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An Input–Output Analysis on the Economic Effect of the Korean First Medium–term Logistics Plan (2001–2005)*

Pak, Myong Sop**·Yoon, Jae Ho***

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I. Introduction

The Korean economy achieved relatively high economic growth during a long period from 1962 to 1996. The high growth was made possible by exports in labor–intensive industries such as textiles,

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** First Author, School of Business Administration, Sungkyunkwan University

*** Correspondence Author, School of Business Administration, Halla University,

Email: jhyoon@halla.ac.kr

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footwear, and garments due to a sufficient Korean labor force and the low wages of the 1960s and 1970s. The economic growth was maintained by the export of electronic home appliances like TVs, washing machines and VCRs in the 1980s. Since the late 1980s, Korea prepared itself for international competitiveness in several heavy industries including automobiles, steel, and shipbuilding.

However, the Korean economy's growth has slowed in recent years due to competition from other advanced nations and the arrival of developing countries on the global manufacturing scene in the mid 1990s. In the 1990s, Korea became a nation with high wages. As a result, Korean companies in light industries such as textiles or garments lost their competitive edge over companies in China, Southeast Asia, and Latin America that enjoyed abundant labor forces and lower wages. As Korean companies began to be competitive in high-tech industries, companies in advanced nations became reluctant to transfer advanced technologies to Korean companies and as a result, the Korean economy was unable to continue its economic growth by relying on knowledge-intensive and capital-intensive industries essential to an advanced economy. The currency crisis of 1997 was another difficulty for the Korean economy.

After overcoming the financial crisis, the Korean government tried to find a new direction for economic policies to solve the fundamental problems of the Korean economy. The Korean government came to the realization that continuous economic growth was not possible by simply exporting manufactured goods, and decided to change Korea's economic development strategy to emphasize the competitiveness of service industries. This included optimizing banking and logistics and attracting direct overseas investment in high-tech industries.

The paper is organized as follows. First, the background for the adoption of a logistics industry by the Korean government is introduced. Secondly, the core contents of the *National Logistics Plans (2001–2020)*

which contain the basic principles of the logistics policies of the Korean government and its aim to be an ‘Excellent Nation of Logistics’ are introduced. Third and finally, the economic effect of the logistics policies implemented between 2001 and 2005, (the period of the first Medium–term Logistics Plan according to the *National Logistics Plans (2001–2020)* set up by the Korean government at the end of 2000) will be estimated through input–output analysis.

II. The Background of Korea’s 21st Century Logistics Policy

1. The Conversion of the Korean economy to emphasize service industries

The dramatic development of the Chinese economy since the late 1970s has provided opportunities for the Korean economy to become a stimulus in the Northeast Asian region. At the same time, China is becoming an economic threat. In the past, Chinese companies competed with Korean companies mainly in labor–intensive and low–priced products. As time passed, the areas of competition among companies of the two nations have expanded and now they compete on price in most manufacturing sectors. China has become the largest manufacturer in the home appliances industry, traditionally an area in which Korean and Japanese companies were strong players, which threatens Korean manufacturing industries. Though Korean companies still maintain their competitive edge over Chinese companies in such high–tech industries as automobiles, steel and iron, IT, petrochemicals, high–class home appliances, high–class fabrics, and the biotech industry, the gaps are narrowing rapidly.

Korea has struggled with China to attract direct foreign investment in recent years. Currently the technological gap is rapidly narrowing even in high-tech industries such that the Korean government is seriously concerned about the possible deindustrialization of its manufacturing base. It has come to believe that if such trends continue, the Korean economy will be completely outrun by the fast-growing Chinese economy. In a word, there is a fear that the status achieved by hard work over the past 40 years may be lost overnight to neighboring China.

Well aware of the looming crisis, the Korean government came to admit that considerable change is necessary to structure the nation's economy, and has attempted to change its economic policies by taking notice of two facts: 1) The portion of manufacturing costs in the price of a product in general is only 30%, the other 70% of costs are due to professional services such as design, research and development, marketing, logistics, and banking. 2) It is necessary to find new economic opportunities through the business of supporting the cargo-collecting places in Eastern China which are geographically adjacent to Korea, rather than competing head-on with China, which is emerging as the factory of the world.¹⁾

After all, considering the cost disadvantage of the Korean labor force compared to the Chinese labor force, the domestic products market in China and the rapid reduction in the technological gap between the two nations, it is better for the Korean economy to absorb some of the added value created by China's tremendous speed rather than confront China head-on. That is, for the Korean economy, it is most desirable to strategically adopt and develop service industries in order to absorb some of the added value created by the Chinese economy. To this end, the Korean government is restructuring the growth engines

1) Eastern China's three major economic zones are the Pan-Barhae region of Beijing, the Changjiang River Delta of Shanghai, the Jugang Delta of Gwangdung Province and Hong Kong.

for the nation's economy by forming innovation clusters for service industries including banking, logistics, and high–tech industries. (Council for Northeast Economic Development, Reports to the 3rd Government Administration Meeting, 2003, p. 2).

