An Analysis on Price Repercussion Effect of the Cost-Push Factors by using the Input-Output Model

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Abstract: The main purpose of this study is to analyze the price impact effect of the cost-push factors by using an inter-industrial model. Specially, this study analyzed the price spreading effect of foreign raw materials, wage raise, public utility costs, crude oils, and exchange rate fluctuations.

Input-output tables are statistical data which show the flow of goods and services in connection with production and distribution activities between the various sectors of a national or regional economy in a certain period.

The 2000 input-output model in Gyeongbuk province was reclassified and aggregated to 27 sectors from 28 sectors of national input-output tables.

The cost-push factors affecting commodity price are public utility charges, raw material prices, exchange rate fluctuations, and wages.

The results of the empirical analysis of the price repercussion effect by the 2000 regional input-output model can be summarized as follows:

First, industries with a high power of price dispersion index in the Gyeongbuk region were primary metal products, petroleum products and chemicals, electric, gas and water services, electronic and other electric equipment, and agriculture, forestry and fisheries. Industries with high power of price sensitivity index were primary metal products, fabricated metal products, food and kindred products, nonmetallic minerals, general machinery and equipment, and textile mill and apparel products.

Second, it is shown that the price spreading effect of increased wages and value added is greater in service industries than in manufacturing industries. This is because the weight of the value added is heavier in service industries than in manufacturing industries.

Third, industries with a higher price repercussion effect in case of increases in electricity, gas, and water costs, in transportation and warehousing prices are nonmetallic minerals, mining and quarrying, fabricated metal products, primary metal products, and petroleum, coal products and chemicals. Public utility and transportation charges have a high price repercussion effects. Thus, governments need to make an effort to lead them to a stable rate rise for the general price stabilization purpose.

Fourth, in the case of a 10% percent rise in the price of imported commodity by each sector, the sectors with high price impact effect to

Kyeongbuk regional products were mining and quarrying products, electronic and other electric equipment, primary metal products, petroleum, coal products and chemicals, agriculture, forestry and fisheries, and textile mill products and apparel. But those with low price impact effect were electric, gas and water services, and construction. The reason is that these industries have a relatively low ratio of imported goods as intermediate inputs, and in most cases they function as nontrade items.

Fifth, in the case of a 10 percent rise in the exchange rate, the sectors with high a price impact effect on regional products were electronic and other electric equipment, fabricated metal products, petroleum, coal products and chemicals, electric, gas, and water, textile mill products and apparel, primary metal products, and precision Instruments. In case of a 10 percent rise in the exchange rate, the price repercussion effect on producer prices in Gyeongbuk province is 1.8998%.

Lastly, in the sectors where price changes of imported commodity have a high price repercussion effect, we should try to find ways to reduce their import portions or to produce their domestic substitutes. The governments also need try to diversify the foreign suppliers for the stable supply of foreign crude oils and raw materials, and to stock important commodities at an appropriate level to prepare for a sudden price hike.

Since the rise in foreign exchange rates also has high price repercussion effects, we should find ways to forecast accurately foreign exchange rate fluctuations so that their effects are minimized.

Keyword: regional input-output model, price repercussion effect, cost-push factors
Jel Classification: R5, E3, C1

I. Introduction

Commodity prices in Korea increased rapidly since the liberation in 1945 until the late 1970s, but prices have been stabilized since 1999. More recently, greater pressure on commodity prices have grown due to cost-push factors-i.e. foreign raw materials, crude oils, and exchange rate fluctuations.

As of August 2005, the consumer price index in Kyeongbuk province is 115.4, showing a 15.4 percent increase compared to 2000. This is less than the average percent increase of 18.2 percent found in all the big cities. Therefore, this seems less volatile than other provinces and big cities.

Due to the greater level of economic openness in recent years, the Korean economy has become more sensitive to foreign market conditions. That is, the Korean economy has become more closely related with cost-push factors-i.e. price changes of foreign raw materials, crude oils, and exchange rate fluctuations. A rise in consumer prices due to cost-push factors can be analyzed with quantitative methods using simple equations or simultaneous equations, but for more specific analysis and to study interrelated impacts among industries, the price repercussion effect analysis based on the input-output model is more desirable. There are few systemic attempts to analyze the price repercussion effect using the input-output model, except for a partial analysis by the Bank of Korea.

The price spread model within the input-output modeling frame is an attempt to analyze the interactions between wage and consumer prices, and the price repercussion process between industrial sectors. Western economists lead this strand of research (V. Bulmer-Thomas, 1982, pp. 224～225). Also this model is called as an "efficient price model", because the price in this model is determined by the full-cost principle.

The price repercussion effect analysis with input-output model started when Professor Leontief (W.W. Leontief) estimated the price repercussion effect of wage and profit changes in a certain industry on product prices in various other industries. He analyzed the inter- relationship between wages

and profits on the one hand and product prices on the other in the 1939 American economy within this framework. Since then, the basic Leontief price model has been modified and developed in various directions.[1] The utility of the price repercussion effect analysis with the input-output model is the possibility to accurately estimate direct and indirect price repercussion effects among industries and the availability to identify the cost-push factors determining a large portion of the product price. This model is especially useful in analyzing the economic structure which is sensitive to the raw material price changes and the cost-push factors such as wage, and profits. The Korean economy is the fitting case because it is heavily dependent on foreign goods and services. Also this model can complement the limits of quantitative analyses by simple equations or simultaneous equations, such as fluid coefficients due to multicollinearity among independent variables, autocorrelations, or model misspecifications.

The previous research in this field includes the Bank of Korea's research and one done by the author. Scholars in major countries, the U.S., Britain, and Japan, for instance, have applied this model for various purposes.

The goal of this paper is to construct the input-output model of the 2000 Gyeongbuk province, to estimate the price repercussion effects of price changes in foreign goods, exchange rate fluctuations, and price changes of public services in Gyeongbuk, thereby ultimately to help to devise regional price stability policy.

This research carries both theoretical construction and empirical analysis. The theoretical framework provides various analytical models to estimate the price repercussion effects based on previous research. Empirical analysis actually analyze the price repercussion effect in Gyeongbuk province by reclassifying 28 industrial sectors in the 2000 national input-output table to 27 sectors, and then constructing the 2000

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1) R.E. Miller and P.D. Blair, 1985, p.357, J.R. Melvin, 1976, pp. 1～23, R.F. Cray, 1986, pp. 1～156.
For example, see Gupta(1967), Lee et al.(1977), Morses(1974), Polenski(1978), Young(1978), Pai(1979), and Melvin(1976, 1979).

Gyeongbuk input-output table with locational quotient method.

