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Expressway Development Impact Study:

Beijing-Tongjiang Expressway Route in the People's Republic of China

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Abstract. The Government of the People's Republic of China is embarking on development of the National Trunk Highway System, a network of interprovincial expressways of about 35,000 km to be constructed during 1991-2010. As part of this network, a 1,867-km Beijing-Tongjiang route in the northeastern region is one of the priority routes and has recently been completed, costing about Yuan 37 billion. As a result, developmental impacts are beginning to emerge. This paper evaluates its impacts on transport services, economic activities, social services, and environmental and social dimensions. The study was conducted through quantification of changes in economic and social indicators by comparing (i) before and after project situations, (ii) project area and a control area, and (iii) project area situations and national or provincial trend. The study concludes that while recognizing the difficulty in isolating the expressway impact from other factors, the expressway development was associated with the development of the local economy through improved accessibility. Travel time was halved from 35 hours to 17 hours for cars. Industrial plants were newly built along the expressway. Tourism has been developed along the expressway. Some feeder roads upgraded along with the expressway are serving 3.3 million rural residents in Liaoning Province.

INTRODUCTION

To facilitate economic growth by improving access, the government of the People's Republic of China (PRC) has been developing the national trunk highway system, a network of interprovincial expressways comprising 12 key expressway routes totaling about 35,000 km, to be constructed during 1991-2010. During the first half of the period, the government has completed the high priority 16,000 km sections with loans provided by external assistance, including the Asian Development Bank (about \$3.2 billion). Of this, 7 loans amounting to \$1.2 billion were concentrated in the northeastern region from Beijing to Tongjiang (1,867 km) to finance 1,271 km during 1993-1998 (see Figure 1). This expressway route has recently been completed and development impact is beginning to emerge.

1. METHODOLOGY

There is an evidence to suggest that highway infrastructure capital contributes to reduction in costs, growth in output, and increases in profitability. The magnitude of these contributions, however, vary considerably from case to case because of differences in evaluation methodologies and a level of data aggregation (1). This study employed a three-tier method to evaluate the impacts of the Beijing-Tongjiang route: (i) comparison of the situations before and after the completion; (ii) comparison of conditions in the project area relative to a control area which did not benefit from the expressway development; and (iii) comparison of the trend in the expressway area with the national or provincial trends.

2. IMPACT ON TRANSPORT SERVICES

The most direct impact on transport services was the savings in travel times. The extent of savings in travel time depends on individual sections. Under the before completion situation, cars traveling from Beijing to Tongjiang required at least 35 hours, and trucks about 45 hours. The new expressway has shortened the travel time to 17 hours for cars and 25 hours for trucks. The average time savings for the Beijing-Tongjiang expressway was about 45 percent for cars and 52 percent for trucks. The access to markets and social services by residents who live along the expressway route was improved. The reduction in travel distance and time was estimated at about 45 percent compared with the before completion situation. The decrease in access time led to an increase in social, economic and travel activities. For example, the access time to the tourist resort of Beidaihe was reduced by 44 percent, which enabled residents in Beijing and Tianjin to spend a weekend in the seaside city.

Traffic diversion and generation of the expressway route was significant, but still fell short of appraisal estimates. The traffic comprised a large proportion of long distance trucks. The long distance vehicles intended to take advantage of the comfortable, fast, and safe expressway. Traffic compositions of the expressway sections are different. While cars and small vehicles accounted for 60 to 70 percent of the traffic between Beijing and Baodi, trucks accounted for as much as 55 to 75 percent between Baodi and Tongjiang, of which over 50 percent was interprovincial transit traffic. Traffic on all sections increased substantially after project completion.

As a result of the improvement of geometric design, better pavement condition and shorten distance, vehicle operating cost was decreased, leading to lower prices for freight and passengers than that on the national roads. The supply of road passenger services increased substantially, especially short and medium distance expressway buses offering frequent service, which attracted passengers from the parallel railways. As for the situation before completion, both highways and railways were congested with slow-moving vehicles. Vehicle ownership increased for both cars and trucks with varying degree depending on the provinces.

Road accidents on the expressway were reduced significantly. The new expressway resulted in a reduction in the number of road accidents, ranging between 50 and 76 percent. The road accidents on the parallel national roads after project completion were also reduced due to the alleviated traffic congestion.