2. Korea's location is advantageous for logistic capabilities

From the viewpoint of the supply chain managers at multinational corporations, Korea is attractive as an outpost for logistics in Northeast Asia. A huge market with a population of about 1.5 billion is located near the Korean peninsula including China and Japan, and Korea is geographically located in the center, connecting China, Far East Russia, and Japan. Moreover, Korea possesses state–of–the–art Internet–based wire and wireless communication facilities and market–oriented and effective transportation service industries.

Incheon International Airport is located where direct flights are possible to both Europe and North America, and there are 43 large cities with a population of over one million located within three hours flying time. Korean Air, a Korean flagship, is ranked second in the volume of cargo transported among world airline service companies. Busan Harbor and Gwangyang Harbor are well–positioned transit harbors on the main sea routes of the world, and the volume of the container load at Busan Harbor is third or fourth in the world.

The Korean economy has continued to develop for the past 40 years and its own import/export volume is ranked high. In particular, orders for exports of semiconductors, home appliances, automobiles, steel, and shipbuilding require excellent logistics facilities in Korea and may foster more Korean logistics companies. Furthermore, the outsourcing of the logistics business may increase with the expansion of the supply chain management industry in Korea. Already, professional logistics companies are actively being established.

In addition, Korea has many potential employees who are able to use the Internet and speak foreign languages. The Korean government is committed to supporting the establishment of logistics companies by measures including a competitive taxation system, financial assistance, and appropriate regulation. It is also planning to build additional infrastructure including harbors, airports, and railroads to support its goal of becoming the logistics center of Northeast Asia.²⁾

III. Korea's Policy to become a Logistics Hub in Northeast Asia

1. The Vision of Korea's Logistics policy

The Korean government set up the *National Logistics Plans (2001–2020)* at the end of 2000. It is a long-term 20-year plan to promote Korea's logistics capability and to effectively allocate and coordinate the responsibilities of government by establishing common policy goals among the related agencies for logistics in Korea. In addition, the "First Medium-term Logistics Plan (2001–2005)" was created and implemented.

The Korean government set up the following three policy goals in the *National Logistics Plans (2001–2020)*. First, Korea will become a powerful nation in logistics, carrying out a pivotal role in logistics in

2) In Guangdongsheng, Hong Kong plays a hub port role, and in Janggang Delta region, Shanghai does. However, in the Pan-Barhae region, there is no hub port. The Pan-Barhae region has Dalian, Tienjin, and Qingdao ports but these ports don't have enough depth compared to ports on Korea's southern and western coastlines. Therefore, Incheon International Airport and ports on Korea's western coastlines are the best choice for trade with China's Shandong Province and the three provinces in the Northeast region.

Northeast Asia. Second, Korea will become a knowledge nation leading the knowledge-based economy in high-tech logistics. Third, Korea will build an "advanced nation in logistics in the 21st century" by becoming a nation which creates wealth through value-added logistics.

For this, the Korean government suggests six visions of logistics policies. The first is 'Global Logistics which links Korea to the world.' This means that Korea is committed to establishing itself as the gateway to logistics in northeast Asia for international trade with Europe and North America by setting up a logistics hub in Korea for Northeast and Southwest Asia.

The second is 'high-class custom logistics service' which provides logistics services through a strategic alliance among business corporations and services to satisfy shippers whose needs change rapidly.

The third is 'smooth seamless logistics' which aims to respond to demands for small-quantity, multi-frequency logistics and create a high-density transportation system with road feeder service (RFS).

The fourth is 'cyber logistics based on the internet' which means that computerization, standardization, and joint operation for logistics will be implemented and one-stop service for transaction and information provision in logistics will be provided to respond to electronic commerce.

The fifth is 'open logistics faithful to the principles of a market economy' to meet the requirements of the global corporate environment.

The sixth is 'environmentally-friendly and safety-oriented green logistics' which is meant to promote a human-oriented logistics system for safe cargo transportation and to develop eco-friendly technology for logistics.

2. The Five Strategies of Korea's Logistics policy

The Korean government set up goals for the five sub-strategies to

achieve the vision and policy goals of the aforementioned *National Logistics Plans (2001–2020)*. First, the main networks for logistics will be established to make a powerful nation in logistics. Second, hardware and software will be compatible to promote advanced technologies in logistics. Third, international competitiveness will be strengthened by improving the logistics industry. Fourth, eco–friendly logistics will be created with respect for safety and the environment. Fifth, global logistics networks will be established to link Korea and the rest of the world. The specifics of the goals are as follows:

(1) The establishment of networks for logistics

Place logistics outpost facilities for each economic zone. Composite cargo terminal and inland container bases are constructed in five regions for the establishment of logistics networks to establish hub and spoke logistics networks. The outpost logistics centers are built to distribute agriculture and fishery products for collection, storage, processing, packing and shipping.

