Policy Implications for Internal and External Balance in Korea

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I. Introduction

Focus on internal and external balance highlights policy implications within open-economy macroeconomic theory. It seems that one has been emphasized more than the other in certain periods. However, internal and external balance need not oppose each other in policy choices but rather should be considered together.

It is widely accepted that the world economy has become more open to foreign trade in the last 30 years. With a more open economy, it should be noted that steps taken to cure external deficit problems are always accompanied by those disturbances such as unemployment and/or inflation. With increasing openness, dependence on imported intermediate goods has deepened in individual countries. The degree of openness, the degree of dependence on imports of domestic producers, and the degree of idle resources may affect the use of policy variables for

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achieving internal and external balance.

Our question is this; how should a small, open, developing country like Korea use alternative policy instruments in order to attain internal and external balance? Focus has been given to the following three methods; internal deflation, devaluation, and import control. The theoretical framework of the analysis is familiar from the works of Otani and Park [11], Black [4], Benavie [3], and Cuddington [7]. But this study develops a revealing formulation of the problem through its emphasis on the sectoral breakdown of the economy and the construction of the production function of each sector.

In the theoretical part, the first step is to develop a three sector macromodel for a small country like Korea. The second step is to analyze the short-run effects of three alternative policies with special consideration of some factors such as the degree of openness, the degree of dependence on imports, and the extent of idle resources.

In the empirical part, we extend the theoretical model to make it suitable for estimation. Korea has been chosen as a case study. The three stage least squares technique will be used for estimation with quarterly data of Korea during 1969~79. We do not construct a full-scale econometric model of Korea, but rather a limited model designed to answer specific questions. In the second part of the empirical study, we will analyze the relative effectiveness on major macroeconomic variables of alternative policy instruments and try to find which policy, in general, would be most effective. This work will be done through simulation exercises.

II. A Theoretical Analysis of Internal and External Balance

1. The Model

We assume three goods; a nontraded good, an exportable good, and

an imported good. The domestic economy produces a nontraded good and an exportable good, but consumes all three goods.

We assume that real outputs of the nontraded good and the exportable good are taken as functions of labor inputs and imported goods used in both domestically produced goods. We assume that other inputs such as capital and domestically produced material inputs are held constant, and thus they are suppressed from our model.

The overall domestic price level is

$$P=\alpha_1 P_n+\alpha_2 P_x+\alpha_3 P_m, \qquad \alpha_i>0 \text{ and } \sum\alpha_i=1, \tag{1}$$

where the α's indicate the share of each good in total domestic expenditures, and P_n, P_x and P_m are the price levels. In a small country the prices of the traded goods, in terms of the home currency, are

$$P_x=eP_x^*, \tag{2}$$

$$P_m=eTP_m^*, \tag{3}$$

where P_x^* and P_m^* are the fixed foreign prices of the exportable and imported goods denominated in foreign currency, e is the nominal exchange rate and T is the tariff rate (defined as one plus the rate of *ad valorem* taxation of imports).

With a small country assumption and a profit maximization behavior, we obtain the output supply function of each sector.

$$Y_n^s=\underset{+}{Y_n}(\underset{+}{P_n},\underset{-}{P_m}), \tag{4}$$

$$Y_x^s=\underset{+}{Y_x}(\underset{+}{P_x},\underset{-}{P_m}). \tag{5}$$

Total nominal GNP is written as

$$PY=P_nY_n+P_xY_x-P_m(I_n^m+I_x^m). \tag{6}$$

Real aggregate domestic demands for the three goods are

$$D_n^d=\underset{+}{D_n}(\underset{+}{Y},\underset{-}{P_n},\underset{+}{P_x},\underset{+}{P_m},\underset{-}{i})+G_n, \tag{7}$$

$$D_x^d=\underset{+}{D_x}(\underset{+}{Y},\underset{+}{P_n},\underset{-}{P_x},\underset{+}{P_m},\underset{-}{i}), \tag{8}$$

$$D_m^d = D_m(Y, P_n, P_x, P_m, i), \quad (+\ +\ +\ -\ -) \tag{9}$$

where D_n^d, D_x^d and D_m^d are domestic demands for the three goods, i is the pegged interest rate on time and savings deposits, and G_n is government expenditures on nontraded goods. For simplicity, the government expenditures on the other goods are suppressed.