II. Analytical Model

1. Input-output Model in Gyeongbuk Province

The sequence of constructing the input-output model in Gyeongbuk province is as follows: first, this paper reclassifies and aggregates 28 industrial sectors of national input-output tables published in December 2003 by the Bank of Korea into 27 sectors, taking local conditions into account. Second, it reclassifies 27 sectors almost identically matched to sectors of the national table, with only the exception of the 7^{th} Oil and Coal sector integrated with the 8^{th} Chemical products sector. In the input-output analysis, we can generally get more information as we classify industrial sectors more specifically, but more specific classification needs more detailed data, which in this case, is not available. This paper constructs the input-output table of Gyeongbuk province using the locational quotient method based on the 2000 national table.

The total output and the intermediate input of the 2000 national and Gyeongbuk province were calculated with reference to "the 2000 Gross Regional Domestic Product" published by the Korea National Statistical Office. The total output and the intermediate input in Agriculture, Forestry and Fishery, Mining and Quarrying, and Service sectors (industrial classification) are available in GRDP data, yet those in the manufacturing sectors are not available except for the aggregated data. Hence, the table is calculated by taking output data into account and by referring to the ratio of each industrial sector in the Industry Statistics Report. Also since the intermediate demand is not readily available in GRDP data, it is necessary to infer from other sources. Intermediate demand in Gyeongbuk province is constructed by multiplying national intermediate demand with industrial production weighted to the regional ratio and by comparing that with Daegu Custom office import value. The constructed input and import tables of Gyeongbuk region satisfy Hokins-Simon Condition, and thus are considered

as fair and accurate.

2. Basics of Price Input-Output Model

The estimation of the production inducement effect of changes of final demand is the quantitative impact analysis using the demand-supply balance equations in rows of the input-output table. Also, if we see the input-output table in columns, we know the composition of the inputs in an industry. Since this also shows the price structure of each industrial sectors' production activities, we can analyze the price repercussion effect. The price repercussion effect analysis treats value added-i.e. wage, profit, and the price change of raw materials as independent variables, and estimates the effect of these independent variables on product prices in each industrial sector.

Since the unit price of a product is the sum of the unit cost and the profit, the price is composed of the intermediate input and the value-added from other industries in the input-output table. That is, the unit price of a product is equal to the sum of the intermediate input and the value added per unit. The intermediate input per unit is calculated by multiplying the input coefficients with the price of an input product in an industrial sector, and the value added per unit is calculated by multiplying the value added input coefficients(ratio) with unit price of the value added. Therefore, the following equation is available[2)]

$$A'P + \widehat{A^v}P^v = P \qquad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \quad (3-1)$$

where A' is the transpose of the input coefficient matrix, P is the vector of unit price, $\widehat{A^v}$ is the diagonal matrix of the value added coefficient matrix, P^v is the vector of value added per unit. When we solve (3-1) for P,

2)金子敬生, 1967, pp. 143～184, Bank of Korea, 2004. 3, pp. 166～179.
United Nations, 1973, pp. 18～108, R.E. Miller and P.D. Blair, Ibid, pp. 351～360

$$P - A'P = \widehat{A}^{v} P^{v}$$

$$(I - A')P = \widehat{A}^{v} P^{v}$$

$$P = (I - A')^{-1} \widehat{A}^{v} P^{v}$$

If we express again this equation for the price change ratio model[3] it is,

$$\dot{P} = (I - A')^{-1} \widehat{A}^{v} \dot{P}^{v} \qquad \cdots\cdots\cdots\cdots\cdots\cdots \qquad (3-2)$$

Now, the equation (3-2) is the basic model for the price repercussion effect, and for estimating the price repercussion effect of independent variables-i.e. wage, value added, on product price in each industrial sector. We can then transform this basic model into more complex models to analyze the price repercussion effect.

3. Types of Price Input-Output Models

A. Price Repercussion Effect of the Changes in the Value Added

The (3-2) basic model for the price repercussion effect using the input-output tables means that the product prices are determined by the price of other products used as intermediate inputs and by the price of the primary production elements. However, because the price of the primary production elements does not influence the price of imported goods and there is a gap between domestic and imported intermediate goods, it is desirable to differentiate input coefficients between domestic and imported goods to construct a more accurate price model. We express this in the matrix form:

$$P^{d} = A^{d'} + P^{d} + A^{mi} P^{m} + \widehat{A}^{v} P^{v}$$
$$P^{d} - A^{d'} P^{d} = A^{mi} P^{m} + \widehat{A}^{v} P^{v}$$
$$P^{d} = (I - A^{d'})^{-1} (A^{mi} P^{m} + \widehat{A}^{v} P^{v})$$

We transform this into the price change ratio model to:

$$\dot{P}^{d} = (I - A^{d'})^{-1} (A^{mi} \dot{P}^{m} + \widehat{A}^{v} \dot{P}^{v})$$

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3) If we divide each side of this equation with product quantity and transform price variables into prices in a given year to the basis year, and then index for each price variable would be identical to input coefficient. When we reformulate each price ratio as price change ratio, we can get the price change ratio model.
Bank of Korea, 2004.3, p. 167~172.

If we assume that there is no price change of imported goods it is:

$$\dot{P}^d = (I - A^{d'})^{-1} \widehat{A^v} \dot{P}^v \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \quad (3-3),$$

where $\dot{P}^d$ is the vector of price change ratios of domestic goods, $\dot{P}^v$ is the vector of the unit price change ratios of value added, $A^{m'}$ is the transpose matrix of the imported input index matrix, $A^{d'}$ is the transpose matrix of the domestic input coefficients, separated from A'. Value added in the input-output analysis can be specified as employee wages, business profits, fixed capital wear and tear reserves, and pure indirect taxes.[4)]

B. Price Repercussion Effect of the Price Changes of Domestic Goods

To estimate the repercussion effect of price changes of intermediate input goods on prices of final products, we need to first transform the changed prices into endogenous and exogenous sectors. This can be shown as follows:

$$\begin{aligned} P^d &= A^{d'}P^d + A^{m'}P^m + A_k^{d'}P_k^d + A_k^{m'}P_k^m + V \\ P^d - A^{d'}P^d &= A^{m'}P^m + A_k^{d'}P_k^d + A_k^{m'}P_k^m + V \\ P^d &= (I - A^{d'})^{-1}(A^{m'}P^m + A_k^{d'}P_k^d + A_k^{m'}P_k^m + V) \quad \cdots\cdots\cdots\cdots\cdots (3-4) \end{aligned}$$

Then we can express this as the price change ratio model.

$$\dot{P}^d = (I - A^{d'})^{-1}(A^{m'}\dot{P}^m + A_k^{d'}\dot{P}_k^d + A_k^{m'}\dot{P}_k^m + \dot{V}) \quad \cdots\cdots\cdots\cdots\cdots \quad (3-5)$$

$A^{d'}$ = the transpose of the domestic input coefficient matrix without the k (exogenous) sector