- Arrange the urban distribution system for systematic arrangement of distribution facilities in the city. This expands the infrastructure to alleviate the urban traffic jam, rationalizes cargo transportation by reasonable arrangement of urban distribution facilities, improves the distribution–related system and implements reasonable cargo transportation and local policies.
- Adjust the expansion plan for logistics facilities by related agencies at a governmental level. The related departments will examine for overlapped investment and optimal arrangement by examining costs for regional distribution facilities and adjust the plan to expand the distribution facilities implemented by each department of the government as needed.

(2) Advanced technologies in logistics for harmonization of hardware and software

- Set up integrated logistics networks which can support the decision making processes of government, companies, and individuals. Individual networks such as land, sea and air networks and relevant networks such as port logistics, customs clearance, and trade networks will be integrated. Also, with IT technologies, logistics information network plans will be set up and civil companies' efforts to build logistics information networks will be supported.
- Standardize domestic and international logistics systems to improve efficiency and productivity in logistics. Logistics equipment and information systems will be standardized to set up a unit–load system and the national logistics standardization plans will be set up based on common goals by defining roles between relevant government organizations.
- Develop and distribute advanced logistics technology with high economic value. The government will support development of next generation logistics information systems with advanced IT, lead systematic logistics technology R&D projects, set up logistics technology development plans, and attract investment from other countries into advanced logistics technology and innovation methods.

(3) Strengthen international competitiveness by improving the logistics industry

- Establish environments for improving national competitiveness in the logistics industry. The government will redirect traffic to railways and coastal transportation means, minimize regulations that impede free competition, strengthen regulations which protect customer

rights, and set up logistics infrastructure and logistics information networks to improve transportation efficiency by adding new freight terminals.

- Improve storage systems by supporting the transformation of storage to warehouses. Automated systems will be introduced to optimize storage usage, and more warehouses will be constructed for efficient delivery and stock management.
- Mechanize loading-and-unloading processes to improve productivity. Port management and port operation will be managed under a single organization. For efficient loading and unloading, the labor supply system will be improved.
- Standardize package specifications: New packaging materials and equipment will be developed. Packaging lines will be automated. Packaging specifications will be standardized for standard pallets.

(4) Promote safety and the environment

- Construct an eco-friendly underground logistics system. To transport liquefied gases or oil safely, pipeline networks will be established, and by utilizing underground facilities, waste and small package transportation systems will be built.
- Strengthen regulations on the transportation of harmful materials and wastes. No harmful material transportation areas will be set up near water sources or populated areas. Commercial Vehicle Operation Systems (CVO) will be employed to continuously monitor vehicles carrying oil, toxic materials, explosives or radioactive materials. Laws will be reorganized for systematic dangerous material management.
- Encourage the use of returnable pallets and containers to preserve the environment.

(5) Establish global logistics networks to link the world.

- Secure international class airports and harbors. Air cargo complexes will be constructed in Incheon International Airport and Gimpo International Airport to improve their cargo handling capabilities. Busan Harbor and Gwangyang Harbor will be renovated into modern penta–ports.
- Build foundations for economic unification between the two Koreas. To tackle problems in trade between the two Koreas, total logistics operation systems will be built to include North Korea.
- Provide open sales environments for overseas advanced logistics companies. Duty free zones and foreign investment zones will be designated within areas around major airports and harbors. Customs clearance processes will be streamlined for fast export/import cargo processing. Logistics network plans will be set up to build a single Northeast transportation market. Experts specializing in logistics will be recruited from the world logistics market.

IV. Input–Output Analysis of the First Medium–term Logistics Plan

1. Input–Output Table of Korea

The input–output analysis based on the input–output table that shows the inter–industry transactions for the economy. The Bank of Korea has published an ‘Input–Output Table for Korea’ for several years which records all the inter–industry transactions each year in the Korean economy since 1962.

The 2000 Input–Output Table, which was published in 2003 by the

Bank of Korea, is used for input–output analysis in this study. This table has the following features: There are 404 basic industries; 168 low–class industries, 77 middle–class industries, and 28 upper–class industries. Concerning price evaluation standards, there are producer prices and buyer prices. Regarding imports, there are competition import tables in which domestic products and imported products are not distinguished for the same goods or service, and non–competition import tables in which domestic products and imported products are separated. (The Bank of Korea, *An Introduction to Input–Output Analysis*, 2004, p. 3). In this analysis, we mainly used 77 middle–class industry classifications, producer prices, and the non–competition import table.

2. Data Used in the Input–Output Analysis

The data used in this study are extracted from the *National Logistics Plans (2001–2002)* reported by the Ministry of Construction and Transportation of Korea. It includes ‘Financial Spending Plans in the periods over the First Medium–term Logistics Plan’ in its texts from page 27 to page 62. They show organizations in charge, investment amounts, the starting and ending dates, and purposes of various projects.

Since the original data are described in form of texts within the report, the input data used for the input–output analysis are processed in three steps. First, the Financial Spending Plans are extracted from the texts and reorganized as shown in <Table 1>.

