Short-Run Macro-Economic Adjustment Policies in South Korea

A Quantitative Analysis

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ABSTRACT OF THE STUDY

The subject of this Working Paper is an analysis of the startling reversal of performance in 1979 and 1980, compared with the preceding 15 years, of the South Korean economy, and an exploration of the short-run macroeconomic policy options available to Korea in 1981. To do this we use a quarterly econometric model presented in the first part of this paper. This model explicitly incorporates the financial structure typical for Korea, and, we think, for many other LDC's. The role of commercial banks, foreign capital inflows (determined endogenously in this model) and Unorganized Money Markets and the use of credit obtained from these sources to finance fixed and working capital are all highlighted. The explicit incorporation of intermediate imports as a factor of production, and of an agricultural sector make the model appropriate for an analysis of the '79/80 period, characterized by a bad harvest and repeated oil shocks.

This model is used first to provide a quantitative analysis of the 79/80 period, trying to disentangle the role of various exogenous shocks and domestic policy measures. We then go on to explore short-run policy alternatives. Specifically, a scenario combining tight fiscal and monetary policy is compared with a more relaxed monetary policy, moderate fiscal stimulus and gradual reductions in the real price of food to world prices.
PART I

MODEL PRESENTATION
Chapter 1
INTRODUCTION

Korea's economic development since the mid-sixties has, with good reason, been widely acclaimed as a nearly flawless success story. A series of trade liberalization measures initiated in 1963 and implemented over the next couple of years and an "opening up" of the financial sector to foreign capital inflows set the stage for a period of unprecedented growth, a real GNP growth rate of nearly 10% over the 63/78 period. Exports responded even more strongly to the opening up of the economy; real exports grew at an annual rate of 26% between '63 and '78, pushing up their share in GNP from 4.7% to 45.6%. All this was accomplished without significant deterioration in the size distribution of income, a feat that is often attributed to the stress on labor-intensive products that characterized the Korean export drive in the sixties and early seventies. Although inflation was high throughout this period, if Taiwan and Singapore are used as a standard of comparison, it never got out of hand in Latin American fashion. With the exception of the years immediately after the '73 and '79/80 oil shocks, inflation usually hovered between 10 and 20%.

All this changed dramatically in 1979 and 1980. Exports actually fell in real terms in '79, and real GNP followed suit in 1980 under the combined impact of a series of external shocks (oil prices!) and a disastrous harvest. At the same time inflation ended up at nearly 45% (WPI) over 1980, although exports were showing some signs of recovery.

The subject of this working paper is an analysis of the startling reversal of performance in '79 and '80, and an exploration of the short-run
macro-economic policy options available to Korea in 1981. We will make use of a macro-econometric model estimated using quarterly time series. The model, which we present in the next two chapters, Chapters 2 and 3, has a variety of unusual features. An explicit attempt is made to incorporate the financial structure typical for Korea, and, we think, for many other LDC's. The role of the commercial banking system providing intermediation between private wealth holders and firms in search of funds, the role of foreign capital inflows (determined endogenously in this model), the important place of the Unorganized Money Markets (UMM) in the Korean financial system, and the use of credit obtained from those sources and abroad to finance fixed and working capital are all highlighted. The latter link between monetary conditions and the financing of working capital provides a transmission mechanism between monetary policy and the supply side of the economy, of crucial importance in many LDC's, but nevertheless usually ignored. Other features are incorporation of intermediate imports as a factor of production and of the implications this has for exchange rate policy and an explicit incorporation of the agricultural sector in the analysis. All this is done while imposing the budget and balance sheet constraints faced by the different actors in the economy, thus insuring consistency between the national accounts, flow of funds and end-of-period asset stocks and composition on the one hand and between those and the beginning-of-period asset stocks on the other.

This model is used in Part II of this Working Paper, first to provide a quantitative analysis of the 1979/80 experience, trying to disentangle the role of various exogenous shocks (bad harvests, oil shocks) and domestic policy measures (fiscal and monetary policy, exchange rate policy). We then go on to explore short-run policy alternatives open to Korea. Two policy issues receive special attention. The first is an example of a short-run
stabilization policy threatening to have large medium-run costs without by the way achieving its short-run aims: I am thinking of the tight fiscal and monetary policies Korea has applied recently and continues to apply. Their negative impact on output and investment seem to be in conflict with the high investment required for structural adjustment to the recent changes in the real price of oil. The second is an example of a long-run policy providing obstacles to short-term stabilization. The issue here is the agricultural price-support policy which has the long-run "non-economic" objective of self-sufficiency in rice. There is a conflict here between this target (and its consequence, a high real price of food), which lowers urban real wages in terms of food and therefore pushes up real wages in terms of manufactured goods and which keeps labor on the land on the one hand, and on the other hand the short-run target of slowing down inflation and maintaining external competitiveness, which calls for lower real wages in terms of manufactured goods.

We outline what is to be expected in 1981 if current policies are continued. Also we provide a different set of policies, more fiscal stimulus, a more relaxed monetary policy, and gradual reductions in the real price of food.

Finally, Appendix A provides the list of the equations used in the simulation runs, Appendix B discusses some theoretical issues of relevance for the policy measures under consideration, and Appendix C provides some basic statistics on the Korean economy.
Chapter 2
A MACRO-MODEL FOR KOREA: THE REAL SECTOR

Section 2.1

The main problem we have to deal with in this chapter is the incorporation of the links between the financial and the real sectors, the transmission channels of monetary policy. The traditional, "Atlantic" view of an eclectic neo-Keynesian would roughly run as follows. Because of imperfectly indexed wage contracts (Fischer [6], Gray [7], Phelps and Taylor [13]), costs of price adjustment (Barro [2]) or something similar, wages and prices are not perfectly flexible in the short run. Under such circumstances a decrease in the nominal money stock implies a decrease in the real money stock. To get back at asset market equilibrium, one has to lure people out of money into other assets, say bonds; the way to do this is to decrease the price of bonds, or in other words, have a higher interest rate. This in turn will slow down investment, and so aggregate demand and income. In the long run prices catch up, the real money stock returns to what it was and long-run neutrality obtains. (Changes in the money growth rate will not be neutral in the long run; we do not go into that here, but see Tobin's numerous writings on this issue.) There are, as we have seen in Part I, a number of problems associated with a transplantation of this view of how the world works to LDC's. One point is the virtual absence of markets in securities, be it bonds or equity. Because of this, firms are much more leveled, and the intermediation role of banks is more important. The intermediation aspect that arises under a
fractional reserve banking system is ignored in this "asset-view" of money. 1/ However, banks are not the only channel between wealth-holders and private firms. In most LDC's there is a flourishing curb market where they meet directly, bypassing the banking system.

Bank and curb market loans are not only a source of funds to finance fixed capital formation (via rolled-over short-term loans); they also finance the working capital firms need to cover advance payments on wages and intermediate inputs. As we have seen, this provides a transmission channel into the supply side of the economy, which gives tight money policies a potentially strong stagflationary bias. The main novelty of the model to be presented here is the incorporation of this transmission mechanism.

The basic structure of the real sector model is as follows. On the supply side, we distinguish between two sectors, exporters and non-exporters. This distinction is made mainly because the government (and the government-controlled banking system) follows radically different credit policies with respect to these two sectors. Exporters have basically unlimited access to bank credit at subsidized rates, while non-exporters face higher rates and quantity constraints. The export sector is characterized by monopolistic competition so that firms determine their output and prices simultaneously subject to a downward-sloping (foreign) demand curve, input prices and production technology. The domestic sector, which has a much lower degree of concentration as far as firm size is concerned, is assumed to price its products following a simple mark-up rule and also faces a downward-sloping

1/ The main dissenters here are of course McKinnon [10] and Shaw [14], who in their well-known contributions stress what Shaw has called "the Debt Intermediation view." They are however more concerned with long-run growth than with short-run issues.
demand curve (for the market as a whole), describing Koreans' allocation of their total expenditure over domestic and foreign goods. The output and pricing decisions are based on a model of the firm that starts from the assumption that primary costs (wages and costs of intermediate imports) are financed via credit. The interest rates that are relevant for the cost of credit are not considered exogenous. The UMM rate will be discussed in Chapter 3. This production model is also behind the intermediate imports demand equation. The wage-price sector is completed by an expectation-augmented Phillips curve-type relation allowing for catch-up wage inflation as a result of last period's inflation surprises.

The demand-side description starts by presenting an equation linking foreign demand for Korean goods to world income and Korea's external competitiveness. Domestic demand components are covered by a consumption equation, an equation explaining investment, and the policy variable government expenditure. These are converted into domestic demand for domestic goods by subtracting imports of consumption goods (considered exogenous) and of capital goods (explained by an equation linking them to relative prices and total investment). Consumption goods imports are dominated by imports of rice, which will be endogenized in the version of the model incorporating an agricultural sector. The other versions take them as exogenous. In principle the real sector model could be expanded by making government policy endogenous via the estimation of reaction functions for the relevant policy variables. This is done in S. van Wijnbergen [18], but we will not pursue this strategy here as our main interest is in an analysis of the impact of changes in a variety of government policy variables (interest rates, exchange rate, etc.).
Section 2.2 The model equations

In this section we will present the specific equations of the model; for conciseness of presentation we will also give the corresponding empirical results here rather than collecting them in a separate section.

2.2.1 The export sector

Assume an exporter faces a downward-sloping demand curve describing foreign demand for Korean goods:

\[ E = f \left( \frac{P_{ex}}{P_{f}}, Y_f \right) \]

where:
- \( P_{ex} \) is the Won price of Korean exports
- \( E \) is Korean exports (in real terms)
- \( P_f \) is the Won price of foreign goods with which Korean exporters compete
- \( Y_f \) is real foreign income

Foreign real income and prices are weighted geometric averages of the relevant Japanese and U.S. variables; these two countries received 55.6% of all Korean exports in the base year of all our price indices, 1975, while the third largest recipient was West Germany with less than 5% (in 1975). So approximating trade-weighted "world income" by a weighted average of U.S. and Japanese real income seems reasonable. The weights are 1975 export shares, rescaled to add up to one. The foreign price variable, similarly derived, is based on the Japanese and U.S. WPI. Grossman's conclusion that LDC exports mainly compete with domestic producers in the importing countries provides some support for this choice \(^1/\) as does the classic Houthakker-Magee paper on import demand functions (Grossman [8], Houthakker-Magee [9]).

\(^1/\) A caveat is in order here: Grossman's results are obtained for the LDC's as a group and have nothing to say on competition between LDC's; e.g., they do not exclude predominance of competition between say Korean and Taiwanese exporters over competition between Korean exporters and Japanese and U.S. domestic producers.
After some experimentation with unrestrained lags, we finally opted for a Koyck lag to get the following result: ¹/

\[
\ln E = -2.07 - 0.43 \ln \frac{P_{\text{ex}}(-1)}{P_{\text{f}}(-1)} + 0.17 \ln(Y_{f}^*) + 0.93 \ln(E(-1))
\]

(2.74) (2.35) (1.17) (3.37)  
(0.99) (0.98) (0.75) (1.00)  

\[ R^2 = 0.99 \quad \text{Estimation Period: '66-II/'79-IV} \]

The estimates confirm the familiar high (world) income elasticity of Korean exports, and imply a long-run elasticity of slightly below 2.6. They also show a high elasticity with respect to relative prices: a short-run elasticity of 0.43 builds up to not less than 6.1 in the long run. With the strong response of Korean exports to the devaluations in '74 and '80 in mind, this will not come as a surprise either.

Let us now turn to export prices.

Consider a firm maximizing its profits subject to (1) and a production function \( h \) giving \( E \) as a function of labor input \( L_e \) and intermediate inputs \( M_e \) (physical capital is kept fixed in the background): ²/

---

¹/ The estimation method used is Fair’s variant of 2SLS (Fair [5]), taking into account first-order serial correlation. All equations are estimated with seasonal dummies, which we do not report here; they seem to be of no interest. The data are on a quarterly basis, obtained from Bank of Korea publications (BoK [1]), the IFS data tape or directly from Korean authorities. An appendix with a detailed description of the data is available on request.

²/ The analysis of firm behavior presented here closely follows Bruno [3].
\[ E = h(L_e, M_e) \]

where \( a \) is defined such that \( h \) displays constant returns to scale. With capital kept fixed in the background, it is reasonable to assume \( a > 1 \).

Simple cost minimization given (3) and a fixed output level yields

\[ C_e = E^a g(W, P_{im}) \]

\( C_c \) Total costs of labor and intermediates used to produce \( E \)

\( W \) Nominal wage rate

\( P_{im} \) Price of intermediate inputs (taken to be the Won price of intermediate imports in Won).

Firms will need credit to finance primary costs during the production process. Under the assumption that all or a fixed proportion of primary costs are financed via credit taken out at cost \( \bar{r}_e \), profits are using (4)):

\[ PR = (1 + t_{subs}) P_e E - E^a g(W, P_{im}) (1 + \bar{r}_e) \]

\( t_{subs} \): export subsidy rate

and profit maximization will lead to

\[ (1 + t_{subs}) (P_e + E \frac{\partial P_e}{\partial E}) - (1 + \bar{r}_e) g(W, P_{im}) a E^{a-1} = 0 \]

\[ 1/ \quad \text{A reminder may be useful: the bar on } \bar{r}_i \text{ indicates we are talking about a real interest rate.} \]
which, after substitution of (1) to eliminate $E$, log differentiation and some reshuffling gives:

$$\hat{P}_e = \frac{(a-I)(1+\sigma)}{1 + (a-I)(1+\sigma)} \hat{P}_f + \frac{\psi_1}{1 + (a-I)(1+\sigma)} \hat{W}$$

$$+ \frac{\psi_2}{1 + (a-I)(1+\sigma)} \hat{P}_{im} + \frac{(a-I) \eta_e}{1 + (a-I)(1+\sigma)} \hat{Y}_f$$

$$+ \frac{1}{1 + (a-I)(1+\sigma)} (1 + \bar{r}_e) \psi_1 \text{ wage share in primary costs}$$

$$- \frac{1}{1 + (a-I)(1+\sigma)} \frac{dt_{subs}}{1+t_{subs}} \psi_2 = 1 - \psi_1$$

which is the equation we will use in our empirical work. Together with the demand equation (2), the pricing equation (6) determines prices and volume of exports.