$A^{m'}$ = the transpose of the imported input coefficient matrix without the k (exogenous) sector

$A_k^{d'}$ = the column vector of the exogenous (k) sector in the transpose matrix of the domestic input coefficient matrix (excluding the index of the exogenous sector)

$A_k^{m'}$ = the column vector of the exogenous (k) sector in the transpose

4) The total value added in 2000 was 599,645,100 million won. This is composed of wages 44.5%, profits 32.5%, fixed capital reserves 14.5%, and pure indirect taxes 8.6%.

matrix of the imported input coefficient matrix (excluding the index of the exogenous sector)

k = exogeous sector

Now, if we assume that there is no change in the imported goods' prices ($\dot{P}^m = 0, \dot{P}_k^d = 0$), and no change in the value added ($\dot{V} = 0$), then the (3−5) can be reduced to:

$$\dot{P}^d = (I - A^{d'})^{-1} A_k^{d'} \dot{P}_k^d \quad \cdots\cdots\cdots\cdots\cdots\cdots \quad (3-6)$$

This equation means that when some domestic goods prices change $\dot{P}_k^{d'}\%$ in the exogenous sector, there would be $\dot{P}^d\%$ changes of the price change ratio in the endogenous sector. To sum up all these, we can get the overall price repercussion effect of the price changes of an exogenous sector (k sector). Also, if we endogenize the wages' sector within the value added composition[5], (3−6) equation can be transformed to:

$$\dot{P}^d = (I - A^{d'} - \widehat{A^w})^{-1} A_k^{d'} \dot{P}_k^d \quad \cdots\cdots\cdots\cdots\cdots\cdots \quad (3-7)$$

C. Price Repercussion Effect of the Price Changes of Imported Goods

The price changes of imported goods have first an impact on the price changes of products which input these imported goods as intermediate inputs, and also have an impact on the price changes of related products which use those products as intermediate inputs. Finally, as a result of the substitute effect, the price changes of imported goods have an impact on the domestic goods which are substitutes for the imported goods, and in the long run, can cause the changes of input coefficients. Since there is no relationship between the imported goods and the domestic value added sector ($\dot{P}^v = 0$) the equation $\dot{P}^d = (I - A^{d'})^{-1}(A^{m'} \dot{P}^m + \widehat{A^v} \dot{P}^v)$ becomes:

$$\dot{P}^d = (I - A^{d'})^{-1} A^{m'} \dot{P}^m \quad \cdots\cdots\cdots\cdots\cdots \quad (3-8)$$

Thus, if we calculate $(I - A^{d'})^{-1} A^{m'}$, we can just multiply the vector of the

5) 金子敬生, pp. 146～154, Chiou-Shuang Yan, 1968. pp. 37～38 and 73～75.

price change ratios of related imported goods ($\hat{P}^m$) to this, and can estimate the price repercussion effect of the price changes of imported goods. When there are price changes of imported goods, we can multiply certain value (%) to relevant sectors in the vector of the imported goods prices ($\hat{P}^m$) and 0s to others. If we are endogeneous the wage's sector within the value added composition, the (3-8) equation can be transformed to:

$$\hat{P}^d = (I - A^{d'} - \widehat{A^w})^{-1} A^{m'} \hat{P}^m \quad \cdots\cdots\cdots\cdots\cdots\cdots \quad (3-9)$$

D. Price Repercussion Effect of Exchange Rate Fluctuations

Exchange rate fluctuations cause the price changes of imported goods in Korea, and hence cause the price changes of products that use imported goods as input materials, and finally cause domestic commodity price changes. For instance, devaluation of the national currency brings about cost increase for importers, and in turn has a repercussion effect on commodity retail prices, thus causing the overall domestic commodity price increases. The price repercussion effect of the exchange rate fluctuations can be estimated by the price repercussion model of the price changes of imported goods, (3-8). The only minor change is that you multiply the same value (%) with $\hat{P}^m$ in all of the industrial sectors in the case of the exchange rate fluctuation.

Meanwhile, the price repercussion effect of the exchange rate change of the Korean Won to the Japanese Yen can be estimated by multiplying the import dependence ratio on Japanese goods to each industrial sector within the given equation, (3-8):

$$\hat{P}_j^d = (I - A^{d'})^{-1} A^{m'} \hat{J} \hat{P}^m \quad \cdots\cdots\cdots\cdots\cdots\cdots \quad (3-10),$$

where $\hat{J}$ is the diagonal matrix of the import dependence ratio on Japanese goods and $\hat{P}_j^d$ is the vector of the sectoral price change ratios in the case of exchange rate changes of the Korean Won to the Japanese Yen.

III. The Result of Empirical Analysis and its Interpretation

1. Price Sensitivity Index and Power of Dispersion Index

The sum of rows in the price inversed matrix of the input-output model is the degree of price sensitivity index of each industry to the unit price increase of all industries, and the sum of the columns is the power of dispersion index of one unit price increase of each industry on all industries. The relative sizes of the price sensitivity and the power of dispersion to those of all industry averages are the price sensitivity index and the power of dispersion index.[6)]

As seen in <Table 1>, the Primary Metal Products (2.0843) has the highest power of dispersion in Gyeongbuk province, and the Petroleum, Coal Products and Chemicals (1.6218), Electric, Gas and Water (1.2403), Electronic and Other Electric Equipment (1.2341), Agriculture, Forestry, and Fisheries (1.1476) have the subsequent higher power of dispersion. Among the lowest power of dispersion are the Public Administration and Defense (0.6868), Precision Instruments (0.7258), Furniture and Miscellaneous Manufactured Products (0.7423), Printing and Publishing (0.7308), and Social and Personal Services (0.7505).

As well, the Primary Metal Products (1.3546) shows the highest degree of sensitivity, followed by Fabricated Metal Products (1.2606), Food and Kindred Products (1.1555), Nonmetallic Minerals (1.1370), General Machinery and Equipment (1.1252), Textile Mill Products and Apparel (1.1151), and Contruction(1.1041).

Industries with both a higher degree of sensitivity and power of dispersion than 1 are Primary Metal Products, Textile Mill Products and Apparel, Nonmetallic Minerals, and Electronic and Other Electric Equipment. Henceforth, it seems necessary to manage these industrial sectors, as well

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6) The Index of Degree of Price Sensitivity = $\frac{1}{n}\sum_j b_{ij} / \frac{1}{n^2}\sum_i\sum_j b_{ij} = \sum_j b_{ij} / \frac{1}{n}\sum_i\sum_j b_{ij}$

The Index of Power of Dispersion = $\frac{1}{n}\sum_i b_{ij} / \frac{1}{n^2}\sum_i\sum_j b_{ij} = \sum_i b_{ij} / \frac{1}{n}\sum_i\sum_j b_{ij}$

where b_{ij} is each element of the price inversed matrix, and n is the number of endogenous sectors.

as those with a higher index to stabilize overall commodity prices.