<Table 1> Some Examples of Financial Spending Plans

Page	Project	Organization in Charge	Starting Year	Ending Year	Costs (Billion Won)
28	Integrated Freight Terminal Construction	MCT	2001	2005	236
	Incoming Railroad Construction	KORAIL	2000	2004	54
29	Total Logistics Complex (Daejeon)	MCT	1999	2002	917
	Total Logistics Complex (Cheonan)	MCT	2000	2004	45
	Total Logistics Complex (Ulsan)	MCT	2000	2004	51
30	Common Delivery Complex (By Region)	MCIE	2001	2005	134
	Delivery Center Construction Support	MCIE	2001	2005	108
Note: 6MCT stands for the Ministry of Construction and Transportation of Korea and MCIE for the Ministry of Commerce, Industry and Energy of Korea					

Second, regarding the projects which are to be carried out during the periods including 2001-2005 years, their total costs are divided by their project periods to calculate their annual average amounts. Then, the annual average amounts for only 2001-2005 years are added to get government spending on each project for the periods of the First Medium-term Logistics plan (2001-2005). From this calculation, the total government spending on the First Medium-term Logistics plan (2001-2005) is found 4,102.7 billion won(\) for a total of 42 projects including integrated freight terminal construction, incoming railroad construction, logistics complex construction, delivery center construction,

container yard construction, total logistics information network setup, and procurement of container trucks.

Finally, to apply the calculated data to the input-output model of Korea, the Bank of Korea's four-digit industry classification codes are matched to 42 projects respectively. For instance, freight terminal construction is classified as non-housing construction (0314); incoming railway construction as railway facility construction (0318); total logistics network construction as software development and supply (0364), and equipment purchasing projects for ULS setup as the industrial transportation machine (0229). The final form of the input data are shown in <Table 2>, whose total project volume is 4,102.7 billion won.

<Table 2> Financial Expenditures for the First Medium-term Logistics Plan

Industry code	Type	Expenditure amounts for 2001-2005 in billion won
0173	Plastic products for industry	121.2
0225	Other metal product	7.3
0229	Moving equipment for industry	121.2
0283	Vehicle	113.8
0291	Train	175.0
0314, 0315(Sub-div. 0130)	Non-residential houses	1,358.7
0318	Rail facilities	124.6
0325	City public work	760.0
0328	Other construction	1,148.8
0364	Software development	172.8
Total		4,102.7
Data: Ministry of Construction and Transportation of Korea, the National Plan for Logistics (2001-2020), 2001, pp. 27-62.		

3. Input–Output Analysis Results

In order to analyze the effect of the first Medium–term Logistics Plan (2001–2005) on the Korean economy, we first computed various input–output multipliers, based on the *The 2000 Input–Output Table*, such as output multiplier, import multiplier, value–added multiplier, and employment multipliers.³⁾ These multipliers are then applied to forecasting the impact of the financial expenditures according to the first Medium–term Logistics Plan (2001–2005) as shown in <Table 2> above.

(1) Output effect

Output effect is defined as the production change in all industries as a result of the change in demand for some industries. The output effect of the first Medium–term Logistics Plan (2001–2005) is measured as the change in production of all industries caused by this policy and computed by multiplying the financial expenditures in <Table 2> by the output multiplier.⁴⁾

<Table 3> shows the total output effect, which is the sum of the direct and indirect effects and its relative weight for various industries. The total amount of output effect is 8,085.6 billionwon, mainly in the non–housing construction (1,358.7 billion won), other construction (1,148.2 billion won), urban civil engineering (760.0 billion won), 1st metal products (620.3 billion won), real estate and business services (531.5 billion won), non–metal products (357.1 billion won), metal products (243.8 billion won), chemical products (242.5 billion won), and electrical and electronics products (224.1 billion won).

The total amount of the indirect output effect is 3,982.9 billion

3) See Miller and Blair (1985), Oosterhaven (1996), and Oosterhaven (1988) for more information.

4) Output effect can be expressed as $X = (I - A^d)^{-1} Y^d$. Here, X is output, $(I - A^d)^{-1}$ output multiplier, and Y^d final demands, here, government expenditure.

won, mainly in 1st metal products (620.3 billion won), real estate and business services (531.5 billion won), non-metal products (357.1 billion won), metal products (243.8 billion won), electrical and electronics products (224.1 billion won), finance and insurance (213.9 billion won), wholesale and retail (159.0 billion won) and petroleum and coal (150.6 billion won).

