Proceedings of 2017 International Conference of Asian-Pacific Planning Societies

Economic Impacts of Development of Asian Highway on Regional Growth and Disparity

Euijune Kim[1] Seung-Woon Moon[2] Yoojin Yi[3]

Abstract

We develop a Multinational Multiregional Computable General Equilibrium (MMCGE) Model to analyze economic impacts of the Asian Highway 1 and Korea-Japan Tunnel on regional economic growth of Northeast Asian countries. The growth sources from the construction of the highway originating from Japan to China via Korean peninsula are classified into two components; (1) reduction in the travel time (cost), and (2) a decrease in transportation cost per time (distance). The direct and indirect effects on economic benefits are generated through the supply and demand linkages among economic agents. Overall, the construction of missing link of Asian Highway #1 in North Korea's section and Korea-Japan Tunnel has the large effects on the GRP of Dongbei in China, Seoul Area in Korea, and Kyushu in Japan. The simulation of the MMCGE model can provide public agents and stockholders with analytical and strategic insights into the investment efficiency, effectiveness and priority of the highway project in terms of income growth. This numerical model is expected to practically assess transportation investment programs and development strategies with the national and regional economic goals.

Keywords: cross-border cooperation, infrastructure investment, regional economic growth

1. Introduction

Since the early 1990s, there have been lots of discussions on how to make an economic complementarity among Northeast Asian countries for transnational economic development; human resources and labor supplies of China, investment and management experiences of Japan, and technology and production capacities of South Korea (Korea hereafter). They have made themselves economically dependent on each other, implementing outward-looking development policies aimed at promoting trades. Although Korea is geographically separated from China by North Korea and from Japan by the East Sea (Sea of Japan), these regional production networks and supply chains have contributed to increasing development potentials to them all. They have resulted from expansion of scopes of spatial markets for goods and services, exploitation of economies of scale and industrial specialization, enhancement of regional competitiveness, and reduction in trade and production costs. The economic cooperation would be more intensified with deregulations on trade and investments, and the development of the transportation network such as Asian Highway Network (AHN).

[1] Seoul National University, euijune@snu.ac.kr
[2] Seoul National University, moonswoon@snu.ac.kr
[3] Seoul National University, jinparki@snu.ac.kr

The purpose of this paper is to analyze impacts of the development of the AH1 on the regional economic growth of Korea and China. We develop a Multinational Multiregional Computable General Equilibrium (MMCGE) Model for 20 regions of three nations (seven regions of China, nine regions of Japan, and four regions of Korea). This MMCGE model is composed of several blocks of production, consumption, savings and investment, government revenue and expenditure, foreign and interregional trade, and capital mobility in the real side economy. The growth sources from the construction of the highway originating from Korea to China via North Korea are classified into two components such as (1) reductions in the travel times (costs) and (2) and in transportation cost per time (distance). The direct and indirect effects on economic benefits are generated through the supply and demand linkages among economic agents. In addition, this paper attempts to explicitly include an economic activity of transportation sector at each national level and a FOB/CIF price structure based on a spatial price equilibrium in the MMCGE model. This MMCGE model has two distinguishing features from conventional analytical tools such as production and cost functions to assess the long-term effects of transportation investments. One is to carry out the evaluation of economic policies in a general equilibrium framework that incorporates factor mobility and institutional rigidities in the real side of regional markets. Another is to measure the economic impacts of transportation investments using the travel time (distance) based on the transportation network (quality side) as well as investment amounts (quantity side).

2. Asian Highway Network

The AHN is a regional transport cooperation initiative aimed at enhancing the efficiency and development of the road infrastructure in Asia, supporting the development of Euro-Asia transport linkages and improving connectivity for landlocked countries. The AH project was initiated in 1959. During the first phase of the project (1960-1970) considerable progress was achieved, however, progress slowed down when financial assistance was suspended in 1975. Entering into the 1980s and 1990s, regional political and economic changes spurred new momentum for the AH project. It became one of the three pillars of Asian Land Transport Infrastructure Development (ALTID) project, endorsed by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) Commission at its forty-eight session in 1992, comprising Asian Highway, Trans-Asian Railway (TAR) and facilitation of land transport projects. The ESCAP initiated the ALTID project with the aim of improving and expanding transport and communications links within the region, as well as with other regions.

AH 1 is the longest route of the AH Network, running 20,557 km (12,774 mi) from Tokyo, Japan via Korea, China, Hong Kong, Southeast Asia, Bangladesh, India, Pakistan, Afghanistan and Iran to the border between Turkey and Bulgaria west of Istanbul where it joins end-on with European route E80 that already connects the western part of Europe with the eastern part. AH1 makes it possible to drive directly from Tokyo to Lisbon, Portugal without taking major detours or back-roads. However, it is now impossible to pass through the AH1 from Japan to China by land transport because of two

missing-link, which one is in sea between Japan and Korea, other is in North Korea.

3. Impact Analysis

We develop a multinational-multiregional CGE (MMCGE) Model for three nations of China, Japan and (South) Korea with building an external module to measure a minimum travel time among the regions. However, North Korea, a key member in the Northeast Asian countries cannot be included in this economic analysis of the highway development due to limitations on availability of socio-economic data such as Input-Output Table and sectoral economic indications such as labor inputs, capital stocks and transportation costs. The structure of the MMCGE model is based on a series of works on transportation network models of Kim *et al.* (2004), Kim and Hewings (2009), and Kim *et al.* (2011). They measured the dynamic economic effects of highway projects on the economic growth and the regional disparity in Korea using a transportation network–multiregional CGE model. This model captured the interactions between the quantity and the prices in regional economies, and there were five stages in estimating the economic impacts of transportation investments: (1) calculation of an interregional minimum distance matrix and the construction cost by highway project; (2) calculation of an accessibility index by highway project; (3) injection of the resulting changes in the accessibility to the multiregional CGE model; and (4) calibration of the economic effects of the highway project on GDP, exports, the price level, and the variation of the regional disparities for wages and population. It was possible to determine which highway development deserved the priority for investment with respect to economic efficiency and interregional disparity in the long run.