There are some differences in the degree of price sensitivity and power of dispersion, when we endogenize wages within the model. Again, the wage endogenizing case considers the inter-relationships between wages and commodity prices. The wage endogenizing case usually shows bigger coefficients in the inversed matrix, compared to that of an exogenous case, but since the degree of sensitivity and power of dispersion are relative to all industry averages, those in the endogenous case can be either larger or smaller than those in the exogenous case.

In the case of wage endogenizing, industrial sectors that show increases in both the degree of sensitivity and power of dispersion are industries with a higher ratio of wages in value added. Those are Construction, Wholesale and Retail Trade, Transportation and Warehousing, Finance and Insurance, Public Administration and Defense, Educational and Health Services, Social and Personal Services. Most of the rest of the industries show decreases in at least one index.

2. Estimation of the Price Repercussion Effect of Wage and Value Added

<Table 2> shows the price repercussion effect when there would be a 10 percent increase of employee wage and value added. When there would be 10 percent increase of employee wage, the industrial sector with the highest price repercussion effect is Finance and Insurance with 5.8912%, followed by Educational and Health Services 4.7874%, Public Administration and Defense 4.5845%, Social and Personal Services 3.8871%, Wholesale and Retail Trade 3.5811%, Transportation and Warehousing 3.5553%, Eating, Drinking Places and Hotels 3.1491%, and Petroleum, Coal Products and Chemicals 3.1449%. As we can see in the table, when there is a 10 percent increase of wage, the overall effect on producer prices in Gyeongbuk province is expected to be 2.3896%.[7)]

7) We can get this by summing up all the multiplications of the prices repercussion effect with the producer prices weight in each industry.

As the value added increases 10% over all industries, the price repercussion effect is the highest in Real Estate and Business Services with 10.7393%, and the Finance and Insurance 10.3175%, Agriculture, Forestry and Fisheries 9.7073%, Electric, Gas and Water 9.3853%, Wholesale and Retail Trade 8.6085%, and Social and Personal Services 7.0675% have the next higher effect. If there would be a 10 percent increase of value added, the overall effect on producer prices in Gyeongbuk province is expected to be 6.0797%.

As seen above, when there are increases in wages or value added, the price repercussion effect is stronger on the service industries than on the manufacturing industries. This is because the value added ratio is bigger in the service industries.

3. Estimation of the Price Repercussion Effect of Changes in Public Utility Costs

<Table 3> shows the estimation of the price repercussion effect when there would be a 10 percent increase of public utility costs or the price of each industry. Specifically, if there would be a 10 percent increase in electricity, gas, and water costs, the price repercussion effects would be 0.7130% for Nonmetallic Minerals, 0.6324% for Primary Metal Products, 0.4021% for Mining and Quarrying, 0.3776% for Paper and Wood Products, 0.3311% for Petroleum, Coal Products and Chemicals, and 0.3147% for Fabricated Metal Products. As the price of transportation and warehousing increases by 10 percent, we expect the price repercussion effects to be 0.2395% for Nonmetallic Minerals, 0.1454% for Printing and Publishing, 0.1415% for Primary Metal Products, 0.1213% for Wholesale and Retail Trade, and 0.1161% for Textile Mill Products and Apparel. When the price of educational and health services increases by 10 percent, the price repercussion effects are expected to be 0.2719% for Precision Instruments, 0.0935% for Electronic and Other Electric Equipment, 0.0689% for General Machinery and Equipment, 0.0523% for Electric, Gas and Water, 0.0490%

for Petroleum, Coal Products and Chemicals, and 0.0489% for Primary Metal Products.

As we shift to the exogenous price changes, when the price of textile mill products and apparel increases by 10 percent, the price repercussion effects would be 0.3614% for Furniture and Miscellaneous Manufactured Products, 0.1142% for Transportation Equipment, 0.0724% for Social and Personal Services, 0.0586% for Paper and Wood Products, 0.0591% for Public Administration and Defense, and 0.0388% for Agriculture, Forestry, and Fisheries. If the price of electronic and other electric equipment increases by 10 percent, Precision Instruments shows 1.5888% of the highest price repercussion effect, followed by General Machinery and Equipment of 0.5640%, Construction of 0.4508%, Social and Personal Services of 0.2456%, and Furniture and Miscellaneous Manufactured Products of 0.1786%. When the price of general machinery and equipment increases at the same rate, the effect is greatest in Transportation Equipment, 0.2434%, followed by Construction of 0.1492%, Public Administration and Defense of 0.1112%, Fabricated Metal Products of 0.0929%, Nonmetallic Minerals of 0.0838%, and Primary Metal Products of 0.0571%.

The overall impact of a 10 percent increase of electricity, gas and water costs on producer prices in Gyeoungbuk province would be 0.4377%, and that of transportation and warehousing is 0.0709%, that of communication and broadcasting is 0.0460%, that of educational and health services is 0.0206%.

In case of price increases in the service sectors, including electricity, gas, and water, transportation and warehousing, educational and health services, the price repercussion effect is high in Nonmetallic Products, Mining and Quarrying, Fabricated Metal Products, Primary Metal Products, and Petroleum, Coal Products and Chemicals. Therefore, when the decision of increasing public utility costs needs to be made, it is recommended to take into consideration the price repercussion effect in these industrial sectors.

4. Estimation of the Price Repercussion Effect of Price Changes of Imported Goods

The empirical estimation of the price repercussion effect of the imported goods price changes is summarized in <Table 4> and <Table 5>. When we estimate the price repercussion effect of a 10 percent increase of imported goods' prices in each industry-Mining and Quarrying, Electronic and Other Electric Equipment, Primary Metal Products, Petroleum, Coal Products and Chemicals, Agriculture, Forestry, and Fisheries, and Textile Mill Products and Apparel show the higher effect. On the contrary, the price changes of imported goods in Electric, Gas, and Water, and Construction have little impact on price of other industries. This is because these industries have a relatively low ratio of imported goods as intermediate inputs, and in most cases they function as nontrade items.

When the price of imported goods increases by 10 percent in petroleum, coal products and chemicals, the price repercussion effect is greatest in Petroleum, Coal Products and Chemicals itself with 0.6716%, and is high in Transportation and Warehousing (0.3552%), Textile Mill Products and Apparel (0.2120%), Nonmetallic Minerals (0.2106%), Electronic and Other Electric Equipment (0.1491%), and Paper and Wood Products (0.1407%). In case of agriculture, forestry and fisheries, the price repercussion effect is highest in Food and Kindred Products with 0.5161%, and the effect is high in Paper and Wood Products (0.4333%), Textile Mill Products and Apparel (0.2052%), Eating, Drinking Places and Hotels (0.1370%), and its own industry (0.0985%). In case of primary metal products, the price repercussion effect is highest in its own industry with 2.4891%, followed by Fabricated Metal Products (1.3906%), General Machinery and Equipment (0.5230%), Transportation Equipment (0.4251%), Furniture and Miscellaneous Manufactured Products (0.4056%), and Construction (0.2964%).