3. INDUSTRIAL AND COMMERCIAL DEVELOPMENT

3.1 GDP Share and Comparison between Project Area and Control Area

The expressway route connects four provinces of Hebei, Liaoning, Jilin and Heilongjiang and two cities of Beijing and Tianjin. The GDP of this area constitutes one fifth of the national total. The expressway in the northeastern country borders North Korea in the east and the Russian Federation in the north. The GDP of the expressway area increased from Yuan 1,307 billion in 1996 to Yuan 1,895 billion in 2000, with an annual growth rate of 9.7 percent, 2.6 percentage points higher than that of the national average. The area's share of the GDP increased from 19.3 percent in 1996 to 21.2 percent in 2000 (2). A growth rate in the project area was higher than that in the control area. In Jilin Province, the growth rate during 1993-1999 was 18.4 percent and 13.5 percent in the project area whereas in the control area they were 12.0 percent and 9.9 percent. Although these effects cannot be fully attributed to the expressway development, it is fair to say that there is a general trend to show that the expressway development had a positive impact on economic development in the region.

3.2 Economic and Technological Development Zone along the Expressway Route

An Economic and Technological Development Zone (ETDZ) is an area with concentrated land use of industrial and commercial activities, usually close to such places as transport hub of port and expressway interchange. There were more ETDZs built along the expressway route after project completion, with high growth rate in output. In the absence of the expressway, such high growth rate may not have been possible.

Before 1996, there were only two ETDZs in Jilin province. Since project completion, five more ETDZs have been established along the expressway in Jilin province, with high tech output value increased from Yuan 3.6 billion in 1995 to Yuan 20 billion in 2000. The average annual growth rate of tourism revenue increased from Yuan 101.3 million over the period from 1990 to 1995 before project completion to Yuan 773.4 million from 1995 to 2000 after project completion. Of the total national level 35 ETDZs, the Changchun ETDZ has the highest growth rate in terms of the output value and local government fiscal revenue, which exceeded those ETDZs in the eastern coast area, ranking 6th in 1999.

The Harbin ETDZ was established in Heilongjiang Province in 1991, with a total area of 10 square kilometers. By the end of 1997 there were 298 Chinese-foreign joint ventures established with foreign capital from 26 countries and regions, with total investment of \$1,360 million, contracted foreign capital \$610 million, and actual use of foreign capital \$220 million. In the development zone there are plants for automobile, food, fruit and corn processing, apparel as well as high-tech entities.

It has been 12 years since Shenyang ETDZ was established in Liaoning Province. Its GDP reached Yuan 7.1 billion in 2000, 27 percent more than 1999; gross social output value Yuan 25.0 billion, 26 percent up; gross industrial output value Yuan 19.1 billion, up by 31 percent; total profit and tax Yuan 2.34 billion, a growth of 24 percent over the previous year. Since 1995, the average annual growth rate for the major economic indicators of Shenyang ETDZ has been at over 30 percent. The gross industrial output value produced by Chinese-foreign joint ventures in the Shenyang ETDZ accounted for 42 percent of the joint ventures' total in Shenyang, with export value accounting for 40 percent of the total. In 2000 the ETDZ attracted more investment, with contract value of Yuan 11 billion, actual use of foreign capital of \$410 million, increased by 16 percent and 28 percent respectively over the previous year.

3.3 Tourism Development

Improvement of transport system is important in promoting the development of tourism. There are tourism resources along the expressway route in all the four provinces and two municipalities, including natural reservation areas of mountains, forests and lakes, and historical sites. For a long time period, these

tourism resources have not been fully developed, owing to lack of transport infrastructure facilities. After completion of the expressway, tourism along the route has been developing.

Hebei province has over 342 tourist spots. Statistics show that in 2000 the number of overseas tourists visited Qinhuangdao and Tangshan accounted for about 40 percent of the provincial total, with the revenue from the overseas tourists accounting for over half of the provincial total. Total tourism revenue in 2000 was Yuan 21.1 billion, accounting for 4.2 percent of the total GDP of Hebei province, compared to 2.2 percent in 1995, with average annual growth rate of 28.5 percent for revenue from domestic tourists and that of 25.4 percent for revenue from overseas tourists. Since 60 percent of the tourists visiting Hebei were from Beijing and Tianjin, the expressway continues to play an important role in the tourism development. Similar impacts on tourism development were felt in Jilin Province and Heilongjiang Province.

3.4 Logistics Development

Liaoning province is an industrial base in the PRC. At present 90 percent of the cities in the province have been connected by the expressway. The improvement of the transport system, particularly the road transport system, facilitates just-in-time delivery service for the industries, reduces inventory cost, and speeds up capital turnover. Although logistics and supply chain management are new for most of the firms in the PRC, there are potential benefits for the Chinese firms to gain from logistics and supply chain management by taking advantage of the new expressway system.