The empirical results are:

$$\hat{P}_e = -0.92 + 0.36 \hat{P}_f + 0.21 \hat{W}(-2)$$

$$(0.33) \quad (3.45) \quad (2.82)$$

$$(0.26) \quad (1.00) \quad (0.99)$$

$$+ 0.13 \hat{P}_{im} + 3.63 (1 + \frac{r_{ex}}{100}) - 0.35 \frac{dt_{subs}}{1+t_{subs}}$$

$$(2.85) \quad (3.73) \quad (1.45)$$

$$(0.99) \quad (1.00) \quad (0.85)$$

$R^2 = 0.70 \quad \text{Estimation period: '66-III/'80-II}$

The export pricing equation shows, as expected, a strong and immediate impact of prices of imported intermediate goods (including, among other things, oil). Wage increases have a weak impact, and that with a delay only. Similar results have been obtained for Japan, which has a similar labor market structure (Ueda [17]). Also, export subsidies do moderate price}

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1/ Hats (^) indicate percentage changes (log differences x 100).
increases, as shown by the negative coefficient on \( \frac{dt_{sub}}{1 + t_{sub}} \)

Increases in prices of foreign competitors lead to price increases of Korean exports, but not one-for-one: The coefficient on \( \hat{p}_f = (e.P_f^*) \) is significantly smaller than one. This, plus the clear importance of domestic cost variables in addition to the importance of foreign prices, confirms our assumption of some market power of Korea in its exports markets. The equation presents us with a few puzzles too, however. Changes in foreign real income show up in our export demand equation and should therefore play a role here too (see equation (6)). This is however not the case; \( \hat{y}_f \) invariably got coefficients with the "wrong" sign and deplorable t-statistics (way below 1). As a consequence the variable was left out altogether. Further, changes in the cost of credit have a dramatic impact. The cost of credit is represented by the special interest rate on export loans. As these are supplied with perfect elasticity at that rate \( r_e \), \( r_e \) really measures the cost of credit, unlike the bank lending rate on loans to domestic producers. In fact, the coefficient on interest changes is embarrassingly high (although the reader should keep in mind that we use \( (1 + r_e/100) \), not \( \hat{r}_e \)). In view of the significance of this variable, it is not surprising to learn that the impact of interest rates on the business sector is an issue of major concern for the Korean authorities (see Westphal [18]), especially his description of the turbulent period 1969-75).

2.2.2 Aggregate demand and output

Government expenditure is considered a policy variable. Private consumption (in real terms) depends on a distributed lag of disposable real income and the real interest rate:
Bank rates are not the relevant rates here; consumers clearly cannot borrow and lend at the going bank rates at will. The curb market does offer this opportunity, so one should expect the real curb market rate to be the relevant one. This is borne out by empirical evidence (see below). Both real consumption and real after-tax income are derived from the corresponding nominal variables by deflation with the CPI. The results are:

\[ C = 0.77 - 3.26 \ln \left( \frac{1 + r_{\text{UMM}}}{1 + \text{CPI}} \right) + 0.31 \left( \frac{Y - T}{\text{CPI}} \right) + 0.57 C(-1) \]

\[ R^2 = 0.99 \quad \text{Estimation period: '66-I/'79-IV} \]

Equation (8a) has a number of interesting features. The long-run saving propensity out of after-tax income is quite high (0.28), a finding that has surely to do with the high proportion of Korean consumers who derive their income from agriculture (about 35%). The more interesting point is however the strong influence of the real curb market rate. The strong positive impact of this rate on saving (negative impact on consumption) shows the dominance of substitution effects over income effects: when future consumption becomes cheaper in terms of current consumption, both current and future consumption may rise (income effect), but inter-temporal substitution away from current towards future consumption dominates, leading to a net decline in current consumption. One of the reasons may be that interest income (and certainly hard-to-trace interest earnings from the UMM) is not part of taxable income.
This makes the Korean tax system look more like an expenditure or wage income tax system that a true income tax system.

Tax revenues themselves are clearly not exogenous. Personal income taxes in Korea are largely wage taxes, which are withheld by employers on a monthly basis; this implies that there is no "lumpiness" problem, with all of last year's taxes coming in one quarter. The tax revenue equation links tax revenues to nominal GDP and nominal imports:

\[ \text{TAXR} = -14.6 + 0.05 \text{GNPKN}(-1) + 0.07 \text{GNPKN}(-2) 0.29 \text{MNWTOT}(-1) \]

\[ R^2 = 0.99 \quad \text{Estimation period: '67-I/'79-IV} \]

Investment, in an admittedly ad hoc fashion, depends on financial market variables: the cost of credit in the curb market and the flow of real credit forthcoming from the banking system:

\[ I = g (r_{umm} - \hat{p}, \Delta \text{LSCBR}) \]

The idea behind this is that firms will first try to obtain whatever bank financing they can get, as it is offered at below-market clearing rates. This in turn makes rationing necessary, which explains why the quantity and not the price variable (real bank lending rate) is of relevance. For that part of planned investment not covered by bank loans, firms will have to decide
whether to go to the curb market or not to undertake the project involved. For this the real curb market rate is of relevance, as the curb market rate, not hampered by regulations, clears the credit market (for empirical evidence backing up this claim, see Chapter 3). Changes in the bank lending rate, under our assumptions of rationed bank credit, have no allocative impact; all they do is change a firm's cash-flow position and the "scarcity premium" earned by those who manage to obtain rationed loans.

The relevant inflation rate in the definition of the real curb market rate is the rate of change of the own product price, which reflects the assumption of putty-clay technology (see F. Modigliani et al. [11]). As at other places in this and the following chapter, expected values are approximated by actual values, using a rational expectations argument. The resulting measurement error is taken into account in the estimation procedure (by using Instrumental Variables techniques on the relevant variables).

The investment variable is total private fixed capital formation in real terms, where the deflator used is the wholesale price index.

\[
\text{(11) IGPRR} = 2.48 - 4.92 \ln \left[ \frac{1 + r_{um}(-1)/100}{1 + P_D(-1)/100} \right] \\
+ 0.76 \text{dLSCBR}(-1) + 0.62 \text{IBRR}(-1) \\
\]

\[
R^2 = 0.81 \quad \text{Estimation period: '66-I/79-IV}
\]

These results show a strong impact of financial market variables on private fixed capital formation, with quantity signals (change in real credit
to the private sector outstanding) of relevance in the regulated markets, and price signals (real interest rate in the curb market) in the unregulated curb market. This is not surprising in view of the prevalence of lending rate ceilings and the credit rationing they cause. These results also point to the importance of crowding out of private investment by additional government expenditure given tax revenues and money growth rules enforced via credit ceilings and capital controls (as are now--1981--in operation in Korea).

Under those circumstances, additional government expenditures will be financed by increases in credit to the private sector. Equation (11) demonstrates that such a reduction has an immediate impact on private investment. A secondary round of crowding out will occur if entrepreneurs do not completely shelve the projects for which commercial bank funding has been cut off, but go into the curb market for part of those projects. This will drive up interest rates there, the second determinant of investment in equation (11).

Not all demand for investment goods translated into demand for domestic goods; substantial parts of it (mainly machinery, etc.) lead to a demand for capital goods imports. This is captured by a demand equation for imports of capital goods linking the volume of imports of capital goods to the volume of private fixed capital formation:

\[
\ln(M_{cap}) = 6.65 + 1.16 \ln(IGPRR)
\]

\[
\begin{align*}
(25.6) & & (11.2) \\
(1.00) & & (1.00)
\end{align*}
\]

\[R^2 = 0.89 \quad \text{Estimation period: '65-III/79-IV}\]

The elasticity with respect to real investment expenditure is about 1; the difference with 1 is not significant using a 5% two-tailed test (the
relevant $t$-statistic is 1.56). No influence was found of relative price variables (in this case the relative price of foreign capital goods). The domestic component of private fixed capital formation is dominated by construction, while imports of capital goods completely consist of machinery and the like, so this evidence of complementarity should not come as a surprise.

The same holds of course for consumption; part of that falls on foreign goods too. However, imports of consumer goods are small in proportion to total consumption, and are dominated by rice imports. Rice imports moreover are entirely government-controlled and sold domestically at prices that do not reflect the price at which they are bought in the world market. Accordingly, we take the imports of consumer goods as a control variable of the government. Rice imports are made endogenous in the version of our model where we incorporate the agricultural sector explicitly. The modifications necessary for that are described in Appendices A.2 and A.3.

The equation describing the remaining category of imports, intermediate imports, is derived from the same model of firm behavior used in the derivation of the pricing equations.

There is one complication: we do not have separate data on intermediate imports used by exporters and by non-exporters. Accordingly, we have to aggregate the demand functions for intermediate imports into one demand function. The production model presented above leads to a demand function for intermediate imports depending on output, the real price of intermediate imports and the real interest rate. This can be obtained by simple differentiation of the cost function (see (4) for the case of an exporter).
(13) \[ c_i = Y_i g(W (1 + r_i), P_{im} (1 + r_i)) \]

with respect to \( P_{im} (1 + r_i) \).

where \( i \) is \( E \) or \( D \) depending on whether (13) refers to producers for foreign or domestic markets. If the production function underlying the unit cost function \( g \) is CES, the resulting demand function will depend on \( P_{im} (1 + r_i), P_i \) and \( Y_i \) only:

(14) \[ \hat{M}_{i1} = -g_i (P_{im} + (1 + r_i) - P_i) + a_i Y_i \]

Now

(15) \[ M_i = M_{i,E} + M_{i,D} \] or

(15a) \[ \hat{M}_i = \phi_1 \hat{M}_{i,E} + \phi_2 \hat{M}_{i,D} \]

\[ \phi_1 = M_{i,E}^O / M_i^O \]

\[ \phi_2 = 1 - \phi_1 \]

Taking (14) and (15a) together leads to our aggregate equation:

(16) \[ \hat{M}_i = \phi_1 \hat{M}_{i,E} + \phi_2 \hat{M}_{i,D} \]

\[ = - \phi_1 g_E (P_{im} + (1 + r_E) = \hat{P}_E) - \phi_2 g_D (P_{im} + (1 + r_{umm}) = \hat{P}_D) \]

\[ + \phi_1 a_1 \hat{Y}_D + \phi_2 a_2 \hat{E} \]

In our empirical work we made the further simplification of replacing the two output components by gross output, \( \frac{GDP + M_{i,P_{im}}}{P_{D}} \), 1/ which is right if

1/ GDP: Nominal gross domestic product.
\[ a_1 = a_2 \] and the shares \( \phi_i \) are equal to the corresponding shares in gross output. The impossibility of splitting up \( M_I \) over intermediates used for export production and those used for production for the domestic market prevented inclusion of disaggregated gross output concepts. So the final equation becomes:

\[
M_I = \phi_E (P_{i,m} + (1 + r_E) - P_D) - \phi_D (P_{i,m} + (1 + r_{i,m}) - P_D) \\
+ a \text{GO} \quad \text{GO} = \frac{\text{GDP} + M_{i,m}P_I}{P_D}
\]

The results are:

\[
\ln(M_{\text{int}}) = 10.9 + 1.35 \ln(\text{GOR}) - 0.85 \ln\left(\frac{P^*_{\text{int}}}{P_{\text{ex}}}\right) - 0.21 \ln\left(\frac{P^*_{\text{int}}}{P_D}\right) \\
(12.0) (11.7) (1.90) (0.49) \\
(1.00) (1.00) (0.94) (0.33)
\]

\[
= 0.12 \ln\left(\frac{1 + r_{\text{ex}}/100}{1 + P_{\text{ex}}/100}\right) - 0.34 \ln\left(\frac{1 + r_{\text{imm}}(-1)/100}{1 + P_D(-1)/100}\right) \\
(1.15) (2.67)
\]

\[
R^2 = 0.84 \quad \rho = 0.8 \quad \text{Estimation period: '66-I/79-IV}
\]

The equation shows a strong impact of gross output, but relative prices and the cost of credit play a significant role too. For exporters relative prices seem to be more important, and the cost of credit less, than for producers for the domestic markets.

2.2.3 Wages and prices

The pricing equation explaining prices of Korean products sold to the domestic market is a simple mark-up on prime costs, wages and intermediate
inputs, with the added novelty of the assumption that these costs are financed by credit taken out at the curb market and commercial bank credit:

\[ \hat{P}_d = a_0 + a_1 \hat{W} + a_2 \hat{P}_{im} + a_3 (1 + \hat{r}_{umm}) \]

where the constant term is supposed to capture "trend" productivity growth due to capital accumulation and technological progress. The relevant interest rate is the real curb market rate; the rationale behind this is similar to the argument presented when we discussed the investment function. As in most pricing equations estimated for DC's (see the well-known Eckstein [4] volume, Nordhaus [12] and numerous other papers in BPEA), aggregate demand does not play a significant role in this mark-up. As a result, the model essentially is a sticky price model (producers just pass through cost factors), with output demand determined. Over time however demand side pressure comes in via the effect of unemployment on real wages.

In analyzing price setting for Korean products sold on the domestic market, we distinguish between the price of rice (taken to be a policy variable) and the price of other goods. Other implications of the distinction between agriculture and the rest of the economy are not yet taken into account; they will be in the model version presented in Appendices A.2 and A.3.

The pricing equation for \( P_D \) comes out as follows:

\[ \hat{P}_d = -7.94 + 0.54 (1 + \hat{r}_{umm}/100) \]

\( (1.81) \quad (3.50) \)

\( (0.92) \quad (1.00) \)

\[ -0.014 (1 + \hat{P}_d(-1)/100) - 0.057 (1 + \hat{P}_d(-2)/100) + \]

\( (0.66) \quad (3.18) \)

\( (0.49) \quad (1.00) \)
As in the export pricing equation, wages come in with a delay only. There is also a strong and much quicker (when compared with the impact of wage changes) response to changes in the Won price of intermediate imports, \( e^{\text{Pint}} \). This considerably complicates exchange rate management, because the exchange rate is a component of the Won price of intermediate imports. 

Turning to the cost of credit variables, we found that the commercial bank lending rate had no impact on \( \hat{P}_d \) whatsoever. The curb market rate \( r_{um} \) does show up strongly, however, a result that is compatible with our story of rationed bank credit and spillover of excess demand into the UMM. \( P_D \) then is added to the price index of rice (after suitable weighting, of course) to give the wholesale price index WPIK.

\[
WPIK = 0.9304 \, P_D + 0.0696 \, \text{Price}
\]

---

\(1/ \) In the presence of intermediate imports, a devaluation has an unambiguously stagflationary impact. See S. van Wijnbergen [17] for this point.
This is not a stochastic relationship but an accounting identity reflecting the way Korea constructs its wholesale price index. The weights are those used in the series that has 1975 as a base year (see Bank of Korea (BoK) [1]).