As seen in <Table 5>, when the price of imported goods in electronic

and other electric equipment increases by 10 percent, it has the greatest impact on its own industry of 3.2205%, followed by Precision Instruments (1.0160%), Transportation Equipment (0.3197%), General Machinery and Equipment (0.3152%), Construction (0.1803%), and Communication and Broadcasting Services (0.1605%). In case of the transportation equipment, it has the greatest impact on its own industry of 0.1694%, followed by Public Administration and Defense (0.0935%), Transportation and Warehousing (0.0540%), Agriculture, Forestry, and Fisheries (0.0048%), and Mining and Quarrying and Nonmetallic Minerals with 0.0018% each.

However, the price changes of imported goods in construction and electric, gas, and water have little impact on domestic product prices, as seen in <Table 5>.

Also, a 10 percent increase of imported goods' prices in mining and quarrying increases the producer prices in Gyeongbuk province by 0.6622%. In case of electronic and other electric equipment, the overall price repercussion effect in Gyeongbuk province is 0.2588%. And the overall price repercussion effect of petroleum, coal products and chemicals is 0.1926%, that of agriculture, forestry, and fisheries is 0.0588%, that of textile mill products and apparel is 0.0519%.

5. Estimation of the Price Repercussion Effect of Exchange Rate Changes

The estimation result of the price repercussion effect of a 10 percent rise in exchange rate is presented in <Table 6>. In case of a 10 percent rise in exchange rate, the price repercussion effect on products in Gyeongbuk province is highest in Electronic and Other Electric Products (3.9949%), followed by Primary Metal Products (3.6493%), Petroleum, Coal Products and Chemicals (3.3698%), Electric, Gas and Water (2.6792%), Textile Mill Products and Apparel (2.2070%), Fabricate Metal Products (2.1407%), Precision Instruments (2.0949%), and the effect is relatively low in Finance and Insurance (0.1704%), Real Estate and Business Services (0.2009%),

Mining and Quarrying (0.3860%), Wholesale and Retail Trade (0.4048%), Educational and Health Services (0.4535%), Communication and Broadcasting Services (0.4651%), and Public Administration and Defense (0.4653%).

The price repercussion effect of a 10 percent rise in the exchange rate on producer prices in Gyeongbuk province is 1.8998% overall, as seen in <Table 6>. As we see each individual industry specifically, the effect is greatest in Petroleum, Coal Products and Chemicals, followed by Electronic and Other Electric Equipment (0.4182%), Primary Metal Products (0.1795%), General Machinery and Equipment (0.1207%), and Electric, Gas, and Water (0.1096%).

When there is a 10 percent rise in the exchange rate with endogenizing wages, the price repercussion effect is highest in Electronic and Other Electric Equipment with 4.5075%, followed by Primary Metal Products (4.2640%), Petroleum, Coal Products and Chemicals (4.0151%), Electric, Gas, and Water (3.0490%), Textile Mill Products and Apparel (2.8883%), Fabricated Metal Products (2.8711%), and Transportation and Warehousing (2.5184%).

IV. Conclusion

In this paper, the input-output model of Gyeongbuk province in 2000 was constructed, and using this model, the price repercussion effects caused by cost push factors were analyzed. The price Sensitivity Index and the Power of Dispersion Index in Gyeongbuk province were analyzed and the effects of the price changes of wages and value added, of public utility costs, of imported goods, and the effects of exchange rate fluctuations were closely analyzed.

The advantages of the price repercussion effect analysis with input-output model is that it is possible to accurately estimate direct and indirect price repercussion effects among industries and that the analysis can complement the limits of quantitative analyses by simple equations or simultaneous equations, such as fluid coefficients due to multicollinearity

among independent variables, autocorrelations, or model misspecifications. But this model also has its own limitations such as the inattention to demand pulling factors and the inability to explain industries without a link to a series of price repercussion. Even with these limitations, though, the price repercussion effect analysis with the input-output model is very useful since it can precisely estimate direct and indirect repercussion effects and long term trend of price changes which are heavily dependent on the changing conditions of cost-push factors.

The Gyeongbuk input-output model analyzed above was constructed by reclassifying and aggregating 28 industrial sectors of national input-output tables published in December 2003 by Bank of Korea into 27 sectors, taking local conditions into account and using the locational quotient method. To analyze the price repercussion effect more accurately, a regional transaction table and an import transaction table were created. The constructed tables of Gyeongbuk regional input and import index satisfy Hokins-Simon Condition, thus are considered as fair and accurate.

The main relevant policy points generated by the analyses are as follows:

First, industries with a high power of dispersion index are Primary Metal Products, Petroleum, Coal Products and Chemicals, Electric, Gas, and Water, Electronic and Other Electric Equipment, and Agriculture, Forestry, and Fisheries. Industries with a high price sensitivity index are Primary Metal Products, Fabricated Metal Products, Food and Kindred Products, Nonmetallic Minerals, General Machinery and Equipment, Textile Mill Products and Apparel, Social and Personal Services. Industries with both a higher index of price sensitivity and a higher index of power of dispersion than 1 are Primary Metal Products, Textile Mill Products and Apparel, Nonmetallic Minerals, and Electronic and Other Electric Equipment. Henceforth, to stabilize the product price, it is recommended to primarily stabilize on industries with a higher score in either index.

Second, it is shown that the price repercussion effect of increased wages and value added is greater in the service industries than in the manufacturing industries. This is because the weight of the value added is

heavier in the service industries than in the manufacturing industries.

Third, in case of increases in electricity, gas, and water costs, in transportation and warehousing prices, and in prices of educational and health services, the price repercussion effect is high in Nonmetallic Minerals, Mining and Quarrying, Fabricated Metal Products, Primary Metal Products, and Petroleum, Coal Products and Chemicals.

Fourth, industries with a higher price repercussion effect because of increases in the imported goods' price are Mining and Quarrying, Electronic and Other Electric Equipment, Primary Metal Products, Petroleum, Coal Products and Chemicals, Agriculture, Forestry and Fisheries, and Textile Mill Products and Apparel. On the contrary, imported goods' price changes in Electric, Gas and Water, and Construction have little effect on the product price of other industries. The reason is that these industries have a relatively low ratio of imported goods as intermediate inputs, and in most cases they function as nontrade items.