For equilibrium of the nontraded good sector we need

$$Y_n^s(P_n, P_m) = D_n(Y, P_n, P_x, P_m, i) + G_n. \quad (+\ -)\ \ (+\ -\ +\ +\ -) \tag{10}$$

Total imports equal

$$M = I_n^m(P_n, P_m) + I_x(P_x, P_m) + D_m(Y, P_n, P_x, P_m, i), \quad (+\ -)\ \ (+\ -)\ \ (+\ +\ +\ -\ -) \tag{11}$$

where M is the flow of imports.

For simplicity, we assume that the domestic demand for the exportable good at the prevailing price is always met. Any surplus is then available for export.

$$X = Y_x^s(P_x, P_m) - D_x(Y, P_n, P_x, P_m, i), \quad (+\ -)\ \ (+\ +\ -\ +\ -) \tag{12}$$

where X is real exports.

Turning to the monetary sector, the basic relationships of the money market are given by

$$L = m(R + D), \tag{13}$$

$$L/P = l(Y, i), \quad (+\ -) \tag{14}$$

where L is the nominal stock of money; m is the money multiplier which is assumed to be constant and equal to one; R is foreign exchange reserves of the monetary base; l is real money demand. Since $\dot{m}=0$, in terms of the rate of change, we have

$$\dot{L} = \dot{R} + \dot{D}. \tag{15}$$

With a fixed exchange rate, the balance of payments equation is

$$B = \dot{R} = P_x X - (P_m - etP_m^*)M + eK, \tag{16}$$

where B is the balance of payments; t is the rate of *ad valorem* taxation

of imports; $etP_m{}^*M$ is the tariff revenue collected by the government; K is the exogenous net capital inflow.

With suppressing $P_x{}^*$ and $P_m{}^*$, and some modification, we rewrite (1) through (16) and get the following three equations: Here we suppress the monetary sector as a residual,

$$\underset{+\ -}{Y_n{}^s}(P_n, eT)=\underset{+\ -+\ +-}{D_n}(Y, P_n, e, T, i)+G_n, \tag{17}$$

$$PY=\underset{+\ -}{P_nY_n}(P_n, eT)+\underset{+\ -}{eY_x}(e, eT)-\underset{+\ -}{eTI_n{}^m}(P_n, eT)-\underset{+\ -}{eTI_x{}^m}(e, T), \tag{18}$$

$$B/e=\underset{+\ -}{Y_x}(e, eT)-\underset{+\ +-\ +-}{D_x}(Y, P_n, e, T, i)-\underset{+\ +\ -\ -}{D_m}(Y, P_n, e, T, i)$$

$$-\underset{+\ -}{I_n{}^m}(P_n, eT)-\underset{+\ -}{I_x{}^m}(e, T)+K. \tag{19}$$

For the next steps, we need to totally differentiate the system of equations. We rewrite them with simple coefficients.

$$D_{n1}dY+\Delta_{12}dP=\Delta_{13}de+\Delta_{14}dT-D_{ns}di-dG_n, \tag{20}$$

$$PdY+\Delta_{22}dP=\Delta_{23}de+\Delta_{24}dT, \tag{21}$$

$$\Delta_{31}dY+\Delta_{32}dP+(1/e)dB=\Delta_{33}de+\Delta_{34}dT+\Delta_{35}di+dK, \tag{22}$$

