3431,9 | 232,2 | 1629,87 |
| 1994 | 3493,15 | 4516,6 | 334,2 | 2141,15 |
| 1995 | 3551,2 | 5734 | 427,8 | 2327,22 |
| 1996 | 3641,3 | 6519,1 | 497,7 | 2327,64 |
| 1997 | 3701,9 | 7315,5 | 629,3 | 2298,14 |
| 1998 | 3783,87 | 7919,1 | 688,8 | 2668,13 |
| 1999 | 3796,32 | 8464,3 | 745,2 | 3027,56 |
| 2000 | 3989,32 | 9662,2 | 908,5 | 3233,7 |
| 2001 | 4058,63 | 10647,7 | 1073,8 | 3536,41 |
| 2002 | 4134,37 | 11735,6 | 1157,8 | 3970,69 |
| 2003 | 4395,93 | 13625,9 | 1207,7 | 5030,57 |
| 2004 | 4681,89 | 16039,5 | 1351,6 | 6025,53 |

| Guangxi | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 2170,8 | 518,6 | 38,7 | 89,7 |
| 1992 | 2217 | 646,6 | 49,1 | 141 |
| 1993 | 2275 | 871,7 | 61,2 | 278,1 |
| 1994 | 2336 | 1198,3 | 69,5 | 382,6 |
| 1995 | 2383 | 1497,6 | 93 | 423,4 |
| 1996 | 2417 | 1697,9 | 112 | 476,4 |
| 1997 | 2454 | 1817,3 | 120,1 | 479,8 |
| 1998 | 2499 | 1903 | 125 | 571,7 |
| 1999 | 2514,9 | 1953,3 | 145,3 | 620,2 |
| 2000 | 2566 | 2050,2 | 160,9 | 660 |
| 2001 | 2578 | 2231,2 | 187,7 | 731,3 |
| 2002 | 2589 | 2455,4 | 225,8 | 835 |
| 2003 | 2601 | 2735,1 | 248,2 | 987,3 |
| 2004 | 2631,8 | 3320,1 | 286,4 | 1254,9 |

| Hainan | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 318,1 | 120,5 | 7,7 | 45,6 |
| 1992 | 322,5 | 181,7 | 10,8 | 87,1 |
| 1993 | 333,3 | 258,1 | 15,7 | 188,3 |
| 1994 | 335,6 | 331 | 20,6 | 220,3 |
| 1995 | 334,5 | 364,2 | 24,5 | 198,1 |
| 1996 | 333,3 | 389,5 | 27,6 | 185,9 |
| 1997 | 341,6 | 409,9 | 31,7 | 167,8 |
| 1998 | 326,7 | 438,9 | 39,8 | 183,3 |
| 1999 | 326,8 | 471,2 | 42,4 | 190,1 |
| 2000 | 334,6 | 518,5 | 47 | 193,5 |
| 2001 | 338,4 | 566,7 | 50,8 | 206,4 |
| 2002 | 349,9 | 624,9 | 54,6 | 225,8 |
| 2003 | 360,3 | 691,7 | 58,2 | 276,3 |
| 2004 | 371,1 | 790,1 | 66,8 | 325,3 |

| Sichuan | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 4425,1 | 1016,31 | 60,96 | 204,3 |
| 1992 | 4521,2 | 1177,27 | 68,7 | 304,8 |
| 1993 | 4556,8 | 1486,08 | 82,18 | 459,4 |
| 1994 | 4587,9 | 2001,41 | 105,71 | 573,4 |
| 1995 | 4619,1 | 2504,95 | 143,01 | 677,3 |
| 1996 | 4627,2 | 2985,15 | 179,83 | 803,8 |
| 1997 | 4641,2 | 3320,11 | 209,08 | 949,3 |
| 1998 | 4651,4 | 3580,26 | 234,91 | 1184,8 |
| 1999 | 4654,3 | 3711,61 | 250,25 | 1220,7 |
| 2000 | 4658,4 | 4010,25 | 281,39 | 1403,9 |
| 2001 | 4664,8 | 4421,76 | 313,78 | 1573,8 |
| 2002 | 4667,6 | 4875,12 | 348,78 | 1805,2 |
| 2003 | 4683,5 | 5456,32 | 381,25 | 2158,2 |
| 2004 | 4691 | 6556,01 | 435,24 | 2648,5 |