The government needs to find ways in which to lower the ratio of imported goods and to replace imported goods with domestic ones in industries having a higher price repercussion effect of price changes of imported goods. Also, the government needs to diversify the importing routes of crude oils and foreign raw materials and to reserve certain level of primary products to prepare for price shocks.

Fifth, industrial sectors with higher price repercussion effects in case of rise in exchange rate are Electronic and Other Electric Equipment, Fabricated Metal Products, Petroleum, Coal Products and Chemicals, Electric, Gas, and Water, Textile Mill Products and Apparel, Primary Metal Products, and Precision Instruments. But, service industries have relatively lower effects.

In case of a 10 percent rise in the exchange rate, the price repercussion effect on producer prices in Gyeongbuk province is 1.8998%. The government should seek to finds ways to reduce the price repercussion effect of the exchange rate fluctuations by predicting exchange rate changes in advance, since the price repercussion effect by rise in exchange rate is relatively high.

<Table 1> Index of Degree of Sensitivity and Index of Power of Dispersion

		Index of Degree of Sensitivity		Index of Power of Dispersion	
		wage(exogenous)	wage(endogenous)	wage(exogenous)	wage(endogenous)
1	Agriculture, forestry and fisheries	0.87835	0.7453	1.14766	0.9937
2	Mining and quarrying	0.86704	0.8338	0.80598	0.7661
3	Food and kindred products	1.15550	0.9943	0.94706	0.8097
4	Textile mill products and apparel	1.11509	1.0928	1.04263	1.0007
5	Paper and wood products	0.95725	0.8473	1.05485	0.9148
6	Printing and publishing	0.98030	1.1016	0.73079	0.7782
7	Petroleum, coal products and Chemicals	0.88119	0.8015	1.62183	1.6596
8	Nonmetallic minerals	1.13703	1.1593	1.01516	1.0169
9	Primary metal products	1.35462	1.2005	2.08431	1.9833
10	Fabricated metal products	1.26059	1.2381	0.97425	0.9379
11	General Machinery and equipment	1.12518	1.0796	0.83313	0.7658
12	Electronic and other electric equipment	1.01275	0.8796	1.23408	1.1027
13	Precision instruments	1.06234	0.9582	0.72584	0.6053
14	Transportation equipment	1.10188	1.0412	0.84124	0.7655
15	Furniture and miscellaneous manufactured products	1.04075	0.9237	0.74226	0.6170
16	Electric, gas and water	0.90629	0.7909	1.24032	1.1564
17	Construction	1.10410	1.2543	0.80816	0.8714
18	Wholesale and retail trade	0.83598	0.8450	1.09973	1.1679
19	Eating, drinking places and hotels	0.99659	0.9984	1.03849	1.0224
20	Transportation and warehousing	0.84469	0.9236	0.87711	0.9758
21	Communication and broadcasting services	0.87038	0.8175	0.85193	0.8107
22	Finance and insurance	0.80543	1.0954	0.97403	1.3989
23	Real estate and business services	0.83800	0.7890	1.13261	1.1493
24	Public administration and defence	0.83850	1.2105	0.68676	0.9445
25	Educational and health services	0.84022	1.1470	0.77013	1.0337
26	Social and personal services	0.93263	1.1581	0.75054	0.8958
27	Others	1.25720	1.0721	1.00837	0.8544

<Table 2> the Price Repercussion Effect in the Case of a 10% Percent Rise in the Wage and Value Added

(단위:%)

		spread effect		producer prices weight	Producer Price (Kyeongbook)	
		Wage	Added value		Wage	Added value
1	Agriculture, forestry and fisheries	1.3299	9.7073	49.0	0.0651	0.4756
2	Mining and quarrying	2.0854	6.0446	2.5	0.0052	0.0151
3	Food and kindred products	0.9832	3.4379	58.3	0.0573	0.2004
4	Textile mill products and apparel	2.3079	4.1140	32.7	0.0754	0.1345
5	Paper and wood products	1.4825	3.4397	21.2	0.0314	0.0729
6	Printing and publishing	3.0042	4.4907	6.6	0.0198	0.0296
7	Petroleum, coal products and Chemicals	3.1449	6.2276	152.7	0.4802	0.9509
8	Nonmetallic minerals	2.6087	5.6222	23.9	0.0623	0.1343
9	Primary metal products	2.2360	6.7349	49.2	0.1100	0.3313
10	Fabricated metal products	2.2778	3.9823	17.9	0.0408	0.0712
11	General Machinery and equipment	1.7909	3.5464	72.9	0.1305	0.2585
12	Electronic and other electric equipment	1.4302	4.3341	104.7	0.1497	0.4537
13	Precision instruments	1.0315	1.8620	5.5	0.0056	0.0102
14	Transportation equipment	1.6431	3.2536	57.5	0.0944	0.1870
15	Furniture and miscellaneous manufactured products	0.9306	1.7138	10.3	0.0095	0.0176
16	Electric, gas and water	1.5861	9.3853	40.9	0.0648	0.3838
17	Construction	3.2071	5.2576	0	0	0
18	Wholesale and retail trade	3.5811	8.6085	0	0	0
19	Eating, drinking places and hotels	3.1491	5.3739	0	0	0
20	Transportation and warehousing	3.5553	6.1298	52.9	0.1880	0.3242
21	Communication and broadcasting services	1.9916	5.5019	42.8	0.0852	0.2354
22	Finance and insurance	5.8912	10.3175	21.6	0.1272	0.2228
23	Real estate and business services	2.4593	10.7393	106.3	0.2604	1.1416
24	Public administration and defence	4.5845	6.4479	0	0	0
25	Educational and health services	4.7874	5.7334	56.1	0.2685	0.3216
26	Social and personal services	3.8871	7.0675	14.5	0.0563	0.1024
27	Others	0.0000	8.5994	0	0	0
계	Total	-	-	1,000	2.3896	6.0757

Sources: 1) This table shows the price repercussion effect when there would be a 10 percent increase of employee wage and value added.

2) The producer price weight used the Outlook of Producer Prices for the Month of the Bank of Korea(2005. 8).