where

$$\Delta_{12}=-(1/\alpha_1)(\underset{+\ -}{Y_{n1}-D_{n2}})<0,$$

$$\Delta_{13}=\{(\underset{-\ +}{TY_{n2}-D_{n3}})-(1/\alpha_1)(\underset{+\ -}{Y_{n1}-D_{n2}})(\alpha_2+\alpha_3T)\}<0,$$

$$\Delta_{14}=\{(\underset{-\ +}{eY_{n2}-D_{n4}})-(1/\alpha_1)(\underset{+\ -}{Y_{n1}-D_{n2}})\alpha_3e)\}<0,$$

$$\Delta_{22}=-\{(1/\alpha_1)(\underset{+}{P_nY_{n1}}+\underset{+}{Y_n}-eTI_n{}^m-Y\}<0,$$

$$\Delta_{23}=TP_n\ \underset{-}{Y_{n2}}-\underset{-}{eT^2I_{n2}{}^m}-\underset{-}{TI_n{}^m}-(1/\alpha_1)(\underset{+}{P_nY_{n1}}+\underset{+}{Y_n}-eTI_n{}^m)(\alpha_2+\alpha_3T)$$

$$+(\underset{+}{eY_{x1}}+\underset{-}{eTY_{x2}}+\underset{+}{Y_x}-eTI_{x1}{}^m-TI_x{}^m)>0,$$

$$\Delta_{24}=\{(\underset{-}{eP_nY_{n2}}-\underset{-}{eT^2I_{n2}{}^m}-eI_n{}^m)-(1/\alpha_1)(\underset{+}{P_nY_{n1}}+\underset{+}{Y_n}-eTI_{n1}{}^m)\alpha_3e$$

$$+(\underset{-}{e^2Y_{x2}}-\underset{-}{eTI_{x2}{}^m}-eI_x{}^m),$$

$$\underset{+}{\Delta_{31}}=\underset{+}{D_{x1}}+\underset{+}{D_{m1}}>0,$$

$$\underset{+}{\Delta_{32}}=(1/\alpha_1)(\underset{+}{D_{x2}}+\underset{+}{D_{m2}}+\underset{+}{I_{n1}^{m}})>0,$$

$$\underset{+}{\Delta_{33}}=\{(\underset{+}{Y_{x1}}+\underset{-}{TY_{x2}}-\underset{+}{I_{x1}^{m}})-(\underset{-}{D_{x3}}+\underset{-}{D_{m3}})-\underset{-}{TI_{n2}^{m}}+B/e^2$$

$$+(1/\alpha_1)(\underset{+}{D_{x2}}+\underset{+}{D_{m2}}+\underset{+}{I_{n1}^{m}})(\alpha_2+\alpha_3 T),$$

$$\underset{-}{\Delta_{34}}=\{(\underset{-}{eY_{x2}}-\underset{-}{I_{x2}^{m}})-(\underset{+}{D_{x4}}+\underset{-}{D_{m4}})-\underset{-}{eI_{n2}^{m}}+(1/\alpha_1)(\underset{+}{D_{x2}}+\underset{+}{D_{m2}}+\underset{+}{I_{n1}^{m}})\alpha_3 e\},$$

$$\underset{-}{\Delta_{35}}=-(\underset{-}{D_{x5}}+\underset{-}{D_{m5}})>0.$$

2. Alternative Policy Effects

(1) Monetary and Fiscal Policies

$$\frac{\partial Y}{\partial i}=\frac{1}{\Delta}(-\underset{-}{D_{n5}}\underset{-}{\Delta_{22}})<0, \tag{23-1}$$

$$\frac{\partial P}{\partial i}=\frac{1}{\Delta}(\underset{-}{D_{n5}}P)<0, \tag{23-2}$$

$$\frac{\partial B}{\partial i}=(e/\Delta)(\underset{+}{\Delta_{31}}\underset{+}{D_{n5}}\underset{-}{\Delta_{22}}-\underset{+}{\Delta_{32}}\underset{-}{D_{n3}}P+\underset{+}{\Delta_{35}})>0, \tag{23-3}$$

where $\Delta=\underset{-}{D_{n1}}\underset{-}{\Delta_{22}}-P\underset{-}{\Delta_{12}}>0$ from the stability condition.