| Guizhou | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 1701,47 | 295,9 | 13,98 | 58,44 |
| 1992 | 1739,03 | 339,91 | 19 | 78,82 |
| 1993 | 1779,01 | 416,07 | 24,82 | 106,3 |
| 1994 | 1828,3 | 521,17 | 17,13 | 140,95 |
| 1995 | 1812,2 | 630,07 | 21,11 | 173,66 |
| 1996 | 1783,2 | 713,7 | 24,22 | 207,1 |
| 1997 | 1796,7 | 792,98 | 20,72 | 247,23 |
| 1998 | 1844,43 | 841,88 | 25,04 | 304,91 |
| 1999 | 1855,17 | 911,86 | 51,33 | 333,9 |
| 2000 | 1884,93 | 993,53 | 64,59 | 402,5 |
| 2001 | 2068,01 | 1084,9 | 75,37 | 533,74 |
| 2002 | 2106,14 | 1185,04 | 84,35 | 632,44 |
| 2003 | 2145 | 1356,11 | 93,11 | 754,13 |
| 2004 | 2186 | 1591,9 | 99,64 | 869,25 |

| Yunnan | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 1989,5 | 517,41 | 23,7 | 98,32 |
| 1992 | 2032,5 | 618,69 | 25,19 | 140,69 |
| 1993 | 2071,5 | 779,21 | 30,41 | 251,4 |
| 1994 | 2108,7 | 973,97 | 38,72 | 321,73 |
| 1995 | 2149 | 1206,68 | 49,33 | 380,57 |
| 1996 | 2186,2 | 1491,62 | 66,87 | 448,02 |
| 1997 | 2223,5 | 1644,23 | 76,02 | 540,5 |
| 1998 | 2240,6 | 1793,9 | 88,9 | 672,54 |
| 1999 | 2244 | 1855,74 | 107,95 | 717,2 |
| 2000 | 2295,4 | 1955,09 | 119,77 | 697,94 |
| 2001 | 2322,5 | 2074,71 | 139,01 | 734,81 |
| 2002 | 2341,3 | 2232,32 | 150,56 | 828,65 |
| 2003 | 2353,3 | 2465,29 | 172,52 | 1021,18 |
| 2004 | 2401,4 | 2959,48 | 212,56 | 1330,6 |

| Shaanxi | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 1640 | 466,8 | 31,5 | 124,9 |
| 1992 | 1672 | 538,4 | 38 | 142,5 |
| 1993 | 1708 | 661,4 | 48,3 | 228,2 |
| 1994 | 1720 | 816,6 | 60,1 | 283,3 |
| 1995 | 1748 | 1000 | 74,1 | 324,3 |
| 1996 | 1776 | 1175,9 | 93,1 | 372 |
| 1997 | 1792 | 1300 | 106,8 | 424,1 |
| 1998 | 1788 | 1381,5 | 115,4 | 544,9 |
| 1999 | 1808 | 1487,6 | 130,3 | 619,3 |
| 2000 | 1813 | 1660,9 | 156,2 | 745,8 |
| 2001 | 1785 | 1844,3 | 188,9 | 850,7 |
| 2002 | 1874 | 2101,6 | 210,4 | 974,6 |
| 2003 | 1912 | 2398,6 | 226 | 1278,7 |
| 2004 | 1941 | 2883,5 | 277,5 | 1544,2 |