In Shenyang there is a large shareholding transport and logistics company established in 1998. With total asset of Yuan 400 million and 19 subsidiary companies, it engages in passenger transport, trucking, freight forwarding, warehousing, intermodal transport, automobile inspection and maintenance, and information technology. It has special railway lines and regular freight service lines connecting with 46 cities across the country.

Automotive industry is the key industry in Jilin province. After opening of the Changchun-Siping section in 1997, a 2.5 km connecting road was built to link the expressway directly with a manufacturing plant. Delivery of the automobiles was previously done by railway, but it was usually difficult with a number of transshipment. Now it is more convenient to deliver by the expressway using long special truck for door-to-door car delivery, which is much more efficient than before. Due to the improvement of the highway transport system, it is possible for the industry to materialize just-in-time delivery, a zero inventory logistics management strategy. In 2000, the Changchun Automobile Manufacturing Group established an integrated procurement and zero inventory control program with a target total saving over Yuan 500 million per annum.

4. AGRICULTURAL AND AGROPROCESSING DEVELOPMENT

Traditional agricultural production in the PRC is labor intensive with low efficiency. During the last half century, agricultural productivity has been enhanced significantly due to the improvements in the irrigation system, research and development and introduction of new grain and crops, and mechanization. Improvement of the road system facilitated access for the farmers to the market, stimulating more production of cash crops.

4.1 Transformation of Farm Land Use

Overall level of agricultural activity increased in output, productivity of the land, and values of output. The agricultural production mix was transformed as farmers shifted land use from low value grains to high value vegetables and fruits, which yield higher profits. The findings are in line with a recent study indicating that the transportation costs for agricultural input and output affect farm land use and production decision (3).

There was increase of vegetable area by 110 percent, sugar beet area by 50 percent and other cash crops areas by 110 percent and reduction of grain area for Jiamusi from 1997 to 2000. In Baodi county the grain area was decreased by 18 percent, vegetable area increased by 91 percent and the cotton area increased by 148 percent. The output share of vegetable, fruit and animal husbandry of the total agricultural output in Hebei province was increased by 15.1 percentage points, from 47.4 percent in 1995 to 62.5 percent in 2000. The output share of vegetable, fruit and animal husbandry accounted for 60 percent of the total agricultural output in Qinhuangdao. The shift to higher value produce, combined with improved yields for traditional crops, raised the value added per unit of cultivated land. Improvements in the transport system promoted employment and establishment of new township and village enterprises.

4.2 Agroprocessing Development

Agricultural production along the expressway is generally based on relatively small holdings and intensive yields. Additional economic value can be obtained mainly through greater processing of the farmland output. Agroprocessing units along the expressway have been the main means of attracting joint venture capital and domestic capital for township and village enterprises, stimulating the transport demand.

There were 418 agroprocessing and agricultural production bases, which have been developed after project completion, from 1997 to 2000 in Jiamusi. There were green food production base, export oriented vegetable production base, etc. After completion of the Harbin-Jiamusi section in 1997, there were 57 green house vegetable planting base established in Binxian county, with annual output value of Yuan 2.13 million.

The feed processing industry is undergoing restructuring with the number of the plants reduced. The output and operation revenue, however, are on the increase. In Tieling, one of the major city along the expressway route, the concentrated feed output reached 500,000 tons in 2000, accounting for 37.4 percent of the provincial total. The output value of the feed processing in Liaoning province reached Yuan 8,230 million, up by 29.8 percent over the previous year. The output value generated by the 4 cities accounted for 47 percent of the provincial total in 2000. So most of the agroprocessing plants are located close to the expressway route relying on the expressway not only for supply of raw materials and products, but also for staff movements to and from the work place.

It is noteworthy that some large scale agroprocessing plants have been developed since completion of the expressway section in each of the provinces. One is a joint venture plant newly built at Gongzhuling in Jilin Province to produce furfuraldehyde with corncob as raw material. One 600,000-ton corn deep processing plant and one 200,000-ton granulose (starch sugar) manufacturer are being built in Jinzhou.

5. POVERTY REDUCTION

The contribution of expressway development to poverty reduction is seen, in general, as indirect and stemming from broad based economic development. Poverty areas usually benefit from expressway, which improves accessibility to transport facilities, making it easier for farmers to get their produce to the market. There are studies available, showing a broad linkage between road development and poverty reduction (4) (5).