<Table 3> Total output effects, direct output effects, and indirect output effects

Industry	Total effect		Direct effect (billion won)	Indirect effect	
	(billion won)	Weight		(billion won)	Weight
Agricultural and marine	26.7	0.33	0	26.7	0.67
Mineral	52.2	0.65	0	52.2	1.31
Food/grocery	27.1	0.33	0	27.1	0.68
Fiber/leather	25.9	0.32	0	25.9	0.65
Wood/paper	82.3	1.02	0	82.3	2.07
Printing/publishing	28.2	0.35	0	28.2	0.71
Petroleum/coal	150.6	1.86	0	150.6	3.78
Chemical	242.5	3.00	0	242.5	6.09
Industrial plastic	185.3	2.29	121.2	64.1	1.61
Non-metal	357.1	4.42	0	357.1	8.96
1 st metal	620.3	7.67	0	620.3	15.57
Metal	243.8	3.02	0	243.8	6.12
Other metal	19.7	0.24	73.3	12.3	0.31

Industry	Total effect		Direct effect	Indirect effect	
	(billion won)	Weight	(billion won)	(billion won)	Weight
Common machinery	150.3	1.86	0	150.3	3.77
Industrial moving machinery	16.1	1.99	12.1	39.4	0.99
Electrical/electronics	224.1	2.77	0	224.1	5.63
Precision tool	15.9	0.20	0	15.9	0.40
Transferring equipment	70.9	0.88	0	70.9	1.78
Vehicle	113.8	1.41	113.8	0.0	0.00
Ship	0.3	0.00	0	0.3	0.01
Train	198.0	2.45	175.0	23.0	0.58
Furniture	12.6	0.16	0	12.6	0.32
Gas/water	100.5	1.24	0	100.5	2.52
Construction	34.8	0.43	0	34.8	0.87
Non-housing construction	1,358.7	16.80	1,358.7	0.0	0.00
Train facilities	124.6	1.54	124.6	0.0	0.00
Urban civil engineering	760.0	9.40	760.0	0.0	0.00
Other construction	1,148.2	14.20	1,148.2	0.0	0.00
Wholesale /retail	159.0	1.97	0	159.0	3.99
Food/accommodation	55.6	0.69	0	55.6	1.40
Passenger transport by train	2.2	0.03	0	2.2	0.06
Luggage transport by train	2.1	0.03	0	2.1	0.05

Industry	Total effect		Direct effect (billion won)	Indirect effect	
	(billion won)	Weight		(billion won)	Weight
Passenger transport by car	12.4	0.15	0	12.4	0.31
Luggage transport by car	33.3	0.41	0	33.3	0.84
Water transport	6.5	0.08	0	6.5	0.16
Shipping	0.0	0.00	0	0.0	0.00
Air flight	8.9	0.11	0	8.9	0.22
Support land transfer	7.8	0.10	0	7.8	0.20
Support water transfer	0.7	0.01	0	0.7	0.02
Support air transfer	0.4	0.00	0	0.4	0.01
Cargo working	3.8	0.05	0	3.8	0.09
Storage	2.0	0.02	0	2.0	0.05
Other related transfer	0.8	0.01	0	0.8	0.02
Communication	80.1	0.99	0	80.1	2.01
Finance/insurance	213.9	2.65	0	213.9	5.37
Real estate / business services	531.5	6.57	0	531.5	13.35
Software development	176.2	2.18	172.8	3.4	0.08
Public administration / National defense	0.0	0.00	0	0.0	0.00
Education/health	114.8	1.42	0	114.8	2.88
Social and other	17.9	0.22	0	17.9	0.45
Other	121.2	1.50	0	121.2	3.04
Total	8,085.6	100	4,102.7	3,982.9	100

(2) Value-added effect

The change in final demand induces change in the domestic production level and the variation in the domestic production level creates value in primary production factors, such as labor and capital, which is defined as the value-added effect. Therefore, the change in final demand, for example in government expenditure, becomes a main source of added value in the economy via the production effect.

The value-added effect of the First Medium-term Logistics Plan (2001-2005) is measured according to the change in the value-added in all industries and computed by multiplying financial expenditures in <Table 2> by the value-added multiplier.⁵⁾

<Table 4> shows the value-added effect and its relative weight among industries. The total amount of value added is 3,376.0 billion won, mainly in non-housing construction (602.3 billion won), other construction (540.2 billion won), real estate and business services (379.5 billion won), urban civil engineering (359.4 billion won), finance and insurance (147.1 billion won), 1st metal products (130.8 billion won), software development (122.5 billion won), non-metal products (121.3 billion won), and metal products (82.4 billion won).

<Table 4> Value-added effects and import effects

Industry	Investment plan	Value-added effect		Import effect	
	(billion won)	(billion won)	Weight	(billion won)	Weight
Agricultural and marine	0.0	16.7	0.49	8.2	1.13
Mineral	0.0	33.1	0.98	139.8	19.24
Food/grocery	0.0	7.3	0.22	4.7	0.65

5) The value-added multiplier is $A^v(I-A^d)^{-1}$ and the value-added effect can be expressed as $V = A^v(I-A^d)^{-1}Y^d$. Here, V is added-value effect, A^v added-value coefficient, $(I-A^d)^{-1}$ domestic output multiplier, and Y^d government expenditure.