| Gansu | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 1302,4 | 271,4 | 12,5 | 68,6 |
| 1992 | 1305,9 | 317,8 | 14,2 | 85,1 |
| 1993 | 1417,8 | 372,2 | 15 | 122,1 |
| 1994 | 1438,8 | 451,7 | 20,2 | 159,1 |
| 1995 | 1483,3 | 553,4 | 25,6 | 194,7 |
| 1996 | 1521,5 | 714,2 | 28,4 | 214,8 |
| 1997 | 1530,3 | 781,3 | 34,9 | 264,4 |
| 1998 | 1539,8 | 869,8 | 39,3 | 331 |
| 1999 | 1489 | 932 | 42,9 | 384,1 |
| 2000 | 1476,5 | 983,4 | 50,1 | 441,4 |
| 2001 | 1488,9 | 1072,5 | 56,6 | 505,4 |
| 2002 | 1500,6 | 1161,4 | 64,3 | 575,8 |
| 2003 | 1510,9 | 1304,6 | 70,9 | 655,1 |
| 2004 | 1520,5 | 1558,9 | 84,3 | 756 |

| qinghai | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 245,2 | 75,1 | 4,5 | 23,9 |
| 1992 | 249,2 | 87,5 | 5,7 | 30,3 |
| 1993 | 253,3 | 109,6 | 6,5 | 44,7 |
| 1994 | 257,5 | 138,2 | 7 | 45,2 |
| 1995 | 261,7 | 165,3 | 9 | 55,6 |
| 1996 | 266 | 183,6 | 10,6 | 77,7 |
| 1997 | 270,4 | 202,1 | 12,1 | 97,7 |
| 1998 | 274,8 | 220,2 | 13,7 | 116,4 |
| 1999 | 279,3 | 238,4 | 16,2 | 128,1 |
| 2000 | 283,9 | 263,6 | 19,2 | 154,8 |
| 2001 | 287,3 | 301 | 23,1 | 201,6 |
| 2002 | 291,3 | 341,1 | 27,5 | 245 |
| 2003 | 295,4 | 390,2 | 32,6 | 285,1 |
| 2004 | 293,3 | 465,7 | 36,7 | 318,1 |

| Ningxia | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 219,2 | 71,78 | 4,2 | 28,81 |
| 1992 | 225,85 | 83,14 | 4,76 | 38,09 |
| 1993 | 229,38 | 103,82 | 5,19 | 52,67 |
| 1994 | 232,68 | 133,97 | 6,14 | 60,98 |
| 1995 | 240,6 | 169,75 | 8,39 | 70,12 |
| 1996 | 245,36 | 193,62 | 11,69 | 77,31 |
| 1997 | 256,8 | 210,92 | 14,33 | 88,1 |
| 1998 | 254,84 | 227,46 | 16,11 | 108,65 |
| 1999 | 272,3 | 241,49 | 18,03 | 130,61 |
| 2000 | 275,5 | 265,57 | 19,31 | 160,82 |
| 2001 | 279 | 298,38 | 22,95 | 195,81 |
| 2002 | 282,4 | 329,28 | 25,58 | 230,83 |
| 2003 | 291,4 | 385,34 | 27,84 | 318,21 |
| 2004 | 298,8 | 460,35 | 29,9 | 380,85 |

| Xinjiang | total employee (10000persons) | GDP (100 million yuan) | infrastructure output(100 million yuan) | total investment in fixed assets (100 million yuan) |
|---|---|---|---|---|
| 1991 | 638,49 | 335,92 | 22,64 | 124,93 |
| 1992 | 646,94 | 402,31 | 28,33 | 170,03 |
| 1993 | 655,98 | 505,63 | 31,78 | 248,44 |
| 1994 | 657,54 | 673,68 | 42,24 | 285,48 |
| 1995 | 676 | 825,11 | 55,34 | 333,34 |
| 1996 | 684 | 912,15 | 66,75 | 387,85 |
| 1997 | 715,4 | 1050,14 | 75,67 | 446,81 |
| 1998 | 680,92 | 1116,67 | 92,04 | 519,77 |
| 1999 | 694,34 | 1168,55 | 108,88 | 534,65 |
| 2000 | 693,85 | 1364,36 | 121,79 | 610,38 |
| 2001 | 685,38 | 1485,49 | 118,6 | 706 |
| 2002 | 701,49 | 1598,28 | 131,43 | 813,02 |
| 2003 | 721,27 | 1877,61 | 121,24 | 1002,13 |
| 2004 | 744,49 | 2200,15 | 138,49 | 1161,52 |