The MMCGE model specifies economic interactions of commodities and factor inputs among regions of three nations. According to Transnational Interregional Input-Output Table for China, Japan and Korea of 2005 by IDE (2015), each country is disaggregated into multiple regions: seven regions (Dongbei, Huabei, Huadong, Huanan, Huazhong, Xibei, and Xinan) of China, nine regions (Hokkaido, Tohoku, Kanto, Chubu, Kinki, Chugoku, Shikoku, Kyushu, and Okinawa) of Japan, and four regions (Seoul Area, Central Area, Southeastern Area, and Southwestern Area) of Korea. We assume that each region has a producer, a household, and a local government, while each nation having corresponding central government and consolidated capital market. The commodities and services are traded not only within each region but also between regions. It implies that the economic institutions are represented by 21 household groups, 21 production sectors, 24 local and national governments, three investors, and the rest of the world. The model is applied to estimate operation effects (period 1 to 10) of North Korea Highway and Korea-Japan Tunnel on regional incomes of 20 regions.

Table 1 Income Impacts of Two Missing Projects on Regions (unit: %)

	North Korea Highway	Korea-Japan Tunnel
Dongbei	2.83	3.19
Huabei	2.71	3.05
Huadong	2.59	2.96
Huanan	2.78	3.25
Huazhong	2.78	2.98
Xibei	2.93	3.25
Xinan	3.02	3.26
Hokkaido	-1.34	-1.39
Tohoku	-1.54	-1.52
Kanto	-1.74	-1.57
Chubu	-1.58	-1.47
Kinki	-1.63	-1.39
Chugoku	-1.38	-1.24
Shikoku	-1.58	-1.49
Kyushu	-1.67	-1.47
Okinawa	-2.23	-2.14
Seoul Area	1.99	2.33
Central Area	1.33	1.94
S.W Area	1.34	2.00
S.E. Area	1.19	1.95

Table 2 Dynamic Income Impacts of Two Missing Projects on the GDP (unit: %)

1) North Korea Highway

Period	1	2	3	4	5	6	7	8	9	10	1-10
China	2.18	2.31	2.43	2.56	2.69	2.82	2.95	3.10	3.24	3.39	2.77
Japan	-1.20	-1.28	-1.37	-1.46	-1.56	-1.66	-1.78	-1.91	-2.05	-2.22	-1.65
Korea	1.51	1.54	1.57	1.60	1.63	1.66	1.69	1.72	1.75	1.78	1.64

2) Korea-Japan Tunnel

Period	1	2	3	4	5	6	7	8	9	10	1-10
China	-0.78	-0.86	-0.94	-1.03	-1.13	-1.24	-1.36	-1.48	-1.62	-1.76	-1.22
Japan	1.14	1.14	1.14	1.15	1.17	1.19	1.23	1.28	1.34	1.43	1.22
Korea	1.00	1.05	1.09	1.13	1.16	1.20	1.23	1.26	1.29	1.33	1.17

4. Summary and further research

The main contribution of this research is to demonstrate the MMCGE model to analyze the economic impacts of the construction of the missing section of the AH1 highway of North Korea on regional economic growth in three northeast Asian countries. Overall, this highway project has the large effects on the GRP of Dongbei, Xibei, and Huabei in China, and Seoul Area in Korea. The simulation of the MMCGE model can provide public agents and stockholders with analytical and strategic insights into the investment efficiency, effectiveness and priority of the highway project in terms of income growth. This numerical model is expected to practically assess transportation investment programs and development strategies with the national and regional economic goals.

Regarding further research directions, it would be worthwhile to examine how a set of different macroeconomic closure rules for the labor and capital markets affect the GRP changes of the highway project in the MMCGE model. For example, the savings-driven neoclassical closure rule in this paper assumes that the investment is determined by total savings, which is expected to have quite different impacts on the economy from a case of investment-driven Johansen closure rule. Also, external shocks such as Foreign Direct Investments (FDI) under the full-employment condition in the factor market have effects on sectoral compositions of total demand, but not on the income. On the contrary, the FDI under the Keynesian macroeconomic closure rule increases the labor demand and the income at the expense of the wage reduction. These experiments on the closure rules can examine what economic conditions in the labor and capital markets are required to maximize the economic benefits of the transportation projects. Another challenge is to address distributional issues i.e. how the construction cost of the AH1 should be shared between two trading partners, China and Korea. This is an important issue because the highway can be viewed as an international public good since investment by one country has spillover benefits for other countries. The investments reduce transportation costs with all trading partners; its benefits are clearly multilateral; thus a three national model seems to underestimate its overall benefits.

References

Kim, Euijune and G. J. D. Hewings (2009), "An Application of Integrated Transport Network –Multiregional CGE Model to Calibration of Synergy Effects of Highway Investments," *Economic Systems Research*, 21(4): 377-397.

Kim, Euijune, G. J. D. Hewings, and C. Hong (2004), "An Application of Integrated Transport Network Multiregional CGE Model I: A Framework for Economic Analysis of Highway Project," *Economic System Research*, 16(3): 235-258.

Kim, Euijune, H. S. Kim and G. J. D. Hewings (2011), "An Impact Analysis of Government Financed Highway Project using Integrated Transport Network –Multiregional CGE Model," *Journal of Transportation Economics and Management*, 45(2): 223-245.