Industry	Investment plan	Value-added effect		Import effect	
	(billion won)	(billion won)	Weight	(billion won)	Weight
Fiber/leather	0.0	7.7	0.23	5.4	0.74
Wood/paper	0.0	21.9	0.65	21.5	2.96
Printing/publishing	0.0	8.8	0.26	1.3	0.18
Petroleum/coal	0.0	49.4	1.46	29.0	3.99
Chemical	0.0	58.2	1.73	67.2	9.24
Industrial plastic	121.2	52.1	1.54	3.0	0.41
Non-metal	0.0	121.3	3.59	18.5	2.55
1 st metal	0.0	130.8	3.88	136.7	18.82
Metal	0.0	82.4	2.44	11.7	1.60
Other metal	7.3	7.7	0.23	3.7	0.51
Common machinery	0.0	46.0	1.36	54.2	7.45
Industrial moving machinery	121.2	52.3	1.55	9.0	1.24
Electrical/electronics	0.0	61.2	1.81	90.8	12.49
Precision tool	0.0	4.1	0.12	9.7	1.34
Transferring equipment	0.0	16.1	0.48	12.7	1.74
Vehicle	113.8	19.7	0.58	0.0	0.00
Ship	0.0	0.1	0.00	0.04	0.01
Train	175.0	23.5	0.70	18.1	2.49
Furniture	0.0	4.3	0.13	2.0	0.28

Industry	Investment plan	Value–added effect		Import effect	
	(billion won)	(billion won)	Weight	(billion won)	Weight
Gas/water	0.0	45.8	1.36	0.03	0.00
Construction	0.0	15.3	0.45	0.06	0.01
Non–housing construction	1,358.7	602.3	17.84	0.0	0.00
Train facilities	124.6	34.9	1.03	0.0	0.00
Urban civil engineering	760.0	359.4	10.65	0.0	0.00
Other construction	1,148.2	540.2	16.00	0.0	0.00
Wholesale /retail	0.0	100.2	2.97	3.2	0.44
Food/accommodation	0.0	22.5	0.67	11.1	1.52
Passenger transport by train	0.0	1.3	0.04	0.4	0.06
Luggage transport by train	0.0	0.6	0.02	0.0	0.00
Passenger transport by car	0.0	7.1	0.21	0.9	0.12
Luggage transport by car	0.0	16.5	0.49	0.03	0.00
Water transport	0.0	2.4.	0.07	0.0	0.00
Shipping	0.0	0.0	0.00	0.0	0.00
Air flight	0.0	2.3	0.07	2.0	0.27
Support land transfer	0.0	6.7	0.20	0.02	0.00
Support water transfer	0.0	0.5	0.02	0.01	0.00
Support air transfer	0.0	0.3	0.01	0.6	0.08
Cargo working	0.0	2.6	0.08	0.1	0.02

Industry	Investment plan	Value-added effect		Import effect	
	(billion won)	(billion won)	Weight	(billion won)	Weight
Storage	0.0	1.3	0.04	0.04	0.01
Other related transfer	0.0	0.5	0.01	0.6	0.08
Communication	0.0	46.8	1.39	2.2	0.30
Finance/insurance	0.0	147.1	4.36	5.8	0.80
Real estate / business services	0.0	379.5	11.24	27.3	3.76
Software development	172.8	122.5	3.63	0.5	0.07
Public administration / National defense	0.0	0.0	0.00	0.0	0.00
Education/health	0.0	77.0	2.28	0.01	0.00
Social	0.0	9.0	0.27	1.8	0.24
Other	0.0	6.8	0.20	23.0	3.17
Total	4,102.7	3,376.0	100	726.7	100

(3) Import effect

The change in final demand for government expenditures results in imported goods and services from abroad for domestic production. This is called the import effect and it is computed by multiplying government expenditures in <Table 2> by the import multiplier.⁶⁾

<Table 4> shows the import effect and its relative weight among industries. The total amount of the import effect is 726.7 billion won,

6) The import multiplier is $A^m(I-A^d)^{-1}$ and the import effect can be expressed as $M=A^m(I-A^d)^{-1}Y^d$. Here, M is import effect, A^m import coefficient, $(I-A^d)^{-1}$ domestic output multiplier, Y^d government expenditure.

mainly in the mineral products (139.8 billion won), 1st metal products (136.7 billion won), electrical-electronics products (90.8 billion won), chemical products (67.2 billion won), common machinery (54.2 billion won), petroleum and coal (29.0 billion won), real estate and business services (27.3 billion won), others (23.0 billion won), and wood and paper (21.5 billion won).

(4) Employment effect and hiring effect

The change in final demand from government expenditure causes change in labor demand through the output effect. There are two kinds of multipliers related to the change in labor demand. One is the employment multiplier (including self-employed and unpaid family supporters with paid laborers) and the other is the hiring (paid labors) multiplier.⁷⁾ The employment effect and the hiring effect of the First Medium-term Logistics Plan are calculated as the diagonal matrices of employment and hiring coefficients multiplied by the government expenditures in <Table 2>.