The consumer price index is also a weighted average of the price of rice and \( P_D \) (domestic price of non-rice goods produced in Korea), \( \frac{1}{1} \) but the timing and weights are different. The timing of the non-rice component is based on regression analysis:

\[
\text{CPI}_K = 4.52 + 0.64 P_D + 0.11 P_D(-1) + 0.27 \text{CPI}_{\text{rice}}
\]

\[
(22) \begin{align*}
(4.50) & \quad (4.68) \quad (0.69) \\
(1.00) & \quad (1.00) \quad (0.51) \\
(4.78) & \\
(1.00) & \\
\end{align*}
\]

\( R^2 = 0.99 \quad \text{Estimation period: '65-II/80-III} \)

The third endogenous price in this model, the price of Korean exports, has been dealt with in section 2.2.1.

Now wages. The wage equation is a traditional expectation augmented Phillips curve, with one special twist: we do allow for catch-up wage demands when last period's inflation was higher than anticipated. The relevant inflation rate is of course the CPI inflation rate. The catch-up effect is modeled in a particularly simple way: assume workers have a target real wage \( W^* \).

At the end of the period, workers will set their nominal wage demands based on

---

\( \frac{1}{1} \) Imports of non-rice consumer goods are negligible in Korea. Rice imports are handled by the government and sold at prices unrelated to the world market prices at which they were bought.
their current nominal wage and the anticipated CPI inflation rate over the coming period; if however an inflation surprise has eroded their real wage below $W^*$, there will be pressure for additional nominal wage increases to catch up with this erosion.

\begin{equation}
\hat{W} = c_0 + c_1 \text{CPI}^2 + c_2 U(-1)^{-1} + c_3 \left( W^* - \frac{W(-1)}{\text{CPI}(-1)} \right)^{1/2}
\end{equation}

If $W^*$ is a declining function of $U$, say $W^* = f_0 + f_1 U(-1)^{-1}$, we get

\begin{equation}
\hat{W} = a_0 + a_1 \text{CPI} + a_2 U(-1)^{-1} + a_3 \frac{W(-1)}{\text{CPI}(-1)}
\end{equation}

If being off target counts last period, $a_3$ should be significantly less than zero. Equation (23a) can be used to define a target wage given the beginning-of-period wage, unemployment and expected CPI inflation. Gradual adjustment towards that target wage gives rise to the following wage equation:

\begin{equation}
\ln(W) = -0.68 + 0.20(\ln(\text{CPIK}) - \ln(\text{CPIK}(-1)) - 0.38(\ln(W(-1)) - \ln(\text{CPIK}(-1))
\end{equation}

<table>
<thead>
<tr>
<th></th>
<th>(3.40)</th>
<th>(0.72)</th>
<th>(3.57)</th>
<th>(1.00)</th>
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<td>(1.00)</td>
<td>(2.66)</td>
<td>(1.00)</td>
<td>(2.54)</td>
<td>(0.99)</td>
</tr>
</tbody>
</table>

The results show the importance of catch-up wage demands; the term capturing that effect has a strongly negative coefficient (a t-statistic of 3.57). Further, the moderating impact of unemployment (adjusted for seasonal variation) on wage demands is clear; the inverse of the beginning-of-period unemployment rate, $U_{SA}(-1)$, shows up with a significantly positive term.
2.2.4 Closing the real sector model

Two more equations are needed to close the real sector part of the model. The first concerns employment, the second potential output.

In line with the putty-clay assumption used elsewhere in this model, we do not use a neoclassical labor demand function linking labor demand to real product wages and output. Instead we used a variant on Okun's law linking (seasonally adjusted) unemployment to the gap between potential output GNPPOT and actual output (also seasonally adjusted). The seasonal adjustment factors are derived in a mechanical way using the Bureau of the Census X-II method. The results came out as follows:

\[
\begin{align*}
U_{SA} &= 1.10 + 1.22 \times \left( \frac{GNPPOT(-1) - GNPKR_{SA}(-1)}{GNPPOT(-1)} \right) + 0.70 \times U_{SA}(-1) \\
(2.64) (0.21) & \quad (6.43) \\
(0.99) (0.16) & \quad (1.00)
\end{align*}
\]

\[R^2 = 0.52 \quad \text{Estimation period: '69-III/79-IV}\]

This equation would imply a "natural rate" of unemployment of 3.7%, which seems reasonable both with respect to actual unemployment in equilibrium years like 1976 (around 4% after seasonal adjustment), and to estimates made by labor market experts. Soh [15] of KDI for example suggests 3.5%

The second equation links potential GNP to real fixed capital formation:

\[
\begin{align*}
GNPPOT &= -0.22 + 0.04 \times IBP\text{RR} + 0.02 \times IGPRR(-1) + 1.03 \times GNPPOT(01) \\
(0.90) (0.74) & \quad (0.40) \quad (52.7) \\
(0.63) (0.54) & \quad (0.31) \quad (1.00)
\end{align*}
\]

\[R^2 = 0.99 \quad \text{Estimation period: '68-I/78-IV}\]
The equation links potential output to new capital equipment coming on-stream, last year's potential output and technological change (leading to increases in capacity output even at zero net investment). Also, the implied incremental capital/output ratio (roughly 4, after conversion to annual figures), is not unreasonable.
Chapter 2
Conclusions

In the preceding sections, we presented a two-sector model of the "real part" of the Korean economy. Before we proceed with an analysis of the financial sector, let us look back at the results.

The model was set up to analyze the transmission mechanisms between the financial and the real sectors of the economy. Especially we wanted to assess the relevance of a credit-supply side link via the financing of working capital with borrowed funds.

The results I think are quite strong. Interest rates (the special rate on export-related loans in the case of export prices and the UMM rate in the case of domestic prices) are shown to have a strong impact on prices. The results clearly confirm the importance of the cost of credit as a component of input costs. As has been shown in S. van Wijnbergen [19], this credit-supply side link gives a stagflationary bias to restrictive credit policies.

The traditional transmission channel of monetary policy via its impact on investment is also shown to be of relevance, although with a one-period lag. The net result is that tight money has a stagflationary bias in its early phase (first quarter) when the transmission channel via the credit-supply side link dominates; from there on, traditional effects via investment take-over. One obtains the familiar effects on both output and inflation from the third quarter onwards.

The price equations also point to another complication policy makers face: both export and domestic prices react strongly and immediately to the price of intermediate imports. This indicates that the exchange rate, given foreign prices, has a direct impact on the supply side of the economy via the
price of imported intermediate goods: a devaluation, on top of its usual effects, has an adverse supply shock element in those circumstances and is stagflationary, reducing output and increasing inflation. Wage changes feed through with a delay only, while our wage equation shows an incomplete first period adjustment to changes in the (CPI) inflation rate, so a devaluation can in fact change relative prices in the short run.
REFERENCES (Chapter 2)


Chapter 3
A MACRO-MODEL FOR KOREA: THE FINANCIAL SECTOR

Section 3.1

There is a wide gap between what most people accept as stylized facts on the financial structure of LDC's on the one hand and the structure of the few models set up to analyze that financial structure on the other. Let us first recapitulate what we know about these stylized facts.

Following authors like Michael Bruno [2] or Lance Taylor [7], a few general characteristics should be mentioned:

1. The absence of significant open markets in interest-bearing government debt. Typically government securities are held by domestic banks who are really captive buyers. An unpleasant corollary of this is that it is often extremely hard to sever the link between government deficits and the money supply.

2. A relatively undeveloped system of financial intermediation. Stock markets play a limited role, if any at all. Accordingly, banks play a much more predominant role than they do in say Europe or the U.S. as a source of funds for firms, both for short-term working capital purposes and for long-term fixed capital formation. For example, debt-equity ratios in countries like Korea range from 5 or 6:1 upwards, as opposed to 1 or 2:1 in the U.S. or Western Europe. Bank credit is often severely rationed, with bank lending rates unresponsive to excess demand for credit. This is of course one of the reasons why 'curb' markets play a large role in many countries. Via these markets the public can lend directly to the firms, bypassing the banking system.

3. The virtual absence of consumer credit.
This implies that tight money policies, to the extent that they affect demand at all, do so via their impact on investment, not on consumption. Much more important in the short run, however, is the link between credit policies and the supply side of the economy via the role of working capital. The stagflationary bias that this gives to short-run monetary restraint will be documented empirically below.

On the other hand, most empirical work on LDC's incorporating the financial sector has remained within the framework of the monetary approach to the BOP. The work done at the IMF is typical, where a series of papers, all inspired by Polak's early work on the monetary approach, (Polak [6]), have attempted to apply the Polak model to a variety of countries. For a good example see Park [5] on Korea.

The implied one-asset structure of such models makes it impossible to incorporate the existence of private curb markets, which in turn makes them of limited use for the analysis of short-run macro-analysis. 1/

In the model to be presented below we will incorporate the stylized facts mentioned above. The approach taken is heavily influenced by the Yale-portfolio allocation model associated with James Tobin [8]. The main features of this model are the assumptions of imperfect substitution between different assets and the attention paid to the impact of balance sheet constraints on the specification of behavioral equations and the structure of the model. The salient features of the model are:

1. an explicit incorporation of the curb market and financial intermediaries;

1/ Other problems exist, of course, such as the assumption of perfect goods market arbitrage enforcing the law of one price, or the exogeneity of income with respect to the credit policies enacted.
2. the attention paid to the role played by firms and banks (rather than private wealth holders, as is usually done) in determining foreign capital inflows;
3. the stress on the importance of the relative size of substitution elasticities in private portfolio allocation for the effects of monetary policy;
4. the explicit incorporation of the balance sheets and accounting identities constraining the different actors in the financial sector.

We hope that the analysis will shed some light on the relations between the banking system, the Unorganized Money Markets, the business sector's demand for working capital and foreign capital inflows.

The rest of the chapter is organized as follows. In the next three sections we will present the sub-models describing the three main actors (firms, public and banks) considered, and the theory and institutional details behind the models. To keep the presentation reasonably concise, we will present the empirical results also in these sections, rather than collecting them in a separate section. Section 5 offers a summary of the results and some conclusions.

Section 3.2 Deposit money banks (DMB's)

Deposit Money Banks can be subdivided into commercial banks and so-called "Special Banks." Banks in the latter category cater to the needs of specific sectors, such as agriculture, fishing or housing. Since 1973, the Korea Exchange Bank, also a Special Bank, has been taking an increasingly important role in trade financing. The total size of these special banks is however comparatively small, the volume of their loans outstanding is slightly
less than 13% of all loans by DMB's, so I have decided to lump them together with the other DMB's.

In the other category, commercial banks, one should distinguish between domestic banks and branch offices of foreign banks, mainly from Japan and the U.S. Although the size of the lending portfolio of foreign branch offices is about the same as that of the Special Banks, and although they too are subject to the same regulations as other DMB's, there is an important difference that warrants special attention: their liability structure is entirely different, with inter-office loans from abroad making up roughly 60% of their sources of funds in 1980 (as of June 1980). Foreign sources provide not more than 2% of total funds to other banks. Time deposits made up only 2% of total liabilities for these branch offices, but 35% for domestic banks in 1980. These inter-office loans skyrocketed after the creation of special swap arrangements in 1975, under which the foreign banks sell foreign currency to the Bank of Korea under repurchase contracts. This facility is only available to branch offices of foreign banks, not to domestic banks. Inter-office loans went up from 43 billion Won in December 1974 via 114 billion Won at the end of 1975 to 619 billion Won in January 1979. For comparison, the figures of total DMB borrowing at foreign capital markets (excluding inter-office loans): 238 billion Won at the end of 1974, 305 billion Won at the end of 1975, and 511 billion Won in January 1979, less than the total amount of inter-office loans outstanding at that time (all these figures refer to end-of-period stocks; the exchange rate was pegged at 484 Won per U.S. dollar from late 1974 to January 1980).

In the banking model presented below we will treat inter-office loans from abroad separately from other foreign borrowing by DMB's. We will assume that lending by foreign banks to their Korean branch offices is
determined in the portfolio allocation process that determines the structure of the loan portfolio of these foreign banks. This leads to an equation linking the volume of inter-office loans $L_{10}$ to the total volume of loans made by foreign (mainly Japanese and U.S.) banks; Korean, Japanese, and U.S. interest rates; and in general, the expected rate of devaluation of the Won versus the U.S. dollar and the yen. Over the period that inter-office loans were relevant the Won was pegged to the U.S. dollar, so the only expectation that matters is the expected rate of devaluation with respect to the yen, $x_{wY}$, or, equivalently, due to the exchange rate policy followed, the expected rate of devaluation of the dollar with respect to the yen.

All this leads to an equation for inter-office loans:

$$
(1) \quad \text{LSCBJ} \quad \text{Total loan supply of Japanese commercial banks in Won}
$$

$$
\text{LSCBUS} \quad \text{Idem for U.S.}
$$

$$
\text{DSWAP} \quad \text{Dummy variable; 0 before introduction swap arrangement, 1 afterwards}
$$

$$
\text{RLD} \quad \text{Domestic bank lending rate}
$$

$$
\text{RTUS} \quad \text{U.S. Treasury bill rate}
$$

$$
\text{RLCBJ} \quad \text{Japanese call money rate}
$$

$$
\text{ERWY} \quad \text{Won-yen exchange rate}
$$

Preliminary estimations showed a total irrelevance of the U.S. variables. Although there are more U.S. branch offices in Korea than Japanese (no information is available on their size however), inter-office loans are apparently dominated by loans from Japan. We then rephrased (1) as a portfolio allocation problem for Japanese banks, leading to the following results: $1/$

------

$1/$ See Chapter 2, page 9, for an exposition of the estimation procedure followed.
\[ (2) \quad \text{LN} \left( \frac{\text{LNIO/ERWY}}{\text{RL}} \right) = -35.8 + 5.98 \ln \left( \frac{1 + \text{RLD}}{1 + \text{RLCBJ}} \right) \]

\[
\begin{array}{c|c|c|c}
& (18.6) & (6.45) & (1.00) \cr
\hline
& \text{RLD} & \text{RLCBJ} & \text{Constant} \\
\end{array}
\]

\[ + 3.31 \ln \left( \frac{\text{LSCBJ}}{\text{ERWY}} \right) + 0.50 \text{DSWAP} \]

\[
\begin{array}{c|c|c|c}
& (19.9) & (3.83) & (1.00) \cr
\hline
& \text{LSCBJ} & \text{ERWY} & \text{DSWAP} \\
\end{array}
\]

\[ R^2 = 0.98 \quad \text{Estimation period: '70-II/80-II} \]

The LHS variable equals the total volume of inter-office loans outstanding (end-of-period), expressed in yen. Interest rate differentials between Korean lending rates (which foreign branch offices can charge on their loans) and the rate of return on comparable short-run bank assets in Japan, the call money rate, come in very significantly (a t-statistic of 6.45) and with the right sign, as does the total of all loans and discounts by all Japanese commercial banks, LSCBJY. The variable DSWAP is zero before the introduction of the swap arrangements mentioned above, and one afterwards (from 1975 onwards). The dummy has a significant coefficient and the "right" sign. Finally, we did not establish a significant relation between expected exchange rate changes and the total volume of loans channeled via branch offices from foreign banks into Korea. This could be related to systematic discrepancies between the premium implied by the swap arrangements and actual expectations. No information is
available on the terms of the swap arrangements, so this is impossible to verify.