$$\frac{\partial Y}{\partial G_n}=\frac{1}{\Delta}(-\underset{-}{\Delta_{22}})>0, \tag{24-1}$$

$$\frac{\partial P}{\partial G_n}=\frac{P}{\Delta}>0, \tag{24-2}$$

$$\frac{\partial B}{\partial G_n}=(e/\Delta)(\underset{+}{\Delta_{31}}\underset{-}{\Delta_{22}}-\underset{+}{\Delta_{32}}P)<0. \tag{24-3}$$

Δ_{22} is small in absolute value, the effects of both the monetary and fiscal policies on the income are small but their deterioration effect on the balance of payments become weak because of the smaller income effect. Thus a high dependence of the nontraded good sector on imports, low availability of idle resources and/or a low elasticity of substitution between inputs in the nontraded good sector decrease the effects of both the interest

rate and fiscal policies on income.

(2) Devaluation and Tariff Policies

In order to analyze the effects of a devaluation and a tariff, we need to determine the signs of Δ_{23}, Δ_{24}, Δ_{33} and Δ_{34}. For a simple analysis, we assume that the hypothetical developing country has a large degree of openness and an economy highly dependent on imports in the production process. Then we get $\Delta_{23}>0$, $\Delta_{24}<0$, $\Delta_{33}>0$, and $\Delta_{34}\gtrless 0$. For the income and price effects of devaluation,

$$\frac{\partial Y}{\partial e}=(1/\Delta)\underset{- \; -}{(\Delta_{13}}\underset{-}{\Delta_{22}}-\underset{-}{\Delta_{12}}\underset{+}{\Delta_{23}})>0, \tag{25-1}$$

$$\frac{\partial P}{\partial e}=(1/\Delta)\underset{+ \; +}{(D_{n1}}\underset{+}{\Delta_{23}}-P\underset{-}{\Delta_{13}})>0. \tag{25-2}$$

If the economy has a relatively small dependence on imported intermediate goods(big Δ_{22} and big Δ_{23}), relatively large size of the exportable sector in GNP (big Δ_{23}), an easy availability of idle resources and a high elasticity of substitution between inputs in both production sectors (big Δ_{12}, Δ_{13}, Δ_{22}), then devaluation will be successful in raising income. Since devaluation increases the price levels of imported goods, if the share of imports in domestic expenditures is big (big α_3 in Δ_{13}), inflationary effects may be high. If the country's share of the exportable sector in GNP is relatively large (big Δ_{23}), devaluation may help the inflationary effect because of higher income effect.

For the balance of payments effect of devaluation, we get

$$\frac{\partial B}{\partial e}=(e/\Delta)\{\underset{+}{-\Delta_{31}}\underset{- \; -}{(\Delta_{13}}\underset{-}{\Delta_{22}}-\underset{-}{\Delta_{12}}\underset{+}{\Delta_{23}})\underset{+}{-\Delta_{32}}\underset{+ \; + \; +}{(D_m}\underset{+}{\Delta_{23}}-P\underset{-}{\Delta_{13}})$$
$$\underset{+}{+\Delta_{33}}\}\gtrless 0. \tag{25-3}$$

The ambiguous result of (25-3) comes from the fact that the direct positive effect of devaluation on the balance of payments is coupled with the indirect negative output and inflationary effects on the demands for exportable and imported goods. The size of Δ_{33} depends partly on the degree of dependence of the exportable sector on imports. If a country heavily

depends on foreign imports, and hence substitutability between imported inputs and domestic input factors is limited, then a devaluation will simply raise domestic prices of imported inputs with little effects on reducing quantity of imports.