<Table 3> the Price Repercussion Effect in the Case of a 10% Percent Rise in the Public Utility Costs and the Commodity Price of Each Industry

(단위:%)

		Rise in the Public Utility Costs				Rise in the Price of Each Industry			
		Electric, gas and water	Transportation and warehousing	Communication and broadcasting services	Educational and health services	Textile mill products and apparel	Electronic and other electric equipment	Construction	General Machinery and equipment
1	Agriculture, forestry and fisheries	0.0494	0.0422	0.0206	0.0117	0.0388	0.0260	0.0169	0.0239
2	Mining and quarrying	0.4021	0.0943	0.0333	0.0121	0.0093	0.536	0.0382	0.0457
3	Food and kindred products	0.1201	0.0909	0.0262	0.0199	0.0184	0.0203	0.0195	0.0190
4	Textile mill products and apparel	0.2128	0.1161	0.0400	0.0208	-	0.0227	0.0197	0.0189
5	Paper and wood products	0.3776	0.1121	0.0413	0.0199	0.0586	0.0308	0.0149	0.0282
6	Printing and publishing	0.1500	0.1454	0.0883	0.0184	0.0368	0.0616	0.0229	0.0291
7	Petroleum, coal products and Chemicals	0.3311	0.0933	0.0323	0.0490	0.0314	0.0362	0.0196	0.0493
8	Nonmetallic minerals	0.7130	0.2395	0.0779	0.0433	0.0351	0.0762	0.0207	0.0838
9	Primary metal products	0.6324	0.1415	0.0416	0.0489	0.0131	0.0517	0.0214	0.0571
10	Fabricated metal products	0.3147	0.1157	0.0343	0.0352	0.0226	0.1018	0.0201	0.0929
11	General Machinery and equipment	0.1625	0.0961	0.0269	0.0689	0.0198	0.5640	0.0163	-
12	Electronic and other electric equipment	0.1493	0.0735	0.0345	0.0935	0.0141	-	0.0212	0.0399
13	Precision instruments	0.1926	0.1116	0.0417	0.2719	0.0381	1.5888	0.0133	0.0511
14	Transportation equipment	0.1698	0.0780	0.0298	0.0556	0.1142	0.5227	0.0169	0.2434
15	Furniture and miscellaneous manufactured products	0.1501	0.1003	0.0341	0.0250	0.3614	0.1786	0.0194	0.0369
16	Electric, gas and water	-	0.0614	0.0321	0.0523	0.0085	0.1098	0.3282	0.0309
17	Construction	0.1596	0.0685	0.0309	0.0323	0.0238	0.4508	-	0.1492
18	Wholesale and retail trade	0.1860	0.1213	0.2466	0.0251	0.0313	0.0398	0.0454	0.0075
19	Eating, drinking places and hotels	0.2756	0.0572	0.0356	0.0212	0.0244	0.0543	0.0592	0.0103
20	Transportation and warehousing	0.0599	-	0.0497	0.0236	0.0171	0.0516	0.0149	0.0095
21	Communication and broadcasting services	0.1214	0.0475	-	0.0313	0.0199	0.2213	0.0486	0.0046
22	Finance and insurance	0.0706	0.0730	0.1097	0.0182	0.0113	0.0445	0.0233	0.0022
23	Real estate and business services	0.1536	0.0418	0.1283	0.0292	0.0109	0.0686	0.5104	0.0145
24	Public administration and defence	0.1741	0.0908	0.0617	0.0237	0.0591	0.0574	0.0769	0.1112
25	Educational and health services	0.1608	0.0371	0.0391	-	0.0205	0.0718	0.0427	0.0110
26	Social and personal services	0.2247	0.0619	0.0989	0.0259	0.0724	0.2456	0.0755	0.0265
27	Others	0.1456	0.1548	0.1716	0.0149	0.3235	0.1516	0.0261	0.0247

<Table 4> the Price Repercussion Effect in the Case of a 10% Percent Rise in the Price of Imported Goods (1)

(단위 : %)

		Agriculture, forestry and fisheries	Textile mill products and apparel	Paper and wood products	Printing and publishing	Petroleum, coal products and Chemicals	Nonmetallic minerals	Primary metal products	General Machinery and equipment
1	Agriculture, forestry and fisheries	0.0985	0.0101	0.0049	0.0001	0.0823	0.0013	0.0098	0.0046
2	Mining and quarrying	0.0050	0.0040	0.0051	0.0002	0.0554	0.0015	0.0176	0.0091
3	Food and kindred products	0.5161	0.0064	0.0140	0.0002	0.0761	0.0042	0.0241	0.0046
4	Textile mill products and apparel	0.2052	1.2458	0.0083	0.0008	0.2120	0.0024	0.0144	0.0117
5	Paper and wood products	0.4333	0.0746	0.8822	0.0004	0.1407	0.0054	0.0187	0.0118
6	Printing and publishing	0.0598	0.0166	0.1742	0.0104	0.1205	0.0017	0.0101	0.0155
7	Petroleum, coal products and Chemicals	0.0301	0.0130	0.0050	0.0002	0.6716	0.0052	0.0331	0.0112
8	Nonmetallic minerals	0.0078	0.0089	0.0119	0.0003	0.2106	0.2083	0.0581	0.0191
9	Primary metal products	0.0028	0.0030	0.0020	0.0002	0.0698	0.0300	2.4891	0.0200
10	Fabricated metal products	0.0053	0.0069	0.0075	0.0004	0.0808	0.0153	1.3906	0.0380
11	General Machinery and equipment	0.0038	0.0051	0.0040	0.0005	0.0620	0.0161	0.5230	0.3269
12	Electronic and other electric equipment	0.0032	0.0109	0.0073	0.0015	0.1491	0.0462	0.2749	0.0182
13	Precision instruments	0.0047	0.0137	0.0060	0.0017	0.0986	0.1189	0.1733	0.0197
14	Transportation equipment	0.0055	0.0343	0.0064	0.0004	0.0896	0.0156	0.4251	0.1065
15	Furniture and miscellaneous manufactured products	0.0371	0.1137	0.2802	0.0007	0.1257	0.0512	0.4056	0.0096
16	Electric, gas and water	0.0023	0.0020	0.0015	0.0001	0.1341	0.0064	0.0246	0.0145
17	Construction	0.0085	0.0064	0.0257	0.0003	0.0656	0.0569	0.2964	0.0344
18	Wholesale and retail trade	0.0035	0.0053	0.0059	0.0013	0.0321	0.0010	0.0046	0.0015
19	Eating, drinking places and hotels	0.1370	0.0054	0.0090	0.0002	0.0503	0.0081	0.0123	0.0023
20	Transportation and warehousing	0.0034	0.0051	0.0015	0.0015	0.3552	0.0013	0.0139	0.0058
21	Communication and broadcasting services	0.0040	0.0043	0.0023	0.0006	0.0157	0.0018	0.0097	0.0011
22	Finance and insurance	0.0021	0.0022	0.0014	0.0006	0.0096	0.0006	0.0042	0.0005
23	Real estate and business services	0.0024	0.0024	0.0036	0.0009	0.0202	0.0034	0.0181	0.0029
24	Public administration and defence	0.0064	0.0109	0.0034	0.0019	0.0314	0.0022	0.0195	0.0486
25	Educational and health services	0.0066	0.0048	0.0030	0.0015	0.0959	0.0021	0.0199	0.0041
26	Social and personal services	0.0073	0.0151	0.0046	0.0015	0.0633	0.0032	0.0258	0.0055
27	Others	0.0842	0.0699	0.0315	0.0086	0.0761	0.0108	0.0318	0.0035

Annotations: this table shows the prices repercussion effect when there would be 10 percent increase of imported goods' prices in each industry.