Borrowing abroad by domestic banks depends on domestic lending rates and the cost of obtaining funds, and not on reserve requirements against other liabilities, current or lagged deposits, etc., as we show in the appendix: as long as the marginal costs of additional borrowing are below the lending rate, the stock of foreign liabilities should be increased. The cost of borrowing abroad (predominantly in the Eurodollar market) consists of the Eurodollar rate for the relevant maturity, a country-specific mark-up factor, and the cost of obtaining government or Bank of Korea (BoK) guarantees. The latter are probably bank-specific. In the model presented here we assume that the cost of obtaining loan guarantees is an increasing function of the banks' total foreign liabilities. Further, there is evidence that the BoK encourages domestic firms and banks to borrow abroad when its Net Foreign Assets position is considered tight via more readily available loan guarantees (Kim [3]). We tried to capture this effect by including the IMF measure of tightness of reserves—the number of months of imports that can be financed with the current stock of NFA of the central bank—as a proxy for this effect in the equations for foreign borrowing by domestic banks and non-financial firms.

I have been unable to obtain a consistent series on the country mark-up for all of the estimation period, but the bits of evidence I have seen indicate that this is a slow-moving variable with a variance an order of magnitude smaller than the variance of the Eurodollar (LIBOR) rate itself, so that is probably not a serious omission.

All this leads to the following equation for total foreign liabilities (a "stock" concept) by DMB's, excluding inter-office loans from foreign banks to their Korean branch offices:
(3) 
$$L_f = L_f (R_l d, \text{REUR} + ERWD, \frac{NFA_{MTOT}}{t}, t)$$

where the signs indicate our a priori beliefs on the signs of the partial derivatives. The appropriate scale variable would have been Net Worth of the DMB's, which we approximate by a time trend. There is the issue of which price deflator to use to deflate the nominal value of total foreign liabilities (note that there are no nominal variables on the right-hand side of (3)). We borrowed from finance theory the notion that a firm should maximize its value in terms of the goods shareholders consume, which leads to the CPI as the appropriate deflator.

The empirical results come out as follows:

(4) 
$$\frac{L_f}{CPI} = -0.67 + 0.10 (R_{LD} - \text{REUR})$$

(1.08) (2.34)

(0.71) (0.97)

+ 0.02 \text{TIME} - 1.85 \frac{NFA(-1)}{MNWTOT(-1)}

(1.59) (3.18)

(0.88) (1.00)

+ 0.62 \frac{L_f(-1)}{CPIK(-1)}

(5.06) (1.00)

$$R^2 = 0.79 \quad \text{Estimation period: '70-I/80-III}$$

The choice of the estimation period is dictated by data availability. As in the previous equation, the relevant interest rate differentials (here the difference between the Eurodollar rate and domestic lending rates) strongly influence the foreign liabilities commercial banks choose to incur.
Not surprisingly, the data do not contain sufficient information to measure the influence of exchange rate expectations. The relevant rate is the Won-U.S.$ rate, which was kept constant during most of the estimation period. The proxy for BoK manipulation of cost and availability of loan guarantees--last period's Net Foreign Assets of the BoK (measured at the end of that period) over last period's imports--is highly significant and has the "right" sign. These results confirm the notion that the BoK encourages the private sector to borrow abroad whenever reserves are "tight."

Other sources of funds (liability items) are dominated by time and savings deposits and, to a lesser extent, by demand deposits. Banks are not free to set the rates on these deposits, so that these deposits end up being demand-determined (Tobin [8]). Accordingly, we will deal with them in the section on private portfolio allocation.

Finally, the BoK is an important source of funds. BoK-to-DMB lending accounts for close to 10% of the total liabilities of commercial banks, and will be considered as a policy instrument.

Then the assets side. The model underlying bank behavior is spelled out in the appendix, but let us repeat the results for the loan supply function. Loans extended to non-exporters will depend positively on the lending rate and beginning-of-period availability of funds from depositors and the BoK. They will further depend negatively on the BoK discount rate and reserve requirements, all standard results. Via a mechanism we will discuss below, one expects a negative correlation with the volume of export loans. Finally, as shown in the appendix, the loan supply to non-exporters will, in the absence of reserve requirements against foreign liabilities, depend one-for-one on current foreign liabilities, the other policy instrument in the hands of the DMB's here considered. All this leads to a loan supply function for loans to non-exporters:
(5) \[ L_{ne} = L_{ne} (RLD, RR, RDISC, LEX_{-1}, DEP(-1), NDCCB(-1), L_f + LNIO) \]
\[ + + + + + + \]
where \( DEP \) is the end-of-period sum of demand, time and savings deposits.

\( NDCCB \) is end of period \textit{net} borrowing from the BoK. The "net" refers to the fact that we netted out the item "securities" against borrowing from the BoK. This item consists mainly of government bonds, stock in government-run enterprises, etc., (Kim (3)). DMB's are really captive buyers for all these things, so we netted them out against BoK credit to DMB's.

The empirical results come out as follows:

(6) \[
L_{ne} = 29.9 + 10.5 (RLD - RDISC) + 0.93 \text{ DEP(01)}
\]
\[
(1.23) \quad (2.73) \quad (50.9)
\]
\[
(0.77) \quad (0.99) \quad (1.00)
\]

\[ + 0.60 \text{ NDCCB(-1)} + 0.999 (L_f + LNIO) \]
\[
(7.18) \quad (6.67)
\]
\[
(1.00) \quad (1.00)
\]

\[ R^2 = 0.99 \quad \text{ Estimation period: '66-I/79-I} \]

The estimation period was confined to ('66-I/79-I) because the Korean authorities switched towards direct limits on total bank lending as an instrument of monetary policy in the second quarter of 1979. The equation shows a strong impact of the difference between the lending rate and the discount rate. 1/ Beginning-of-period deposits and net credit from the BoK have a significant impact on end-of-period loans, as expected. An earlier version

1/ Apart from their sign the coefficients when estimated separately were not significantly different from each other, so we imposed equality.
contained the rate-of-Reserve Requirements (RR) and loans to exporters (see below) to capture the crowding-out effect of the preferential credit policy with respect to exporters, but the relevant coefficients were insignificantly different from zero although they did have the right sign (negative). Finally, the prediction of a one-for-one pass-through of funds borrowed abroad into loans extended domestically is clearly confirmed.

To get a figure for total domestic credit to the private sector, we also need to explain credit to exporters. Commercial banks are obliged to satisfy all loan requests for working funds by exporters, and are induced to comply with this rule by the availability of automatic rediscounting facilities at the central bank. This implies that these loans are demand-determined. DMB's automatically rediscount 80% of all loans made to exporters at preferential rates at the BoK. Although lending rates on export loans are about half the rate on comparable loans to non-exporters, the fact that 80% can be rediscounted at a very low discount rate makes for a very high effective rate of return on the remaining 20%. For example, at the 1979-IV values for lending and rediscount rates for export loans, respectively 9% and 4%, this effective rate is 29% (= (9 - 0.8 x 4)/(1 - 0.8)), considerably higher than the lending rate on comparable loans to non-exporters, at that time 19%. This implies that banks have an incentive to comply with the policy of automatic credit extension to exporters. As only 80% of export loans can be rediscounted, loans extended to non-exporters should be negatively correlated with loans to exporters (see the appendix for a formal analysis). As we saw before, however, this effect is quite weak. All this comes down to the fact that export loans \( L_{ex} \) are demand-determined.

We will present the demand equation in the section that deals with firm behavior.
The remaining two items on the asset side are required and free reserves. Required reserves clearly follow from the liability structure. Free reserves then become the residual item, dictated by the behavioral equations specified above and the balance sheet constraint stating that total liabilities are equal to total assets.

Section 3.3 Firm behavior

For our analysis of the financial sector, we are mainly interested in the liability management of firms. There is a clear dichotomy here between exports and non-exporters; exporters have essentially unlimited access to bank credit and therefore have no incentive to enter the Unofficial Money Market as borrowers. Their demand for loans is simply based on the model presented in van Wijnbergen [9], where demand for loans depends on the level of output, the costs of inputs and the real cost of credit. This leads to the following result:

\[
\ln\left(\frac{L_{EX}}{P_{ex}}\right) = -5.60 - 0.49 \ln\left(\frac{1 + RL_{EX}(100)}{1 + P_{ex}(100)}\right) + 0.84 \ln\left(\frac{P_{MINT} \times ERWD}{P_{ex}}\right) + 0.57 \ln(E) + 0.38 \ln\left(\frac{L_{EX}(-1)}{P_{ex}(-1)}\right)
\]

\[R^2 = 0.96\]

Estimation period: '66-I/79-IV

\(L_{EX}\) Loans to exporters (billion Won)
\(RL_{EX}\) Lending rate charged on \(L_{EX}\)
\(P_{ex}\) Won price of exports
\(P_{MINT}\) Dollar price of intermediate imports
\(ERWD\) Won-dollar exchange rate
\(E\) Real exports

Somewhat surprisingly, the cost of intermediate inputs is the only input cost factor to show up significantly; wage costs do not seem to play a role here. The real cost-of-credit parameter has the right sign and a
plausible magnitude, but is estimated very imprecisely, the t-statistic on its parameter is only 0.79. The other parameters present no surprises.

Equations (6) and (7) and credit to the government allow us to derive total domestic credit, one part of the domestic money supply. More on this in the section on the accounting identities behind the money supply definition.

Non-exporting firms face a different situation. Bank loans are rationed; they face a quantity constraint. For the rest of their credit needs they have to either enter the curb market or the Eurodollar market. Given their balance sheet constraint, a behavioral equation for one of the two will imply one for the other. We are choosing the foreign liability part; so we now turn to foreign sources of credit and the capital account of the BOP.

Unfortunately there is no way to separate foreign liabilities incurred by the export sector from those incurred by the non-export sector, so we are forced to estimate an aggregate function explaining total foreign liabilities as a share of all liabilities incurred by firms as a function of the Eurodollar market rate, the curb market rate (the alternative source of funds for non-exporters), and the rate on export loans (the alternative source of funds for exporters). The result is equation (8):

\[
\ln \left( \frac{FLPSW}{WPIK} \right) = 0.41 - 1.28 \ln(1 + \frac{REUR}{100}) + 0.15 \ln(1 + \frac{RUMM}{100}) \\
(2.15) \quad (1.96) \quad (0.91) \\
(0.96) \quad (0.94) \quad (0.63)
\]

\[-0.04 \times \ln(1 + \frac{e^{\text{W}_{\text{S}}}_{\text{-1}}}{100}) - 0.05 \ln(1 + \frac{e^{\text{W}_{\text{S}}}_{\text{-2}}}{100}) - 0.16 \frac{NFA(-1)}{MNWTOT(-1)} +\]

\[(0.55) \quad (0.88) \quad (3.64) \]

\[(0.42) \quad (0.57) \quad (1.00)\]

---

\[1/ \text{Retained earnings are modeled as a loan from the firm owner to the firm and are lumped together with loans from the curb market.}\]
\[
FLPSW + LSDMBNE + L_{EX} + LSUMM \\
+ 0.18 \left( n\left( \frac{\text{WPIK}}{\text{WPIK}} \right) \right) + 0.69 \left( n\left( \frac{\text{FLPSW(-1)}}{\text{WPIK(-1)}} \right) \right) \\
(3.07) \quad (19.5) \\
(1.00) \quad (1.00)
\]

\( R^2 = 0.99 \quad \text{Estimation period: '69-II/79-I} \)

FLPSW Total net foreign liabilities of the non-bank/non-government sector (billion Won)

REUR Eurodollar rate in London (3 months)

RUMM Curb market rate

LSUMM Volume of loans outstanding

The domestic lending rate did not play any role at all, which should not come as a surprise after what was said in the previous sections on disequilibrium in the market for bank credit. The curb market rate does come in with the right sign and a coefficient that seems to have a reasonable magnitude, but the standard error is quite large. The 3-month Eurodollar rate has the expected negative sign, as do the proxies for expected exchange rate changes. Also, our proxy for BoK encouragement to borrow abroad in periods of "tight" reserves (for an elaboration see page 35) shows up significantly and with the right sign.

Finally, the equation can degenerate into a "flow" approach equation if the coefficient of the lagged endogenous variable (which came in via a stock-adjustment scheme) is not significantly different from one, thus allowing for a test of the two approaches (stock versus flow approach to the capital account of the BOP) against each other. The flow version is definitely rejected, with a t-statistic--on the difference between the coefficient of the lagged LHS variable and one--of 8.86, thus confirming our "stock" approach to the capital account.

Equation (8), together with the current account deficit that comes out of the part of the model presented in Chapter 2, plus some accounting
identities, allows us to derive the Net Foreign Assets position of the consolidated banking system, the second component of the money supply. More on that in Section 5. For the determination of money demand, we have to consider the private sector's portfolio allocation. This we will do in the next section.

**Section 3.4 The private sector**

The analysis of the commercial banking system and a part of the non-bank business sector presented in the two previous sections allows us to build up the components of the supply of M2. The demand for M2 and its components comes out of the public's allocation of its wealth over M2 and other assets.

Private individuals can hold their wealth either as currency, demand or time deposits at DMB's or as loans outstanding at the UMM. The latter option comes down to direct lending to firms, bypassing the banking system (disintermediation).

Contrary to what is usually assumed in the (scarce) literature on this subject, the UMM is largely an urban phenomenon in Korea. In a survey done by the Sogang university of Seoul, it was found that 79% of UMM lending was to the urban business sector, 7% to urban consumers and the remaining 14% to rural households (the survey was undertaken in 1969). Kim [3], from whom this information is taken, does not provide information on sample design, etc., so one should be careful in interpreting these data. Moreover, Kim [3] reports that urban and rural credit markets are entirely separated. In what follows we will confine our attention to the urban business sector.