<Table 5> shows that the total employment effect is 79,203.7 people, which is composed of non-housing construction (17,091.6 people), other construction (1,444.1 people), urban civil engineering (9,560.5 people), wholesale and retail (6,571.8 people), real estate and business services (3,288.2 people), metal products (2,607.7 people), education and health care (2,448.2 people), finance and insurance (2,356.7 people), and non-metal products (2,264.6 people).

The total hiring effect shown in <Table 5> is 67,547.7 people, which is made up of non-housing construction (16,232.8 people), other construction (13,718.3 people), urban civil engineering (9,080.1

7) The employment coefficient is $l_w = L_w / X$ and the hiring coefficient is $l_e = L_e / X$. Here, l_w is the employment coefficient, L_w total domestic labors including self-employed and unpaid family supporters, l_e is the hiring coefficient, L_e the number of domestic paid labors and, X is gross national output.

people), wholesale and retail (2,663.0 people), real estate and business services (2,618.4 people), finance and insurance (2,340.5 people), education and health care (2,196.3 people), metal products (2,176.8 people), and non-metal products (2,087.6 people).

<Table 5> Employment effects and hiring effects

Industry	Investment plan	Employment effects		Hiring effects	
	(billion won)	(people)	Weight	(people)	Weight
Agricultural and marine	0.0	1,555.9	1.96	115.0	0.17
Mineral	0.0	374.8	0.47	339.4	0.50
Food/grocery	0.0	129.7	0.16	95.5	0.14
Fiber/leather	0.0	281.6	0.36	245.5	0.36
Wood/paper	0.0	517.6	0.65	449.4	0.67
Printing/publishing	0.0	371.7	0.47	307.6	0.46
Petroleum/coal	0.0	51.6	0.07	50.9	0.08
Chemical	0.0	885.6	1.12	847.7	1.26
Industrial plastic	121.2	676.7	0.85	647.7	0.96
Non-metal	0.0	2,264.6	2.86	2,087.6	3.09
1 st metal	0.0	1,208.6	1.53	1,158.4	1.71
Metal	0.0	2,607.7	3.29	2,176.8	3.22
Other metal	7.3	210.3	0.27	175.5	0.26
Common machinery	0.0	1,082.1	1.37	991.3	1.47
Industrial moving machinery	121.2	1,156.2	1.46	1,059.3	1.57

Industry	Investment plan	Employment effects		Hiring effects	
	(billion won)	(people)	Weight	(people)	Weight
Electrical/electronics	0.0	880.4	1.11	853.8	1.26
Precision tool	0.0	145.7	0.18	134.6	0.20
Transferring equipment	0.0	295.5	0.37	290.1	0.43
Vehicle	113.8	474.2	0.60	465.6	0.69
Ship	0.0	1.3	0.00	1.3	0.00
Train	175.0	824.7	1.04	809.7	1.20
Furniture	0.0	168.4	0.21	131.0	0.19
Gas/water	0.0	229.6	0.29	229.6	0.34
Construction	0.0	438.2	0.55	416.2	0.62
Non–housing construction	1,358.7	17,091.6	21.58	16,232.8	24.03
Train facilities	124.6	1,567.3	1.98	1,488.6	2.20
Urban civil engineeering	760.0	9,560.5	12.07	9,080.1	13.44
Other construction	1,148.2	14,444.1	18.24	13,718.3	20.31
Whole–sale /retail	0.0	6,571.8	8.30	2,663.0	3.94
Food/accommodation	0.0	1,851.3	2.34	804.3	1.19
Passenger transport by train	0.0	34.2	0.04	24.7	0.04
Luggage transport by by train	0.0	32.8	0.04	23.7	0.04
Passenger transport by car	0.0	189.8	0.24	137.1	0.20
Luggage transport by car	0.0	508.9	0.64	367.6	0.54

Industry	Investment plan	Employment effects		Hiring effects	
	(billion won)	(people)	Weight	(people)	Weight
Water transport	0.0	99.1	0.13	71.6	0.11
Shipping	0.0	0.0	0.00	0.0	0.00
Air flight	0.0	135.8	0.17	98.1	0.15
Support land transfer	0.0	119.1	0.15	86.0	0.13
Support water transfer	0.0	10.8	0.01	7.8	0.01
Support air transfer	0.0	5.4	0.01	3.9	0.01
Cargo working	0.0	57.8	0.07	41.7	0.06
Storage	0.0	30.3	0.04	21.9	0.03
Other related transfer	0.0	12.0	0.02	8.7	0.01
Communication	0.0	299.5	0.38	290.7	0.43
Finance/insurance	0.0	2,356.7	2.98	2,340.5	3.46
Real estate / business services	0.0	3,288.2	4.15	2,618.4	3.88
Software development	172.8	1,089.9	1.38	867.9	1.28
Public administration / national defense	0.0	0.0	0.00	0.0	0.00
Education/health	0.0	2,448.2	3.09	2,196.3	3.25
Social	0.0	566.0	0.71	274.5	0.41
Other	0.0	0.0	0.00	0.0	0.00
Total	4,102.7	79,203.7	100	67,547.7	100