Next, we examine the tariff effects.

$$\frac{\partial Y}{\partial T}=(1/\Delta)\,(\underset{-}{\Delta_{14}}\underset{-}{\Delta_{22}}-\underset{-}{\Delta_{12}}\underset{-}{\Delta_{24}})\gtrless 0, \tag{26-1}$$

$$\frac{\partial P}{\partial T}=(1/\Delta)\,(\underset{+}{D_{n1}}\underset{-}{\Delta_{24}}-P\underset{-}{\Delta_{14}})\gtrless 0, \tag{26-2}$$

$$\frac{\partial B}{\partial T}=e(-\Delta_{31}\underset{+}{\frac{\partial Y}{\partial T}}-\Delta_{32}\underset{?}{\frac{\partial P}{\partial T}}+\underset{+}{\Delta_{34}})\gtrless 0. \tag{26-3}$$

The tariff effects on Y, P, and B are all ambiguous. While the dependence of both production sectors on imports will decrease their output levels when a tariff is imposed, a tariff increase will stimulate the output of the nontraded good with demand shifts toward that good. A tariff increases the overall price proportional to α_3, but its ambiguous income effect makes us unable to determine the sign of (26-2). The ambiguity of (26-3) follows from the dependence of the exportable sector on imports besides the ambiguities of (26-1) and (26-2). Its economic interpretation is this: an easy availability of idle resources, a high elasticity of substitution between inputs (big Δ_{14} and Δ_{22}) and a low dependence of both production sectors on imports (big Δ_{22} and small Δ_{24}) contribute to the positive effects of the tariff on income and price variables.

If tariffs are imposed only on the imports for final demands, how is our previous analysis of tariff policy changed? A tariff imposition on imports of consumption goods will cause domestic demand to shift from imported consumption goods to domestically produced goods. Such a demand shift will stimulate the output and the price level of nontraded goods. However, the balance of payments effect of such a tariff policy is still ambiguous because, even though tariffs improve the balance of payments by reducing imports, the increased output and price level will

offset such a favorable effect.

III. An Empirical Study of the Korean Experiences

1. Construction of Variables

The sample period, 1969/IV through 1979/IV, contains 44 observation. Abbreviations used in the estimated equations are as follows. All variables except dummy variables are constructed by taking a natural logarithm.

(1) LGD=GNP deflator, seasonally adjusted, 1975=100.

(2) LER=the effective exchange rate index based on bilateral weighting scheme.

(3) LTR=one plus tariff rate. The tariff rate was constructed as ratio of actual tariff revenues to total imports values in terms of "won".

(4) LIP=Korean import unit value index, 1975=100.

(5) LGNP=gross national product in billion won, seasonally adjusted, in 1975 price.

(6) DO=oil shock dummy variable, 1973/IV through 1974/IV=1, otherwise 0.

(7) LWR=daily wage in manufacturing sector, in won.

(8) LKS=real capital stock in billion won, 1975=100.

(9) LEXP=real exports of commodities and nonfactor services in billion won, seasonally adjusted, in 1975 price.

(10) LIMP=real imports of commodities and nonfactor services in billion won, seasonally adjusted, in 1975 price.

(11) LRTD=nominal interest rate on time and savings deposits.

(12) D2, D3, D4= seasonal dummy variables.

(13) LWM=real world imports in billion won in 1975 price.

(14) LG=real government expenditures in billion won.

(15) LPP=economically active population.

(16) LGD1, LGNP1, LEXP1 and LIMP1=lags of each variable.

2. Estimation Results

In this stage, the theoretical model will be extended for a suitable estimation. Variables such as wages, capital stock, foreign prices and foreign income will be added to the empirical model with a partial adjustment mechanism. In order to solve the problems of simultaneity and contemporaneous correlation among the equations, the three-stage least squares method which estimates all equations jointly was used for the system of equations. The summary of estimation results follows. The symbol # indicates unexpected sign and t-statistics are in parenthesis.