In the same survey it was found that 75% of all firms responding had some debts outstanding at the UMM, while 10% had more than 50% of their debts at the UMM. The importance of the UMM has been declining over time, however, since the interest rate reform in 1965 improved the functioning of financial
intermediaries, and with increasingly easy access to foreign capital markets. Nevertheless the UMM continues to play an important role, as will be shown below.

For many small firms the UMM is the only place to go when turned down by commercial banks (which, as mentioned earlier, only happens to non-exporters, as exporters have automatic access to credit). In the same survey, 93% of the firms with UMM debts gave as the reason for operating in the UMM the unavailability of (sufficient amounts of) bank credit. It seems clear that, from the demand side, the UMM is largely a spillover phenomenon kept alive by the occurrence of credit rationing by commercial banks, which have no control over their lending rates.

So much for the demand for UMM loans, but who supplies them? In the Sogang university survey, 73% of the loans made to the urban business sector came from "relatives and friends and professional money-lenders" with the latter taking up 33%; 7.3% came from "men of same trade" and the remaining 19.3% from "miscellaneous," including merchants. So only about 20% represents trade credit. According to Kim [3], professional money-lenders are usually middlemen acting for wealthy businessmen. These results seem to lend support to the approach taken in van Wijnbergen [9]. There I assumed that, in the absence of significant securities markets and an open market in interest-bearing government debt, individuals can hold their wealth as currency, savings and demand deposits at the banks, or engage in direct lending to the business sector via the UMM (financial disintermediation).

This leads to traditional portfolio allocation equations for the different M2 equations, with RUMM, RTD, CPI, income and wealth (M2 + LSUMM) as arguments. \(^1\) the loan supply at the UMM can then be derived via the wealth constraint a private individual faces.

---

\(^1\) RUMM Curb market rate  
RTD Time deposit rate  
\(\hat{\text{CPI}}\) CPI inflation (= minus the real rate of return on cash balances)  
M2 Currency in hands of the public; and demand, savings and time deposits at DMB's  
LSUMM Volume of loans outstanding at the curb market.
(9) \[ \ln\left(\frac{\text{TD}}{\text{CPIK}}\right) = 0.36 - 0.89 \ln\left(1 + \frac{\text{RUMM}}{100}\right) + 1.63 \ln\left(1 + \frac{\text{RTD}}{100}\right) \]

\[ (1.71) \quad (2.42) \quad (4.08) \]

\[ (0.91) \quad (0.98) \quad (1.00) \]

\[ - 0.38 \ln\left(1 + \frac{\text{CPIK}}{100}\right) + 0.02 \ln\left(\frac{\text{GNPK}}{\text{CPIK}}\right) + 0.93 \ln\left(\frac{\text{TD(-1)}}{\text{CPIK(-1)}}\right) \]

\[ (3.51) \quad (0.53) \quad (4.24) \]

\[ (1.00) \quad (0.40) \quad (1.00) \]

\[ R^2 = 0.997 \quad \rho = 0.3 \quad \text{Estimation period: '64-I/79-IV} \]

Reshuffling the variables to derive dependence on real rates of return of course leaves the coefficients on the two interest rates unchanged, but results in a negative coefficient for the real rate of return on currency (minus the CPI inflation rate): the coefficient on \( \ln\left(1 + \frac{\text{CPIK}}{100}\right) \) becomes +0.36. See Table 1.

### Table 1: Elasticity with Respect to the Real Rate of Return on:

**Alternative asset 1:** the curb market \((\ln\left(1 + \frac{\text{RUMM}}{100}\right) - \ln\left(1 + \frac{\text{CPIK}}{100}\right))\): -0.89

**Alternative asset 2:** currency \((-\ln\left(1 + \frac{\text{CPIK}}{100}\right))\): -0.36

**Itself:** time deposits \((\ln\left(1 + \frac{\text{RTD}}{100}\right) - \ln\left(1 + \frac{\text{CPIK}}{100}\right))\): +1.63

Clearly, substitution between the curb market and time deposits is of more importance than substitution between currency and time deposits. This is of crucial importance for the analysis of the effect of time deposit changes on inflation and economic activity. This, together with the absence of wealth effects on the demand for time deposits (via which increased savings could have been channeled into time deposits over time), is a strong indication that the
phenomenal increase in time deposits after the interest rate reform in 1965 was caused by a switch from lending at the UMM to time deposits at DMB's by private asset holders, and not by additional savings as is usually claimed.

The equation for M1 showed no significant wealth or interest rate effects, but a strong dependence on the own rate of return, minus the CPI inflation rate:

$$\ln(\frac{M1}{CPIK}) = 0.08 - 0.40 \ln(1 + \frac{CPIK}{100})$$

$$+ 0.03 \ln(\frac{GNPKN}{CPIK}) + 0.97 \ln(\frac{M1(-1)}{CPIK(-1)})$$

$$R^2 = 0.998 \quad \text{Estimation period: '64-I/79-IV}$$

Equations (9) and (10) imply a reasonable supply equation for loans on the curb market via the wealth constraint, with positive dependence on its own real rate of return, negative dependence on the real rate of return on the two alternative assets (M1 and Time Deposits) and a unit wealth elasticity.

Finally we have to describe the allocation of M1 over demand deposits and currency because we need total deposits (time deposit and demand deposit) in the loan supply equation of DMB's. For simplicity, we choose a variant on the fixed currency - demand deposit ratio:

$$DD = 2.81 + 0.18 M1 + 0.69 DD(-1)$$

$$R^2 = 0.99 \quad \text{Estimation period: '66-I/80-IV}$$

which represents a gradual adjustment to a fixed share of demand deposits in M1.
Section 3.5 Pulling the threads together

The building blocks outlined in the preceding sections allow us to construct money (M2) supply and demand.

The money supply simply equals

\[ M^S_2 = NDCG + L_{ne} + L_{EX} + NFA - OL \]

\( NDCG, \) Net Domestic Credit to the Government, equals last period’s NDCG plus the fraction of the budget the government chooses to finance via recourse to the BoK. Credit to the private sector (to non-exporters \( L_{ne} \) and to exporters \( L_{EX} \)) is explained by equations (6) and (7). All this is fairly straightforward. One has to be careful however in setting up NFA, Net Foreign Assets of the consolidated banking system (the BoK and the DMB’s). Clearly, foreign borrowing by the banking system does not affect their net foreign assets position; \(^1\) this changes only via an unbalanced current account and foreign capital inflows into the non-bank sector. A further wrinkle is added by exchange rate changes: capital gains (losses) on beginning-of-period Net Foreign Assets because of intra-period exchange rate changes do increase end-of-period Net Foreign Assets, but do not automatically lead to changes in the money supply. The capital gain (loss) on the asset side is offset by a matching entry in a revaluation account on the liability side, leaving M2 unchanged. We have "submerged" this revaluation account into the residual category Other Liabilities, OL, which therefore follows equation (13):

\(^1\) We endogenized these capital inflows via the banking system; nevertheless, equations (2) and (4), because of the role they play in determining the DMB’s loan supply.
The demand side of the money market is simply the sum of the demand for currency, demand and time deposits by the public:

\[(13) \quad \text{OL}(t) = \text{OL}(t) + \text{NFA}(t-1) \times \frac{\text{ERWD}(t) - \text{ERWD}(t-1)}{\text{ERWD}(t-1)} \quad 1/\]

The crucial question now becomes: does the curb market rate in fact move to equilibrate demand and supply of credit, which, by appropriate manipulation of the balance sheet constraints, can be shown to also imply money market equilibrium?

Under the admittedly ad hoc assumption (nevertheless a standard one in disequilibrium models) that the curb market rate will rise (fall) proportionately to the excess demand for money, 1/ a test for this equilibrium assumption can be set up along lines suggested by Amemiya [1].

Under certain rather strong assumptions, 2/ adding a variable that is zero whenever the interest rate falls and equal to the change in the interest rate whenever the rate goes up (the relevant rate is the RUMM) to the demand equation allows one to estimate its parameters consistently and to test for equilibrium. If the coefficient on this variable is not significantly different from zero, the equilibrium hypothesis cannot be rejected.

---

1/ Which in turn is equal to excess demand for credit (= excess supply of "bonds") via the wealth constraint.

2/ One has to assume strict proportionality between changes in the price (here the \( r_{\text{UMM}} \)) and excess demand in the market, implying the assumption of known sample separation in periods of excess demand and periods of excess supply. This assumption seems hard to reconcile with uncertainty about whether there is disequilibrium at all (after all, one is testing for equilibrium). See van Wijnbergen [10] on this point.
Now, there is no way one can stop people from moving in or out of M1 from time deposits. Moreover, we found that M1 holdings are not affected by the curb market rate at all. Accordingly the appropriate demand equation to use in this test becomes the time deposit rate equation. The result of reestimation of (9) with the Amemiya variable included is:

\[
\ln\left(\frac{TD}{CPIK}\right) = 0.39 - 1.00 \ln(1 + \frac{\text{RUMM}}{100}) + 1.78 \ln(1 + \frac{\text{RTD}}{100}) - 0.44 \ln(1 + \frac{\hat{\text{CPIK}}}{100}) \\
0.39 - 1.00 \ln(1 + \frac{\text{RUMM}}{100}) + 1.78 \ln(1 + \frac{\text{RTD}}{100}) - 0.44 \ln(1 + \frac{\hat{\text{CPIK}}}{100}) \\
+ 0.03 \ln(\frac{\text{GNPKN}}{\text{CPIK}}) + 0.02 \ln(\frac{\text{TD}(-1)}{\text{CPIK}(-1)}) + 0.0019 \times \text{DISEQ} \\
0.03 \ln(\frac{\text{GNPKN}}{\text{CPIK}}) + 0.02 \ln(\frac{\text{TD}(-1)}{\text{CPIK}(-1)}) + 0.0019 \times \text{DISEQ} \\
\frac{2}{2} R = 0.99 \quad \rho = 0.3 \quad \text{Estimation period: '64-I/79-IV}
\]

where DISEQ is the Amemiya variable, equal to Δ RUMM if Δ RUMM > 0 , and equal to zero if not. The results are clear: the Amemiya variable DISEQ comes in with the wrong sign and a very low t-statistic, leading to a rejection of the disequilibrium hypothesis. Apparently the curb market absorbs the unsatisfied demand for bank credit and the curb market rate clears the market for credit. It is straightforward to show that this implies disequilibrium in the money market too. Given inflation, income and the regulated interest rates, the curb market rate will jump up and down to clear the money market. 1/

The final disequilibrium condition, implicitly determining the curb market rate, is simply:

\[
M2^S = M2^D
\]

1/ This is a somewhat dubious statement, as all variables are determined simultaneously in a full model simulation.
It is easy to show, by appropriate use of accounting identities, the balance sheet constraints imposed on all the actors in this model and the assumption that demand and time deposits are demand-determined, that (16) translates into a demand-equals-supply condition for monetary base (the "inside" component of M2) with demand coming from the public (currency) and banks (reserves) and supply determined in similar fashion to equation (12).

A final accounting identity incorporated in the model, and needed to close it, is worth mentioning here. We have explicitly linked saving by private individuals to private asset accumulation. As said before, private assets are either held as loans on the curb market (LSUMM), currency or as demand and time deposits at DMB's.

The savings/asset accumulation implies that nominal private saving should equal nominal increases in total wealth: 

\[
(17) \quad \text{LSUMM}(t) + M2(t) = \text{LSUMM}(t-1) + M2(t-1) + \text{GNPKN}(t) - \text{TAXR}(t) - \text{CPRN}(t)
\]

or disposable income minus private consumption equals wealth accumulation. Although this is of course standard in theoretical growth models, we are not aware of applied models that display this consistency between beginning-of-period asset stocks, savings decisions determined in the real sector and the end-of-period asset stocks whose composition is determined in the financial sector. The model presented here seems to be the first applied model that integrates the real and financial sector in an internally consistent way. 

It can generate the national accounts, flow of funds and end-of-period asset

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1/ This is compatible with real savings equals real wealth accumulation if real income is defined properly (i.e. includes capital gains, etc.). See for example Levhari and Patinkin [4].

2/ This is certainly so if one confines the search to econometric macro-models. But even if one includes the burgeoning group of Johansen/Taylor/Adelman-Robinson type CGE models, whose builders are less constrained by data limitations, the claim seems to be correct.
stocks and composition that are internally consistent with each other and with the beginning-of-period asset stocks carried over from the previous period.

Section 3.6 Conclusions and summary

In this and the previous chapter we have presented an empirical implementation of the theoretical model outlined in Chapter 3, adapted to Korea. The model as set up here focuses on short-run macro-economic adjustment with special emphasis on the transmission channels of monetary policy between the financial and real sectors of the economy. Apart from the usual link between monetary policy and aggregate demand via investment, we have incorporated the link between monetary policy and the supply side of the economy via the impact of credit policies on cost and availability of working capital. This link can potentially reverse the short-run impact of tight money on inflation and aggravate the negative impact on output.

A further feature of the financial sector model presented here is that it incorporates all the accounting identities and balance sheet constraints and their implications for behavioral equations, constraining the different actors in the economy. Finally, the incorporation of the link between private saving (determined, loosely stated, in the "real" sector) and the increase of end-of-period asset stocks whose allocation is determined in the financial sector (increase over the beginning-of-period stocks) make the real and financial parts of the model internally consistent. This seems to be a novelty in applied models, although this feature is of course standard in modern theoretical macro-economics. The model presented here can generate the national accounts, flow of funds and end-of-period asset stocks and composition that are internally consistent with each other and with the asset stocks carried over from the previous period.

The financial sector model implemented in this chapter focuses on the role Unofficial Money Markets and foreign capital markets play in
satisfying the business sector's demand for financing, on the private sector's portfolio allocation and on the role of the commercial banking system.

The role of the curb market is quite pervasive; time deposits are shown to be a closer substitute to curb market loans than to M1, which has important ramifications for the effect of interest changes on the economy (see van Wijnbergen [11]). We also found that the demand equations for M2 components do not show significant wealth effects, indicating that increased savings are mainly channeled into the curb market over time. These two results indicate that the phenomenal increase in time deposits in 1965 after the financial reform was caused by a switch from lending at the UMM to time deposits by private asset holders, and not by an increase in savings as is usually claimed.