V. Summary and Conclusions

In the process of overcoming the financial and foreign currency crisis in 1997, the Korean government chose the logistics industry for its new strategic growth initiative along with banking and some high–technology industry sectors. What lies behind this new policy is as follows. First, as the Chinese economy grew rapidly in the late 20th century, northeast Asia’s influence on the world economy increased. Secondly, as Korea faced more competition in the labor–intensive industry from developing countries, and more competition in the high–tech industry from developed countries, the Korean government decided to focus on Korea’s natural geographic advantage to become a logistics hub for Northeast Asia.

The Korean government set up the *National Logistics Plans (2001–2020)* at the end of 2000. A long–term plan to promote the future of logistics in Korea and to effectively allocate and coordinate the responsibilities of each government department by establishing common policy goals for the related agencies for logistics in Korea. In the plan, the Korean government presented six logistics visions: Global Logistics, Custom–made Logistics, Seamless Logistics, Cyber Logistics, Open Logistics, and Green Logistics.

Based on these visions, the Korean government has the following three policy goals: First, Korea will become a strong nation in logistics and carry out a pivotal role in northeast Asia. Secondly, Korea will become a leading knowledge–intensive nation. Finally, Korea will build an “Advanced nation in logistics in the 21st century” by becoming a nation with many logistics experts who create wealth through value–added logistics strategies (*National Logistics Plans (2001–2020)*, p. 17).

During the first medium–term period of the *National Logistics Plans (2001–2020)*, 2001–2005, by applying the input–output model, the economic

effects of various investment policies for logistics infrastructures are quantified. Total output effect is 8,085 billion won. This figure is broken down into non-housing construction (16.8%), other construction (14.2%), urban civil engineering (9.4%), 1st metal products (7.7%), real estate and business services (6.6%), non-metal products (4.4%), metal products (3%), chemical products (3%), and electrical and electronic products (2.8%). Total indirect output effect is 3,982 billion won, which consists of the 1st metal industry (15.6%), real estate and business services (13.4%), non-metal products (9%), metal products (6.1%), electrical and electronic products (5.6%), finance and insurance (5.4%), wholesale and retail (4%), and petroleum and coal (3.8%).

The total value-added effect is 3,376 billion won, which consists of non-housing construction (17.8%), other construction (16%), real estate and business services (11.2%), urban civil engineering (10.7%), finance and insurance (4.4%), 1st metal products (3.9%), software development (3.6%), non-metal products (3.6%), and metal products (2.4). The total import effect is 726 billion won, which is made up of mineral products (19.2%), 1st metal products (18.8%), electrical and electronic products (12.5%), chemical products (9.2%), common machinery (7.5%), petroleum and coal (4.0%), real estate and business services (3.8%), others (3.2%), and wood and paper (3.0%).

The total employment effect is 79,203.7 people, which is composed of non-housing construction (21.6%), other construction (18.2%), urban civil engineering (12.1%), wholesale and retail (8.3%), real estate and business services (4.2%), metal products (3.3%), education and health care (3.1%), finance and insurance (3%), and non-metal products (2.9%). The total hiring effect is 67,547.7 people, which is made up of non-housing construction (24%), other construction (20.3%), urban civil engineering (13.4%), wholesale and retail (3.9%), real estate and business services (3.9%), finance and insurance industry (3.5%), education and health care (3.3%), metal products (3.2%), and non-metal products (3.1%).

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ABSTRACT

An Input–Output Analysis on the Economic Effect of the Korean First Medium–term Logistics Plan (2001–2005)

Pak, Myong Sup·Yoon, Jae Ho

This study introduces the adoption of the logistics industry by the Korean government as a threshold of overcoming economic difficulties. The core contents of the National Logistics Plans (2001–2020) which contain the basic principles of the logistics policies of the Korean government and its aim to be an ‘Excellent Nation of Logistics’ is introduced. The economic effect of the logistics policies implemented between 2001 and 2005, (the period of the first Medium–term Logistics Plan according to the National Logistics Plans (2001–2020) set up by the Korean government at the end of 2000) is estimated through input–output analysis.

The input–output analysis result is as follows: the total output effect is 8,856 billion won of which indirect output effect is 3,982.9 billion won; indirect output effect comes mainly from real estate and business services, non–metal products, metal products, electrical and electronics products, finance and insurance, wholesale and retail, petroleum and coal; the total amount of value–added effect is 3,376 billion won and total import effect is 726 billion won. Employment

effect including self-employed and unpaid family supporters with paid laborers is 79,203.7 people of which paid laborers comprise 67,547.7 people.

Key Words : input-output analysis, inter-industry analysis,
logistics policy, output effect, value-added effect,
import effect, employment effect, hiring effect