<Table 5> the Price Repercussion Effect in the Case of a 10% Percent Rise in the Price of Imported Goods (2)

(단위:%)

		Electronic and other electric equipment	Precision instruments	Transportation equipment	Electric, gas and water	Construction	Transportation and warehousing	Communication and broadcasting services	Finance and insurance
1	Agriculture, forestry and fisheries	0.0134	0.0021	0.0048	0.0000	0.0000	0.0245	0.0005	0.0031
2	Mining and quarrying	0.0278	0.0009	0.0018	0.0000	0.0000	0.0115	0.0005	0.0067
3	Food and kindred products	0.0107	0.0013	0.0023	0.0000	0.0000	0.0176	0.0005	0.0032
4	Textile mill products and apparel	0.0111	0.0008	0.0007	0.0000	0.0000	0.0143	0.0007	0.0032
5	Paper and wood products	0.0150	0.0013	0.0008	0.0000	0.0000	0.0122	0.0006	0.0040
6	Printing and publishing	0.0275	0.0010	0.0012	0.0000	0.0000	0.0186	0.0012	0.0035
7	Petroleum, coal products and Chemicals	0.0106	0.0018	0.0005	0.0000	0.0000	0.0080	0.0003	0.0023
8	Nonmetallic minerals	0.0315	0.0018	0.0018	0.0000	0.0000	0.0194	0.0009	0.0059
9	Primary metal products	0.0297	0.0019	0.0008	0.0000	0.0000	0.0121	0.0005	0.0032
10	Fabricated metal products	0.0477	0.0037	0.0008	0.0000	0.0000	0.0128	0.0006	0.0033
11	General Machinery and equipment	0.3152	0.0194	0.0028	0.0000	0.0000	0.0119	0.0005	0.0029
12	Electronic and other electric equipment	3.2205	0.0300	0.0005	0.0000	0.0000	0.0089	0.0005	0.0020
13	Precision instruments	1.0160	0.3434	0.0007	0.0000	0.0000	0.0121	0.0006	0.0026
14	Transportation equipment	0.3197	0.0416	0.1694	0.0000	0.0000	0.0089	0.0005	0.0034
15	Furniture and miscellaneous manufactured products	0.0825	0.0014	0.0008	0.0000	0.0000	0.0138	0.0007	0.0027
16	Electric, gas and water	0.0640	0.0049	0.0003	0.0000	0.0000	0.0041	0.0003	0.0043
17	Construction	0.1803	0.0051	0.0008	0.0000	0.0000	0.0115	0.0006	0.0035
18	Wholesale and retail trade	0.0183	0.0010	0.0007	0.0002	0.0001	0.0308	0.0033	0.0033
19	Eating, drinking places and hotels	0.0219	0.0007	0.0009	0.0000	0.0000	0.0100	0.0006	0.0023
20	Transportation and warehousing	0.0323	0.0023	0.0540	0.0002	0.0001	0.8728	0.0011	0.0043
21	Communication and broadcasting services	0.1605	0.0022	0.0004	0.0000	0.0000	0.0101	0.1150	0.0017
22	Finance and insurance	0.0186	0.0003	0.0004	0.0000	0.0000	0.0099	0.0014	0.3137
23	Real estate and business services	0.0311	0.0020	0.0003	0.0000	0.0009	0.0068	0.0015	0.0067
24	Public administration and defence	0.0637	0.0048	0.0935	0.0005	0.0018	0.0202	0.0036	0.0025
25	Educational and health services	0.0365	0.0220	0.0014	0.0000	0.0000	0.0078	0.0006	0.0026
26	Social and personal services	0.0881	0.0042	0.0071	0.0000	0.0000	0.0112	0.0014	0.0032
27	Others	0.0587	0.0021	0.0012	0.0000	0.0000	0.0981	0.0073	0.0016

Annotations: this table shows the prices repercussion effect when there would be 10 percent increase of imported goods' prices in each industry.

<표 6> the Price Repercussion Effect in the Case of a 10% Percent Rise in the Exchange Rate

(단위:%)

		Effect of Rise in the Exchange Rate	Producer Prices Index (Weight)	Effect of Rise in the Producer Price (Kyeongbook)	Effect of Rise in the Exchange Rate (wage endogenous)
1	Agriculture, forestry and fisheries	0.4574	49.0	0.0224	0.5624
2	Mining and quarrying	0.3860	2.5	0.0010	0.5557
3	Food and kindred products	1.0847	58.3	0.0632	1.2640
4	Textile mill products and apparel	2.2070	32.7	0.0722	2.8883
5	Paper and wood products	1.8818	21.2	0.0398	2.2092
6	Printing and publishing	0.6614	6.6	0.0043	1.0687
7	Petroleum, coal products and Chemicals	3.3698	152.7	0.5145	4.0151
8	Nonmetallic minerals	1.1857	23.9	0.0283	1.6567
9	Primary metal products	3.6493	49.2	0.1795	4.2640
10	Fabricated metal products	2.1407	17.9	0.0383	2.8711
11	General Machinery and equipment	1.6561	72.9	0.1207	2.1820
12	Electronic and other electric equipment	3.9949	104.7	0.4182	4.5075
13	Precision instruments	2.0949	5.5	0.0115	2.5122
14	Transportation equipment	1.5488	57.5	0.0890	2.0076
15	Furniture and miscellaneous manufactured products	1.7095	10.3	0.0176	2.0514
16	Electric, gas and water	2.6792	40.9	0.1096	3.0490
17	Construction	0.9781	0	0.0000	1.5992
18	Wholesale and retail trade	0.4048	0	0.0000	0.5775
19	Eating, drinking places and hotels	0.6828	0	0.0000	0.9531
20	Transportation and warehousing	1.7283	52.9	0.0914	2.5184
21	Communication and broadcasting services	0.4651	42.8	0.0199	0.6101
22	Finance and insurance	0.1704	21.6	0.0036	0.3434
23	Real estate and business services	0.2009	106.3	0.0213	0.3039
24	Public administration and defence	0.4653	0	0.0000	0.9592
25	Educational and health services	0.4535	56.1	0.0254	0.9053
26	Social and personal services	0.5073	14.5	0.0073	0.9200
27	Others	1.5771	0	0.0000	1.7622
계	Total	38.3421	1,000	1.8998	49.1185

Sources: 1) This table shows the price repercussion effect when there would be 10 percent rise in the exchange rate

2) The producer price weight used the Outlook of Producer Prices for the Month of the Bank of Korea(2005. 8).

3) When there is a 10 percent rise in the exchange rate with endogenizing wages, the price repercussion effect was calculated by the (3-9) equation.

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