We also show preliminary evidence that the UMM lending rate clears the market for credit (and, by implication, the money market), which has important implications for the short-run transmission channels via which monetary policy affects the real sector, and restricts the leeway the government has in regulating the money supply given an independent (of the M2 rule) exchange rate policy. Note in this context the link between the UMM rate and capital inflows demonstrated in Section 3.3. The empirical evidence strongly supports a "stock" approach to the capital account. Of course, it remains to be seen to what extent this generalizes to countries other than Korea.
REFERENCES (Chapter 3)


PART II

SHORT-RUN MACRO-ECONOMIC ADJUSTMENT PROBLEMS IN SOUTH KOREA
Chapter 4

INTRODUCTION TO PART II

Section 4.1 Symptoms

The Korean economy has been sent into a nosedive unprecedented in post-1965 history, by an extraordinary series of shocks. Some of these shocks are external, some internal, some policy-induced, others clearly outside government control. But let us consider the symptoms first.

Figure 1 presents a measure of Korean competitiveness, Korean export prices compared with Japanese and U.S. wholesale prices. After an initial surge due to the slide of the dollar versus the yen in '78, Korean export prices accelerated in late '78 and early '79, leading to a steep drop in competitiveness. This process continued at a slower pace through '79, until exchange rate developments in Korea and abroad reversed the trend. Not surprisingly, exports slowed down in '78, actually declined in '79 and are only now ('80-III) picking up slowly.

At the home front, '78 saw all the signs of an overheated economy, with however signals of longer-run problems coming through.

Wages exploded halfway through 1978, the current account went into deficit as private investment accelerated way beyond private savings, and inflation took off in late '78. Labor shortages were predominantly in the skilled labor categories, indicating a source of possible future frictions when Korea starts implementing its move into skill-intensive industries.

The government responded with a radical change in monetary policy early in '79, switching to a staunch monetarist stand. The restrictive demand management did nothing to slow down inflation, which hit an all-time high of

1/ Figures are collected in Part III.
45% in 1980 but certainly contributed to the recession of '79/80, a recession that culminated in a fall in GNP of 5.7% over 1980. Unemployment went from an all-time low of 3.2% in '78 to 5.7% in the first quarter of 1980.

Real wages in terms of manufactured goods were outrunning productivity up to 1979, when the rate of increase of the real product wage slowed down, only to rebound in 1980, unemployment notwithstanding. A factor in the continuing upward pressure on wages may have been the high real price of food under the combined influence of agricultural price supports and bad ('78 and especially '80) or "flat" ('79) harvests.

All these figures are the more disturbing when seen against the background of Korean performance over the previous decade (‘66-76). These facts are well known and are not in need of repetition here.

Section 4.2 Causes

So what was behind all this? The Korean economy has gone through an extraordinary series of shocks in the last 5 years, which go a long way in explaining these developments. A short chronology:

1976-78 Government pushes private industry (via banking system) into excessive investment program, both as to size (I share GNP jumps up from around 25% to nearly 40% over '76-79 period) and as to direction (heavy emphasis on heavy machineries, chemicals). Result: shortages of skilled labor; government exerts pressure, does not let wage differentials go up + general wage inflation (real wages outrun productivity). A current account deficit clearly comes from surge in private investment. On top of this comes a bad harvest; rice output is estimated to fall 4%.
1978-79 Wage explosion, especially '78-II, III. Leads to high inflation, loss of competitiveness (after early '78 gain due to slide-down of the US$ to which they were pegged). Exports collapse late '78, early '79.

1979-II In March/April, government clamps down on economy, slows down real government expenditure, reversal monetary policy: from now on tight M2 growth rate targets, direct limits on credit. Immediate collapse of private construction. Inflation in fact accelerates.

1979-III Oil price shock. Higher prices of intermediate imports added to high real wages and high real costs of credit investment, GNP, exports collapse. The government nevertheless maintains tight fiscal and monetary policies.

1979-IV Only marginally better crop, no net growth over 2 years.

1980-I, II Monetary and fiscal policy remains restrictive. Tight M2 targets adopted, large devaluation in January, fairly smooth depreciation from there on, another plunge in Oct./Nov. Result: exports start picking up. Inflation, under combined onslaught of devaluation, new rise of oil prices, continuing high wage increases, explodes (WPI: 45% in '80).

1980-III Although there does not seem to be a catch-up for the slowdown in '79, real product wages are again rising sharply. Inflation slows down somewhat, WPI inflation much higher than CPI inflation → real depreciation taking place.
1980-IV Again a bad crop (a very bad one this time—25\% decrease in agricultural income) + agricultural prices do not fall as they typically do this time of year. Inflation (WPI) takes off again.

Current inflation (1980) clearly caused by series of adverse supply shocks (bad harvest, shifts in the relative price of oil). Unemployment (and possibly inflation, real cost of credit story) adversely affected by tight fiscal and monetary policies. Issues for the future:

A. Let relative price changes take place by letting some prices go up faster than others, i.e. have accommodating monetary policy. Taking the monetarist route will also work in the long run (can the politicians survive the adverse short-run effects?), but inflicts unnecessary short-run hardship on the economy in terms of unemployment. The choice is between a tight money rule plus flexible exchange rate (fix some real rate), or a preannounced rate of crawl (backed up by wage guidelines and all that) and a credit target, letting money demand determine the nominal money stock via capital inflows.

B. Unfortunately, fiscal and monetary policy are not easily separated in a country with Korea's financial structure (no such thing as open market operations to break the link between the government deficit and the money supply for example). This makes it nearly impossible (given an unwillingness to drastically raise taxes in the midst of a recession) to raise expenditure with strict money targets in place. This is a strong argument for the second alternative mentioned under point A.
C. Given the importance of agricultural goods in consumption, high agricultural prices exert upward pressure on wages and therefore on production costs for producers of manufactured goods. This in turn leads to a loss of competitiveness of Korea on its export markets. Therefore, opening up the economy to imports of rice and the lowering of the real price of rice that this would enable, presents the opportunity to, as it were, administer a positive supply shock to the economy, stimulating output and lowering inflation. Clearly, this has to be done in a carefully planned and pre-announced way to allow farmers to switch to crops more in line with Korea's comparative advantage.

III. Government Policy

A. In spite of the fact that current inflation has been largely caused by supply side shocks, government has maintained both restrictive fiscal and monetary policies. The latter may, in fact, have added to the supply shocks a higher real cost of credit.

B. Government policy with respect to agricultural price-support policy conflicts with macro-targets of increased employment and price stability. They intend to abolish rice subsidies by raising consumer prices, but this seems to go in the wrong direction—see point II-C.

Section 4.3 Cures

In discussing what is going to be done about all this and what should be done, two policy issues are of paramount importance. The first is an example of a short-run stabilization policy threatening to have large long-run costs without by the way achieving its short-run aims; I am thinking of
the tight fiscal and monetary cum exchange rate policies Korea has applied and continues to apply. The second is an example of a long-run policy providing obstacles to short-term stabilization. The issue here is the agricultural price support policy which has the long-run "non-economic" objective of self-sufficiency in rice. There is a major conflict here between this target (and its consequence, a high real price of food) which lowers urban real wages in terms of food and therefore pushes up real wages in terms of manufactured goods and which keeps labor on the land on the one hand, and on the other hand the short-run target of slowing down inflation and maintaining external competitiveness, which calls for lower real wages in terms of manufactured goods.

Chapters 5 and 6 review the series of shocks, providing more quantitative details. Chapter 7 assesses the effectiveness of the fiscal and monetary policies followed, and ventures some predictions for '81 if they are adhered to. Also in Chapter 7 we outline a different set of policies, more fiscal stimulus, more relaxed monetary policies, and gradual reductions in the real price of food. The macro-economic picture to be expected in '81 based on a model of the Korean economy is provided; the details of this model are provided in Appendix A. Appendix B discusses the theoretical issues of relevance when considering monetary and exchange rate policies as anti-inflation tools. Finally, Appendix C presents basic statistics of the Korean economy. Chapter 8 briefly touches on some long-run issues.
Chapter 5
1977/1978

The Korean economy recovered spectacularly from the oil shock induced recession in 1974, returned to a high growth path in '76, but from there on ran into a remarkable series of shocks, from the government-inspired great leap forward in '77/78 right up to the disastrous harvest in '80-IV, with a couple of oil shocks in between and further contractionary pressure due to a rigid adherence to monetarist prescriptions in 1979 and 1980.

A more or less chronological analysis follows:

5.1 The Period 1977/1978

The period '77/78 is a period characterized by strong domestic expansion. Private investment increased at an accelerating rate in '77/78 (see Table 1B), with 25.5% in '77 and not less than 36.4% in '78. Other components of aggregate demand did not grow unusually fast in '77: private consumption (6.5%) and government construction (18.4%) increased at roughly the same rate as they did the preceding two years. Accordingly, the share of private investment increased from 22% over '75/76 via 25.5% in '77 to an unprecedented high of 32.8% in '78 (see Table 1A; the figures are based on constant price comparisons). Both private construction and producer durables and equipment doubled their growth rate in '77, from 11.8 to 22.4% and from 13.9% to 26.3% respectively (Table 2B).

As mentioned elsewhere in this report, investment was heavily biased towards chemicals and heavy machinery, all skill-intensive industries. We will come back to this point when discussing labor market problems. Private saving did not go up in line with private investment (Table 3B): consumption

1/ Tables are collected in Part III.
accelerated to a 10% real growth path in '78, roughly the same rate as GNP growth (11.6% in '78), leading to a private savings share of 19.9% compared with an investment share of 25.6% (this time in current prices, and inclusive of increases in stocks) in 1978. See Table 3B for the numbers.

The boom in private investment, far in excess of private saving (see Table 3A) is clearly the cause of the deterioration of the current account (equals income minus expenditure or, equivalently, net private and government saving) in '78: net government saving in fact went up (Table 3), but not enough to offset the decline in net private saving. The ratio of investment financed by foreign sources went up accordingly, from 2.2% to 10.6%. Another index pointing to demand pressure is the velocity of inventories in manufacturing displayed in Figure 2. Velocity clearly increases steeply over '78, before starting its long slide down under the impact of the current recession. It is correct but somewhat misleading to point to private investment as the main culprit, because the government has a strong influence on it: econometric investigations show that the change in the real amount of credit to the private sector outstanding is one of the main factors influencing private investment. Domestic bank lending in real terms accelerated strongly in '77/78 (Figure 3A), nearly doubling in two years. That central bank operations had a lot to do with this can be read from Figure 4 and Table 4: BoK lending to private banks skyrocketed and became the main component of the monetary base. The credit expansion was reflected in strong M2 growth, 33.3% in '77 and 29.2% in '78, leading to steep increases in the real money stock (Figure 3B).

All this led to a sharp drop in unemployment: unemployment, adjusted for seasonality, fell to its lowest point in post-'65 history in the first quarter of 1978 and remained low throughout the year (Table 5).
The impact on wages was swift: in the second quarter wages exploded after the extraordinarily tight end-of-period first quarter labor market, and accelerated by 15% within one quarter (an annualized rate of slightly less than 75%). An econometric wage equation, estimated over the '66-79 period, predicted only a 6.5% increase if one makes the assumption of 4% unemployment, the average level for '76. 1/ Clearly, labor market pressure, generated by strong domestic expenditure, was laying the foundation for later inflation problems, after the delay between wages and prices had passed (about 2 quarters for export prices, 3 quarters for wholesale prices. See Chapter 2.

In fact, although nominal wage increases accelerated sharply halfway through '78, they had been high over all of '76, '77, and '78 when compared with inflation and productivity. Over this period, the real product wage 2/ increased by 60% while productivity in manufacturing went up 24.3% only. Measured in terms of export prices, the real wage increase was 52.3%, still much higher than productivity increases in manufacturing (the leading component of exports). 3/ What gives in of course is profits, which were squeezed over that period. A loss of competitiveness was clearly unavoidable unavoidable--a matter of time only.

Wages are passed through in export prices with about a 2-quarter lag (see Appendix A); these duly exploded at an annualized rate of 41% in the fourth quarter of '78, the highest rate ever recorded since '65 with the exception of the post-oil crisis increase in '74-I and the two devaluation-

1/ The same equation predicts 14% with actual unemployment figures. For the parameters see Appendix A.

2/ Wages deflated by wholesale prices, the relevant real wage definition for employers, who compare wages with their product prices.

3/ See Figures 5A, B, C.
induced increases in '75-I and '80-I. This clearly had a strong negative impact on Korean competitiveness--see Figure 1--which nosedived in '78-IV after the pass through of the wage increases. Exports, although still increasing, did so at a slower rate (16.1% in '78 compared with 36% in '76 and 23% in '77); the early '78 appreciation of the yen against the dollar (to which the Won was then pegged at a rate of exchange of 484) had helped Korean competitiveness (Figure 6), but not enough to prevent an overall negative impact over '78 due to the 4th quarter export price explosion.

Imports showed no sign of slowing down, in fact accelerated (25.6% in constant prices over '78, as opposed to 22.3% in '77), with capital goods imports leading the pack: the share of capital goods in total commodity imports went up to 33% in '78 from 27% in '77 (see Table 6B). This of course should not come as a surprise, as investment was the leading factor behind the acceleration of growth in '78. The net result, as we have seen already, was a deterioration of the current account.
Chapter 6
MACRO-ECONOMIC DEVELOPMENTS IN '79 AND '80

1979 saw the artificially induced boom of '77/78 come to a crashing
halt under the combined impact of the '78 wage explosion, the subsequent
dramatic reversal in fiscal and monetary policies as of early '79 and the
August '79 hike in oil prices (and by the way in prices of other intermediate
products.)

The surge in private investment and the associated acceleration in
GNP growth put extreme pressure on labor markets in '78 (leading to the lowest
unemployment rate ever in early '78 \(^1\)). This in turn was behind the wage
explosion in '78, as demonstrated in the previous section. The rapid wage
increases led to an erosion of Korean competitiveness in late '78, more than
negating the gains of the first three quarters due to the appreciation of the
yen against the US dollar (see Figures 1 and 6A).