(a) *Price equation*

$$\begin{aligned} LGD = &-6.5 + 0.23LER - 1.33LTR\# + 0.23LIP + 0.27LWR \\ &(-5.0)\ (3.0)\quad (-1.6)\quad (3.1)\quad (2.5) \\ &+0.65LRTD\# + 0.58LGNP + 0.05LGD1 - 0.09DO. \\ &(1.7)\quad (2.9)\quad (0.3)\quad (-3.2) \end{aligned}$$

Restriction: coefficient of LER=coefficient of LIP.

(b) *GNP equation*

$$\begin{aligned} LGNP = &6.9 + 0.11LER + 0.88LTR - 0.15LIP - 0.23LWR \\ &(11.4)\ (1.4)\quad (1.6)\quad (-2.1)\quad (-2.7) \\ &+0.38LGD + 0.21LKS + 0.0002LGNP1 + 0.08DO. \\ &(3.2)\quad (5.5)\quad (3.2)\quad (3.0) \end{aligned}$$

Restriction: coefficient of LWR+coefficient of LIP

$$= -\text{coefficient of LGD.}$$

(c) *Export equation*

$$\begin{aligned} LEXP = &-5.5 + 0.05LER - 0.007LIP - 0.17LGD + 0.59LWM \\ &(-2.0)\ (0.24)\quad (-0.06)\quad (-1.4)\quad (2.0) \\ &+0.79LEXP1 - 0.07DO + 0.30D2 + 0.18D3 + 0.21D4. \\ &(6.4)\quad (-1.5)\quad (8.6)\quad (7.2)\quad (8.1) \end{aligned}$$

(d) *Import equation*

$$\begin{aligned} LIMP = &-5.7 - 0.15LER - 1.56LTR - 0.16LIP + 0.12LGD \\ &(-1.8)\ (-0.7)\quad (1.1)\quad (-1.1)\quad (0.5) \end{aligned}$$

$$+1.47LGNP+0.16LIMP1+0.06DO+0.14D2+0.05D3+0.09D4.$$
$$(3.0)\qquad(0.9)\qquad(0.9)\qquad(3.9)\qquad(1.4)\qquad(2.3)$$

In the price equation(a), the strong and significant coefficient of import price index indicates the influence of foreign inflationary pressures on domestic prices. The positive effect of devaluation on the domestic price level confirms the theoretical model. The tariff variable has an unexpected sign although it is not highly significant. There may be possible explanation of an unexpected and insignificant coefficient of the tariff variable: There are measurement aggregation bias of the tariff variable, because we are using the problems and/or aggregate tariff rate which is constructed as the ratio of the total tariff revenues to the total import values. The interest rate has an unexpected positive effect on price but its significance is low. There are measurement problems of the interest rate variable. Because the nominal interest rate are often kept below the market rates, it may not have a significant effect on the choice among financial assets, and hence it may not reflect a significant effect on the aggregate demand. The GNP level as an indicator of another demand pressure is highly significant.

All the estimated coefficients in the GNP equation have the expected signs. The positive sign of the coefficient of the tariff rate may indicate that there are some import substitution sectors. Devaluation shows a positive effect on GNP through the expansion of the exportable sector. Coefficient of the real wage is small which reflects the inelastic response of the demand for labor to the real wage change. Furthermore, the low elasticity of supply with respect to relative prices indicates that the elasticity of substitution between imported factors and the other domestic factors is quite low. Such a low elasticity of supply with respect to both relative prices and real wage may indicate that the economic structure in Korea has been dependent on foreign economies.

The estimated equation for exports is found to have all expected signs.

Variables such as the exchange rate, tariff rate and import price are not significant but the level of world import and lagged dependent variable are significant. Such a result may be interpreted as follows: Since the exportable sector depends on imported inputs, the devaluation effects on the exports will be offset, in some degree, when devaluation increases the domestic price levels of imported inputs. The domestic price level has negative effects on exports. The negative coefficient of import prices may explain the dependence of exports on import goods. The exchange rate does not seem to be significant and it does not have high explanatory power on exports.