To enhance the poverty reduction impact of the expressways, associated feeder roads were included in the scope of some expressway sections to provide improved access for the poor in the project's hinterland in Liaoning province. Eight feeder roads, totaling 203 km and costing \$56.7 million, were selected using the following criteria: (i) proximity to the project expressway, (ii) low incomes of the communities served, and (iii) prevalence of disadvantaged groups within the served communities. The upgraded feeder roads now serve about 3.3 million rural people, with an annual income of Yuan 2,238 in 1998 compared with the provincial average of Yuan 2,580. The upgraded roads reduce transport time and the cost of reaching schools, hospitals, and other social services. They make health care and skills

development opportunities more accessible to the poor, improving their chances of finding employment in nearby industries (6). Among the affected counties, Tiefsa is the county showing the strong progress, with per capita GDP up to Yuan 7,380, 4.9 percent higher than the national average in 2000, comparing to Yuan 1,036.7 in 1993, which was only 28.4 percent of the national average. The average annual growth rate of GDP was 12 percent and that of per capita GDP 16 percent for the counties.

6. EMPLOYMENT OPPORTUNITIES

Expressway projects help create jobs directly through civil works contracts and indirectly through local economic development in project area. It is also related to the economic restructuring and reform, facilitating development of the service sector. The Beijing-Tongjiang expressway route sustained the engagement of a large workforce over nearly 7 years. Construction works are estimated to have directly employed more than 10,000 people working at the site every year during construction. Operation of the expressway now provides direct employment opportunities for 2,800 people, and there will be more for those working in service sector activities, estimated to be at least 1,000. Wages and salaries, together with local procurement of materials, totaled an estimated Yuan 2.2 billion for the Heilongjiang section alone. According to the estimates made by Jilin province, every Yuan 100 million investment in highway construction, a total of 450,000 man-day's work is created, equivalent to about 1,500 employment opportunities (7). Given the size of the entire expressway route, the employment opportunities created are estimated at 433,000.

7. ENVIRONMENTAL AND SOCIAL IMPACTS

The expressway construction impacted on the local environment and residents due to land acquisition. For the Changchun-Harbin section (262 km) alone, 2,100 ha of land was acquired, affecting about 8,100 residents, including those who lost part of their assets. The entire route is estimated to have acquired about 15,000 ha of land, affecting about 58,000 people. The main environmental impacts include noise, air pollution, water, and soil erosion. Most of these adverse effects, however, have been mitigated by implementing appropriate measures as specified in the environmental impact assessments, such as planting green belts of trees on both sides of the expressway, replanting borrow pits, etc. The environmental monitoring system was also effectively implemented.

Resettlement of local affected residents was a main social impact. These affected people were compensated based on the resettlement plans consistent with the Land Administration Law and the provincial guidelines, which set out the procedures, the compensation rates, and resettlement subsidies for acquiring land. Villagers losing housing received compensation directly and a replacement house site, with vulnerable households receiving special assistance to replace their houses. Those losing other assets, such as crops, trees, sheds, and other structures, were compensated directly for their losses. People whose land was borrowed temporarily were compensated for loss of production. The resettlement budget was found to be sufficient for implementation.

8. CONCLUSIONS

How does expressway development contribute to the economic development? This paper addresses this question by examining a case study in a northeastern part of the PRC, where the 1,867 km expressway route has just been completed. The immediate impact was on the transport services. The expressway enabled efficient, safe, and comfortable transport. It facilitated industrial and commercial development of the area as evidenced by creation of the economic and technological development zones and tourism development. Agricultural and agroprocessing industry also benefited through access improvement. The expressway development brought about direct and indirect employment opportunities for the people living along the expressway route, and hence promoted poverty reduction in the area. The expressway development also brought about some environmental and social impacts, including resettlement. Despite

all these positive impacts, how do we know that they are due to the expressway development? To address this issue, the study adopted a comparative analysis, using a control area where the economic condition was similar to the expressway route area, but it did not benefit from expressway development. In this way, the study established, to some degree, a direction of causality. But in a strict sense, it would still be difficult to fully attribute its effects to the expressway development because there could be some other factors affecting either project area or control area or both. A more thorough investigation of both areas would be useful to eliminate other factors affecting them.

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LIST OF FIGURE

FIGURE 1 Map: The Beijing-Tongjiang Expressway Route in the People's Republic of China

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