This loss of competitiveness and the slowdown of OECD growth in '79
cooperated to cause the first decline in real exports in the post-'65 period
over '79 (Figure 7 and Table 1B): exports of goods and services, measured in
'75 prices, fell 3.7% over '79 after a sluggish performance (at least by
Korean standards) in '78. The slowdown was most pronounced in the traditional
export sectors textiles, footwear and plywood (Table 6C, D). Figure 8 depicts
the rate of growth of seasonally adjusted real exports; after a flat
performance in the last 3 quarters, the adverse price developments in late '78
(see Figure 1) sent exports into a nosedive in early '79. A modest recovery
in the 3rd quarter was cut short by the anticipation of the devaluation that
indeed came in January 1980, after which pent-up supplies were released (note

\(^1\) I am referring to seasonally adjusted unemployment, cf. Table 5.)
the '79-IV trough and '80-I peak in Figure 8). It is only in the third quarter that some recovery comes up, a recovery clearly helped by the boost to competitiveness provided by the 16.6% devaluation of the Won versus the US dollar in January 1980 plus further depreciation to 660 W/US$ (from the '79 value of 484 Won/US$), and the renewed appreciation of the yen versus the US dollar (see Figures 1 and 6). Korean competitiveness (Korean exported prices over a trade-weighted average of foreign wholesale prices) is now back where it was in '76/77; in fact some overshooting occurred. Preliminary data on '80-IV seem to indicate that the recovery is still alive; the prospects of renewed growth in the OECD in '81 leads to some optimism for '81. Predictions are offered in Section 4.

In view of the importance of export growth as an engine of growth for Korea, the authorities were understandably worried about the loss of competitiveness in late '78 and early '79. The cause was, correctly in our view, thought to be the overheating of the economy through '78 and early '79 and the ensuing wage pressure. Their response was a dramatic reversal in monetary and fiscal policies in true British stop/go fashion.

As of early '79, the system of monetary control was changed, from a credit targets system to M2 growth rate rules. Up until '79 Korea essentially used the Mundell assignment for fixed exchange rates: fiscal policies geared to maintain internal balance and monetary policy to maintain external balance (given credit targets and M2 demand, an unanticipated current account deficit will lead to capital inflows to maintain M2; in this sense they followed the Mundellian strategy.)

However, from early '79 onwards, M2 growth rate targets have been enforced via direct credit limits and capital controls, with an eye on internal balance: the Koreans in effect (although it seems not consciously)
are trying to bring inflation down by restrictive demand management. At the same time, government expenditure is kept low in real terms (more on this below) because of the need for "external adjustment." Clearly the assignment has been reversed. The problem with this is that it is an unstable assignment leading to wide swings in policy (known from the British example as stop/go policies) and an eventual breakdown in the fixed exchange rate system, which indeed happened in 1980. The reason is that under this assignment the two instruments work at cross-purposes in periods of domestic slack and balance of payments deficits. The Koreans briefly experimented with a flexible exchange rate system in 1980, which would solve the instability problem, but has other drawbacks, discussed in Appendix B on inflation policies. The main problem is the resulting volatility of the exchange rate, which poses serious problems especially for countries in importing intermediate goods whose prices are fixed in foreign currency.

Even a "formula variant" crawling peg (fixing some real rate) presents serious problems in a country like Korea, as it tends to magnify wage disturbances. 1/

The Korean authorities are aware of these problems, and in fact have decided on a variant of the fixed rate system for '81: They have guaranteed businessmen a smooth and predictable rate of devaluation over '81 of about 10%. This of course reintroduces the stability problems associated with the particular assignment of fiscal and monetary policies chosen by the Korean government. This problem had not yet arisen in early '79 as both assignment

1/ A wage increase leads to higher export prices (in Won), from there to a devaluation under such a rule because of the decline in competitiveness; this in turn increases the Won price of intermediate inputs, leading to further price increases. See Dornbusch [3] for an elaboration on this theme.
schemes prescribe the same remedies in a period of overheating and BOP deficits; the problems arise when BOP deficits are coupled with unemployment.

Anyhow, in early '79 the authorities put drastic curbs on M2 growth, leading to a clear break with past trends of real money growth (see Figures 3A and 3B) which had been rising rapidly up until '78 but started to decline from there on. Due to the high current account deficits in early '79 (54% of the total deficit of 4.2 billion US$ was incurred before the third quarter, when the big increase in oil prices occurred); this did not result in a reversal of the trend in real credit to the private sector until 1980. In nominal terms, M2 growth slightly exceeded the inflation rate (see Table 7) over '79, mainly because of the large increase in private credit financed by central bank borrowing in the second half of '79 (a similar thing happened after the '73 crisis; see Figure 4): the initial response to the oil shock was monetary accommodation, for which there was room after the draconian slowdown in the first half of the year.

The tightening of monetary policy in early '79, coupled with a variety of tax measures introduced to discourage real estate speculation, led to an abrupt collapse in private construction in the second quarter of '79. Private investment in producer durables and equipment, responding to monetary conditions with one quarter delay as econometric evidence shows (Appendix A) remained buoyant through through the second quarter, but slowed down in the second half of the year to end up at an annual increase of 15.1% (as opposed to 42% in '78; see Table 2B).

Halfway through 1979 one could witness the beginning of a long series of adverse supply shocks, beginning with a jump of nearly 20% within one month in the dollar price of mineral fuels (between July and August). After a "flat" period in the 3rd quarter, further increases occurred in the
4th quarter, leading to an increase in the average index over '79 of 32.5% compared with '78 (Figure 9). The fourth quarter data for 1980 are not yet in, but preliminary estimates made by the IMF and reported in the 1980 World Economic Outlook come out at a 60% increase for 1980, an increase that was mainly concentrated in the early part of 1980.

Oil shocks, and more general changes in the price of intermediate imports, have two aspects, both of them unpleasant: first they represent an adverse supply shock as the relative price of an input goes up; second they imply a transfer to be made to the exporter of the intermediate good.

The short-run problem of adjustment to oil shocks has to do with the transfer part of it: has the transfer been effected or not? The long-run adjustment problem refers to the relative price change: has the economy adjusted to the change in the real price of oil (using world prices) or not? This is a long-run problem simply because long-run substitution elasticities are higher than short-run elasticities; changes in factor intensities in response to changes in the real price of an input can only be introduced as and when new capital replaces and augments old capital. Accordingly, adjustment takes time. It is here that there is a direct conflict between tight monetary policy for short-run stabilization purposes and long-run adjustment. Long-run adjustment needs lots of investment, as this will speed up adjustment of the structure of the capital stock, but monetary "stabilization," if it works at all in the short run, does so exactly by curbing investment. More on this issue in Section 4.

A precondition to the long-run adjustment is clearly the realignment of the domestic relative price of oil and oil-related products with the corresponding world prices. In this respect Korea has followed a courageous and perceptive economic policy; domestic prices of energy have by and large
followed world price trends. Adjustment of factor intensities to the new price structure is now only a matter of time (and sufficient economic growth and investment!); the necessary preliminary steps (get the domestic price structure right) have been taken. Of course there is a reverse side to every medal: getting the price of an input such as energy right is good for long-run adjustment but bad for short-run inflation. Relative prices adjust by letting some prices go up faster than others, not by letting some go down and others up. The net result is inflation. Table 8 gives a breakdown of the causes of Korean inflation for the WPI, CPI and export prices in '79 and '80. The contribution factors have been derived by running the model presented in Appendix A first with "true" values of the exogenous variables, then under the assumption of a constant dollar price of intermediate inputs and so on. The results are revealing. Actual inflation in '79 was somewhat higher than in '78. In the first half of the year this was partly due to spillover of '78 wage increases, partly to rises in the price of intermediate imports: these were outrunning general inflation throughout the year, not just after August (see Figure 9). In the second half, however, a reasonably good harvest and a slowdown of the economy on the one hand and the first oil crisis on the other led to a year-long domination of foreign factors in '79 inflation.

In the first quarter of 1980, all price indices (WPI, CPI and export prices) exploded, under the combined impact of the January 1980 oil price increases and the exchange rate changes effected by the Korean authorities: a 16.6% devaluation in January and a further depreciation throughout the year to 660 Won/US$ as of January '81. The rate of depreciation was fairly smooth during the middle of the year but peaked again at the end.
In '80-I the WPI rose at an annualized rate of 67%, about 3/5 of it due to oil price changes and the devaluation measures taken by the government. Similar figures were obtained for the (Won) export price index, but somewhat larger domestic demand pressure was recorded for the CPI. The latter result should not be surprising, as the CPI typically lags the WPI by about a quarter. Over the second and the third quarter, inflation was completely dominated by foreign factors, as the short-lived pickup in construction in '79-IV fizzled out in early '80 under the impact of renewed tightening of monetary policy.

The tight money policy of early '79 and the oil shocks of '79 and January '80 had brought Korean growth to a halt and the devaluation in early 1980 and the extremely tight money growth rules enforced over the first three quarters (Figure 3), made a decline in output practically unavoidable. As can be seen from the inflation breakdown in Table 8, the contribution of domestic demand pressure to inflation (for all three price indices!!) turned negative in the second quarter and remained so throughout the year. There are actually several other signals that indicated that demand pressure is not what is causing current Korean inflation. A particularly telling one is presented in Figure 2: the velocity of inventories in manufacturing has dropped precipitously since the peak of around 1.9 in late '78 to less than 0.9 in September 1980. Economic activity actually declined by 5.7% over 1980 (as measured by real GNP, '75 marked prices). Model simulations show that a 3% drop can be ascribed to the bad harvest in the fourth quarter, while not less
than 9.5% of the slowdown was due, directly or indirectly, to the combined impact of the oil price increases over 1980 and exchange rate changes. 1/

Of course, that a devaluation is bad for inflation and growth in the short run does not imply it is always inappropriate: it clearly helped to restore Korean competitiveness to what seems a more reasonable level (Figure 1), it brought about a change in relative prices that seems to stick and it has clearly not been eroded by inflation. As such it helped the recovery of exports, to which future growth prospects of Korea are linked.

Now, let us turn to the short-run adjustment problem: has the transfer to OPEC been effected or not? The answer to this question is different depending on whether one looks at '79 or '80. What one wants to know is whether the transfer has been made out of savings or expenditure. In the first case it is not effected at all and will lead to a one-for-one deterioration in the current account; in the second case it will be effected and accordingly no deterioration of the current account deficit will occur. In the real world one typically ends up halfway, in which case the transfer is undereffected. From this little theoretical digression to actual numbers is a non-trivial step.

1/ A devaluation has a contractionary impact on economic activity, in the short run at least, for a variety of reasons, some of which are discussed in Krugman and Taylor [4]. In the Korean context the most important contractionary factors are:

1. The fact that it raises the Won price of intermediate inputs (oil!) whose prices are fixed in dollars, and so causes an adverse supply shock.
2. The fact that, given the nominal money stock, it leads to a contraction in the real money stock via its direct and indirect impact on prices (this is of course the mechanism via which adherents to the monetary approach to the BOP think a devaluation improves the BOP over the short run).
3. The fact that, if successful, it lowers real wages and so transfers income from low savers to high savers.
If one simply computes the additional transfer to be made because of
the oil price change (this will be done below) and compares that number with
actual changes in the current account deficit as conventionally measured, the
answer is straightforward: the additional transfer was not effected at all in
'79 and only partially in '80 (see Tables 9, 10). Two issues have to be
settled first, however, before one can conclude that Korea has not adjusted
sufficiently to the oil shocks. The first question is a normative one:
should a country, assuming rational intertemporal behavior, adjust immediately
or not? There are strong theoretical arguments against immediate effecting of
the transfer, to which I will come back below. The second is more basic and
has to do with the distortions introduced in conventional accounting practices
by inflation. At issue is the inclusion of all interest payments on foreign
debt as an expenditure item, and therefore as a negative item in the current
account (= income minus expenditure). The problem is that in inflationary
times interest payments contain an inflationary part (the difference between
the nominal and the real rate of interest) which really is repayment of the
real value of one's debt, and not part of the cost of credit (the real
interest rate, payment of which does lead to true expenditure items).

It is irrelevant whether interest rates actually reflect increases
in inflation or not: if they do, expenditure—as conventionally measured—is
over-estimated by the amount of the "inflation premium" in the interest rate
times the outstanding debt, so that the current account as measured
conventionally (once again, income minus expenditure) should be adjusted
upwards; if they do not, the borrower enjoys a capital gain at the expense of
the lender which should be included in an appropriate definition of income;
this too leads to an upward adjustment of the current account as
conventionally measured (now expenditure is right but income is
underestimated). Once this is taken into account, the story changes drastically. The numbers are put together in an organized way in Tables 9 and 10.

First, the size of the transfer. Economic theory tells us that the appropriate definition is the "normal," (pre-price increase prices) times the price increase. Two issues here: first, what is a "normal" amount? We took the previous year's amount of oil imports times a growth factor of 10%. One can argue about the 10%, but a percentage point more or less will not change the results in a qualitative way. Second, what exactly is the price increase? Clearly it is the change in the real price of oil (oil in terms of everything else) that matters, not the nominal, dollar price. In Table 9 we used the price of oil in terms of the world price of manufactured goods (source: IMF Economic Outlook, Statistical Appendix, 1980). See also Figure 10. All this leads to an increase in the transfer to OPEC of 0.4 billion US$ in '79 and not less than 2.0 billion US$ in '80. Using the conventional current account definition, one would conclude that there was no adjustment at all in '79, while about 45% of the transfer seems to have been effected in 1980. This conclusion is partly reversed, however, once the inflationary distortions are taken out of the current account. The numbers are presented in Table 10. The '78/79 deterioration remains large (2.9 billion US$ instead of 3.1 billion US$) and exceeds the increase in the transfer to OPEC several times. No such thing as short-run adjustment in '79. Not so in 1980, however. The adjusted current account deficit deteriorated over '79/80, but only by 0.1 billion US$, while the increase in the transfer to OPEC was 2 billion US$. Therefore, adjustment to the 1980 oil shock was nearly complete (the transfer increase was effected for 95%).
As if all these problems were not enough, 1980 ended with a disastrous harvest; agricultural (and fishery and forestry) value added dropped by 25% in '80 on a year-to-year basis. Model simulations with the model presented in Appendix A.2 indicate that this caused a 3 percentage point slowdown in GNP growth, an estimate that, if anything, seems on the low side. As Korea could not or would not cover the shortfall with food imports, shortages developed and food prices started to rise faster than general inflation (i.e. the real price of food went up; see Figures 11A and 11B). The breakdown of inflation presented in Table 8 shows that food prices contributed a major part of the outburst of inflation in late 1980.

The end result over 1980 of all these supply shocks has been the first net decline in real GNP (5.7%) in years. On the expenditure side, consumption, already slowing down in '79, fell by 1.1% in real terms. A much more spectacular drop could be seen in investment which over the year fell by a full 16% (see Tables 1A, B for further details). The collapse in private investment was particularly pronounced in Producer's Durables and Equipment, which fell a dramatic 35.5% over '80 (Table 2B). Total construction in fact picked up considerably from the depressed level of '79. As we have seen, the decline in expenditure was not sufficient to prevent an increase in the current account deficit, although, as we have also seen, there may be some money illusion hidden behind the 1.1 billion US$ increase in the deficit.