The final equation for imports has all expected signs but shows low significance levels for some variables. The poor statistics of price variables as in the export equation may indicate that imports are determined, in some degree, exogenously. High income elasticity of demand for imports may imply that the economic structure of production and consumption in Korea is highly dependent on imports and import policy through quantity control may be effective in lowering import level. Devaluation and tariff imposition as well as a rise in the import price reduce the import level while an increase in the domestic price level has a positive effect on the import level.

3. Simulation Results

Our four equation system is dynamically simulated for five years(twenty periods). All estimated parameters except the coefficients of the tariff rate and the interest rate in the price equation which were obtained by using three stage least squares in the previous section are held constant during the simulation period. Three different parameter values will be assigned to the coefficients (d_2 and d_4) of both variables which had unexpected signs in the regression analysis. The following policy changes are considered:

Case A. The effective exchange rate is devalued by 10 percent (not by percentage points).

Case B. The overall tariff rate is raised by 10 percent.

Case C. The interest rates on savings and time deposits are raised by 10 percent.

From Table 1, devaluation has a positive effect on the price level and real income. However, it contracts exports and stimulates imports. Such a simulation result of devaluation on the trade balance is opposite to regression results in the previous section. Such a result could mean that the inflationary effect and income effect of devaluation offset the relative price advantage of devaluation in a short-time period. An increase in the tariff rate shows the same effects as the case of devaluation. A rise in the interest rate by the central bank has a depressing effect on the price level and real income, but it improves the trade balance.

Table 1. Qualitative Effects of Changes in Exogenous Variables

Endogenous Variables	Case A	Case B	Case C
Price level	+	+	−
Real income	+	+	−
Exports	−	−	+
Imports	+	+	−

Notes: Cases B and C show same qualitative effects for all three parameter values.

Table 2 shows the total multipliers on major endogenous variables with respect to a 10 percent increase in the alternative policy instruments during the 20 quarter simulation periods.

Table 2. Total Multiplier of Alternative Policy Instruments (20 quarters Simulation)

	Case A	Case B			Case C		
		$d_2=0.2$	$d_2=0.4$	$d_2=0.8$	$d_4=-0.4$	$d_4=-0.8$	$d_4=-1.2$
Price level	2.81	0.60	0.90	1.32	−0.66	−1.8	−3.78
Income	1.68	0.92	1.06	1.21	−0.21	−0.46	−0.91
Exports	−0.55	−0.44	−0.65	−0.90	0.51	1.3	2.54
Imports	2.19	0.20	0.36	0.50	−0.50	−1.3	−2.44

We have assumed that the multiplier effects of policy variables are proportional to the size of the policy. In the cases B and C, various multipliers have been reported with respect to the various parameter sizes of d_2 and d_4. It is observed that the relationships between parameter sizes and corresponding multipliers are stable and positive for both cases B and C.

Based on the same percentage changes in the policy variables, a devaluation shows larger income multiplier than other policy choices. Large income multiplier of devaluation indicates that Korea has a pretty big size of the open economy, which means that the exportable sector is relatively big compared with the nontraded sector. In order to compare the relative effectiveness, it is necessary for the multiplier of any one endogenous variable (for example, income multiplier) to be kept equal across the policy instruments.

Table 3 shows a cross comparison of the relative effectiveness among policy instruments when the income multiplier is kept equal across the cases. The result of Case B is obtained by increasing the tariff rate by 13.9 percent and Case C is the result of an increase in the interest rate by 18.5 percent. In Table 3, only cases of $d_2=0.6$ and $d_4=-1.2$ were reported for simplicity. Table 3 shows that tariff policy, *ceteris paribus*, could be a preferred policy choice relative to the devaluation.

Table 3. Relative Effectiveness of Alternative Policy Instruments when Income Multiplier Is Kept Equal Across Policy Instruments

	Case A	Case B ($d_2=0.6$)	Case C($d_4=-1.2$)
Price level	2.81	1.83	−6.98
Income	1.68	1.68	−1.68
Exports	−0.55	−1.25	4.69
Imports	2.19	0.69	−4.50

Table 4 shows the relative effectiveness of combined policy instruments when the government decides to stabilize the overall income level. The first case is to combine the devaluation policy with the interest rate policy.

The other case is a policy combination between the tariff rate and the interest rate. The alternative combined policy (ii) shows more deflation and slightly better balance of payments effects than the first policy combination (i). However, since the actual differences between the overall effects of the two policy combination, (i) and (ii), are not big, a policy choice may be made according to its long-run effect or the relative emphasis of the government on the economic structure.

Table 4. Relative Effectiveness of Combined Policy Instruments when Income Multiplier Is Kept Equal Across the Cases

	10% devaluation combined with 18.5% increase in interest rate	13.9% increase in tariff combined with 18.5% increase in interest rate
Price level	−4.17	−5.15
Income	0	0
Exports	4.14	3.44
Imports	−2.31	−3.81

IV. Summary and Conclusions

The theoretical results show that the deflationary policies improve the balance of payments and lower the price level, but reduce the output level. Devaluation raises the output level but causes inflation. The effects of the tariff policy are ambiguous when it is imposed on imported intermediate goods. However, tariff imposition on imported final goods shows identical results with the cases of devaluation. The effects of devaluation and tariff imposition on balance of payments are ambiguous.

It is found that effects of policy variables on internal and external balance are, to a great extent, affected by the economic conditions, including the degree of openness, the degree of dependence on imports, and the extent of idle resources. When a country suffers a balance of payments deficit coupled with high inflation, a deflationary monetary and fiscal policy could be an effective choice. When dependence of the domes-

tic sectors on imports is big and/or unemployment rates are low, monetary or fiscal policy does not have a large impact on income and price levels. If a country has idle resources and has a relatively large exportable sector, devaluation is one of the most effective instruments. But if its dependence on imports is big and/or unemployment rates are low, its income effect is small and its inflationary effect is high. In this case, with the low substitutability between inputs, devaluation may even deteriorate the balance of payments.

The regression results, as a whole, show that the empirical model describes the movements of the actual Korean economy quite well. It is found that the empirical results are consistent with the theoretical results except the balance of payments effects of devaluation and tariffs. Their effects on the balance of payments are negative in the case of Korea. Such negative effects of devaluation and tariffs on the balance of payments may indicate that indirect income and price effects resulting from devaluation and tariff imposition are the most important factors in determining levels of the balance of payments.

Simulation exercises show that income is most sensitive to change in exchange rates. However, the monetary policy using the interest rate seems to perform a better result overall except for its contractionary effect on income. The tariff policy shows less income effects but less inflation effects and better balance of payments effects than the devaluation policy. Such a finding suggests that a combination of monetary, exchange rate, and tariff policies is required in order to achieve internal and external balance. A combined policy of tariffs and interest rates shows more deflation and slightly better balance of payments effects than the other policy combination of devaluation and interest rates. Since differences are not big, selection of an appropriate combined policy must depend on their long-run effects on the economy and on the economic structure of Korea.

As I pointed out earlier, the model applied to this study were constructed under certain limitations, and hence results may not be conclusive. However, the study provides some useful policy implications for Korea. One recommendation can be suggested for a small, open developing country whose economy is heavily dependent on foreign economies with consistent deficits and is experiencing a relatively high inflation rate with low unemployment rates. In order to achieve internal and external balance such a developing country needs to stabilize the price level and to improve the balance of payments by raising the interest rates and to restore its income level by devaluating its currency slowly coupled with the tariff imposition on the final goods. In this case, the sizes of policy variables should be determined by considering all economic circumstances, including the degree of openness, the degree of dependence on imports, and the extent of unemployment.

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