Government consumption in real terms fell over '79 (by -0.5%) and continued to so so over the first three quarters of 1980. In the fourth quarter however the government finally saw the need for some expansion, when seasonally adjusted unemployment kept on rising throughout the year and the restrictive demand management failed to make a dent in inflation (not surprisingly, as it is entirely caused by supply shocks in the second part of
Government consumption picked up in the fourth quarter, while construction was also stimulated. The fourth quarter increase of 9.3% over '79-IV was just enough to achieve a small increase of 0.1% over the year as a whole.

The monetary counterpart of this fiscal stimulus was a slight reversal of the downward trend in real credit to the private sector (Figure 3A) in the second half of 1980. Over the year as a whole, however, fiscal and monetary policies have clearly been contractionary, and are expected to remain so throughout 1981. This brings us to the prospects for 1981 to which we turn in Chapter 7.
7.1 Introduction

The major short-term macro-issue for 1981 is the conflict between restrictive demand management (planned by the government) and structural adjustment to the change in the real price of oil (needed by the economy). We touched on this issue before, but because of its importance the argument will bear repetition. Structural adjustment to changes in relative factor prices implies changes in factor intensities. However, because we live in a putty-clay world, changes in technology needed for different factor intensities can only be implemented on new capital goods, not on old. Accordingly, buoyant investment (which, over time, leads to a "younger" capital stock than otherwise would obtain) speeds up structural adjustment. On the other hand restrictive demand management (tight fiscal and monetary policies) has its impact on demand mainly via its negative impact on investment, and therefore, slows down structural adjustment.

In countries like Korea, the link between monetary policy and investment is moreover more direct and faster than in OECD economies, the availability of credit (measured by the change in real credit to the private sector) is a direct determinant of private investment (see Appendix A for econometric evidence). Therefore, if one wants to stimulate structural adjustment to the increase in the real price of oil, restrictive demand management is a bad way to start. The argument that the large current account deficit does not leave the authorities much choice, and does not allow for further demand expansion, seems unconvincing after our discussion of current account adjustments in Section 3.5: after the inflation-induced erosion of the foreign debt is taken into account, the 1980 current account deficit is only 2.8 billion US$, still high but nowhere near the 9% of GNP represented by the unadjusted current account deficit of 5.3 billion dollars.
There are further problems with curbing money growth as a tool to combat inflation. A detailed discussion is presented in Appendix B.2, but the main points can be repeated here. In highly levered economies like Korea, bank and Unofficial Money Market credit is a major source of funds for firms to finance.

Accordingly, the real cost of credit (on the margin represented by the real rate in the curb market) is an important component of input costs. This in turn means that tight money not only influences demand (via its negative impact on investment), but also supply and pricing decisions: higher real rates on credit extended to firms represent higher input costs, and therefore lead to stagflationary consequences, just like that other supply shock, changes in the real price of oil. If the adverse impact on output via higher costs of credit is stronger than the adverse impact on demand via investments, the impact effect of curbing money growth on inflation may in fact be perverse, i.e. it may even accelerate inflation in the short run. 1/

Empirical evidence (see Chapters 2 and 3) shows that this is in fact the case in Korea. For about two to three quarters, the negative impact on supply of a one-shot contraction in the money supply is more important than the negative impact on demand via investment; accordingly, for the first two or three quarters output falls and inflation accelerates after a tightening of monetary policy. After that, traditional effects via aggregate demand take over.

The net effect is an initial increase in inflation that tapers off later on, a fall in real output and low investment (and thus low medium-term

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1/ The theory behind this can be found in Cavallo [2], Bruno [1] and van Wijnbergen [5]; empirical evidence is presented in Cavallo [2] and van Wijnbergen [6] and in Chapters 2 and 3 of this Working Paper.
growth). These results are borne out in the model simulations presented below.

A final argument against restrictive demand management is the finding reported in Table 8: the contribution of domestic demand pressure to inflation has been negative for the last three quarters of 1980, a fact that fits in well with the continuing high unemployment figures (see Table 5) and the more than 50% decline in velocity of inventories in manufacturing Figure 2).

Section 7.2 Prospects for 1981 given Korea's intended macro-economic policies

7.2.1 Planned fiscal and monetary policies

The Korean government has opted strongly for restrictive demand management, in striking contrast to Korea's response to the '73/74 oil crisis. At that time fiscal stimuli were coupled with accommodating monetary policy. It is maybe worthwhile to point out that these '74/75 policies led to a fast and spectacular recovery, faster and to a higher growth path than most other countries in the world. For reasons undisclosed to us, Korea has opted for a different strategy this time around. Target GNP growth is 5%, predicted inflation 20% (now increasingly presented as the lower end of a range rather than a point estimate). From these targets Korean authorities have derived an M2-growth rule of 25%. Even a simple exercise with an M2-demand equation linking demand for real M2 to the inflation rate, time deposit rates and income shows that this is not a consistent set of targets and instruments. The M1 and time deposit equations presented in Appendix A would predict a drop in velocity of more than 6% if the income and inflation targets are really hit and interest rates remain unchanged. This would lead to a 31% increase in money demand, 6% in excess of the Korean M2 target. Clearly matters would
become worse if time deposit rates were raised, as this would decrease velocity further and thus lead to even more M2 demand. More on this in the section on alternative scenarios. The IMF, starting from 5% real income growth and a more realistic 25% inflation target, has estimated money demand at 35% above 1980’s level, after an exercise similar to the one performed above, and has set its credit ceilings accordingly.

We have run our model under both assumptions, but before we turn to those results, some discussion of fiscal policy is in order.

Korea is planning to raise government expenditure by 22% to a total of 9,542 billion Won. 1/ This comes down to a decline in real terms of 4% if our 25% inflation prediction (WPI) is right (see below for the prediction). The deficit is projected to remain nearly constant in nominal terms (Table 11 below),

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<th>Table 11</th>
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<tr>
<td>Central Government</td>
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<td>'76</td>
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<tr>
<td>-------------------</td>
</tr>
<tr>
<td>expenditure</td>
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<tr>
<td>2,519</td>
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<tr>
<td>revenues</td>
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<tr>
<td>2,327</td>
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<tr>
<td>deficit</td>
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(- indicates deficit)

so it will decline by about 25% in real terms. This clearly is contractionary fiscal policy. Korea has chosen to do so despite the continued increase in

1/ Central government expenditure.

2/ Projections made by the Korean authorities.
unemployment (Table 5). Their strategy for '81, although contractionary both as to projected money and government expenditure, relies on a rather subtle device to get out of the current slump. Most of the growth in M2 will be concentrated in the first two quarters (when M2 will grow at an annualized rate of about 32%), to be followed by drastic cutbacks in the second half of the year (an 18% annualized growth rate in the second half of '81).

Similarly, they will try to reverse the seasonal pattern of government expenditure, to have 60% fall in the first half. There are serious questions as to whether this is feasible; a large part of government consumption cannot be shifted forward (wage payments), while the main component of government investment, construction, cannot be undertaken at all in the first quarter because of the climate.

A "normal" seasonal pattern for '81 would be 48% in the first half, 52% in the second half of the year; 1/ Korean authorities rely heavily on a boiler replacement program (see the energy section in this report) and an expansion in government-sponsored housing to effect this shift of expenditure. For reasons discussed elsewhere in this report, the boiler replacement program is not coming off the ground (nor is it obvious it should do so), while the public housing project is not likely to lead to any disbursements before the fourth quarter of '81. The IMF has estimated a 53%/47% pattern as feasible. Although these numbers (like the Korean estimates) are not based on hard calculations, they would seem more reasonable in view of the problems

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1/ Seasonal adjustment factors are derived from past experience using the Federal Reserve X-II seasonality correction computer program.
mentioned above. Accordingly, we have used this pattern in the simulation
exercises to which we will now turn. 1/ 2/

7.2.2 Predictions for '81 given planned expenditure and M2 growth (25%) plans

In the simulation exercises, the results of which are reported in
this and the next two sections, we made a series of assumptions on exogenous
variables: 3/

11% world inflation (based on 11% U.S. inflation,
6% Japanese inflation and a further
5% appreciation of the yen versus the US dollar)
2.4% real growth in the first half of '81 of the trade-weighted
geometric average of U.S. and Japanese income, based on 4%
growth in Japan and 1% growth in the U.S. in the first 2
quarters;
3.2% real growth in that variable in the second half of '81, based
on 4% growth in Japan and 2.5% growth in the U.S.
15% increase in the nominal price of oil over '81.
4% increase in volume of "other" imports (i.e. other than capital
goods and intermediate imports) plus added to that 1 billion
USS of additional rice imports.

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1/ Simulation results for all the different expenditure patterns are avail-
able but not reported here. The results are quite similar for the year as
a whole but, not surprisingly, with a stronger recovery in the first half
and a larger slump in the second if the Korean pattern is followed.

2/ The resulting expenditure pattern will be referred to as IMF pattern for
government expenditure in the text and tables to follow.

3/ All growth rates, inflation rates, etc. are given as annualized percentage
changes (log differences). The assumptions on Japanese and U.S. economic
performance come from the 1980 OECD economic forecasts.
- Constant nominal prices of food throughout 1981 (until recently the official plan for 1981).

- A smooth 10% rate of devaluation of the Won/US$ rate throughout the year.

- Constant food prices throughout the first three quarters and fourth quarter increases compatible with the GMF rice price plans discussed elsewhere in this report. Rice makes up less than half of all expenditure on food, so this may bias inflation and growth predictions in an optimistic way if non-rice food prices do go up.

The results are reported in summary form in the first row of Table 12, and more extensively in Tables 13A, B, C and D. The full model simulation confirms the inconsistency of 5% growth and 20% inflation targets with 25% M2 growth. Inflation will come out at 26% over the year, partly due to the high real cost of credit in the second half of the year when monetary policy tightens considerably under this scenario. This is vividly demonstrated by what happens to private investment under these policy measures: investment starts at 16-18% of GNP but in the second half drops to below 13% (Table 13A). Over the year private real fixed capital formation will fall short of the '80 amount by a whopping 11.7% (Table 12A). This drastic reduction in an expenditure item of course leads to a much better current account performance than anticipated, and slower growth (Table 13A): under this scenario real GNP will grow at only 4%, while unemployment (adjusted for seasonality) will rise a further half percentage point to 5.5% in late '81 from the current third quarter figure of 5.1%. These results clearly demonstrate the conflict
between long-run structural adjustment, which requires high investment, and the restrictive monetary and fiscal policies currently envisaged by the Korean authorities, as these will lead to a large drop in private investment, without achieving either the inflation or the output target wanted by the Korean authorities.

Section 7.3 Alternative Scenarios

7.3.1 Different fiscal and monetary policies for 1981

25% M2 growth and 22% increase in nominal government expenditure lead to unsatisfactory results, as seen in the previous section. What however if a less stringent monetary policy were followed? Will there be room for further fiscal expansion? These are the questions we will try to answer below.

The first scenario we looked at leaves fiscal policy as it is, but assumes a 35% money growth rule, a growth path that would be consistent with IMF ceilings. For the results see Tables 12A and 13B. For the first half of the year not much changes, simply because for the first two quarters money growth rates do not differ much. However, the tightening of monetary policy in the 3rd and 4th quarters under the 25% scenario does not take place now; investment does not collapse in the last quarter and in fact ends up at about the same level as in 1980 (one percent increase). Over the year it will then be at 18% of GNP, still below the 20.2% it used to be in '76 (considered by many to have been a "normal" year). The fact that investment will be more than 10% higher in real terms compared with the 25% scenario (a nominal difference of 900 billion Won; see Tables 12A and 13B) does not mean that the current account will deteriorate by the same amount: expenditure goes up but so does income and therefore private saving. The 35% M2 growth rule will lead
to 1.3% more real growth (Table 12A), GNP in real terms will increase 5.3% under this scenario. Private saving goes up about one third of the amount by which investment rises; not much happens to government savings, so the current account deteriorates by about half the increase of private investment to 2,300 billion Won (3.3 billion US$).

Finally, inflation. As we have seen before, tight money in fact increases inflation for about 2 quarters, before more traditional effects take over; under the 25% rule, monetary policy tightens up in the 3rd and 4th quarters; in line with this, inflation over '81 actually ends up 2 percentage points lower with a 35% M2 rule than with a 25% M2 rule, at 22% per annum (WPI).

However, 5% growth—although an 11 percentage point improvement over 1980—is still low by Korean standards. One may with reason ask whether there is room for fiscal stimulus. To find the answer we ran two different simulations. Both assume a 7% increase in nominal government expenditure on top of the 22% increase already planned; in the first run (scenario III) we assume no change in monetary targets. This implies that the additional credit needed to finance the additional expenditure has to come from a cutback in credit to the private sector ("crowding out"). In view of the importance of the availability of bank credit for private investment, one expects this to have a strong impact on private investment, an expectation that is borne out by the results. In the other run we assumed no cutback in credit to the private sector, and accordingly an increase in total domestic credit and M2. Finally, we made the assumption that the additional government expenditure itself (as opposed to further output increases induced via multiplier effects) would not use any intermediate imports. This reflects Korean attempts to concentrate government spending as much as possible in projects that are
energy efficient, do not use many imports directly and generate as many jobs (directly) as possible.

The results are reported in Tables 12A, 13C and 13D. An additional fiscal stimulus with crowding out (scenario III) and 35% M2 growth leads to a nearly one-for-one crowding out of private investment, but because it is concentrated in high value-added projects leads to an increase in output nevertheless: Table 13C shows 2% further output growth, bringing the total up to 7.1%. Not surprisingly, there is no noticeable impact on inflation, as there is considerable slack in the economy: inflation remains at 22%. The additional government expenditure (which by assumption has a zero intermediate import content) is replacing private investment (which has a very high import content, partly because it has a large direct import component as many capital goods are imported, partly because on top of that the domestically produced part uses intermediate imports), so the current account actually improves when compared with the case of the 35% M2 rule without extra expenditure. Increases in private saving minus investment (S goes up, I goes down, so S-I goes up a lot) more than offset the decrease in government saving when comparing the two scenarios. This of course does not happen when there is no crowding out, our scenario IV (see Tables 13D and 12A). Here additional government expenditure is financed via money creation; M2 grows at 39% as a result. Private investment now does not drop (in the crowding-out scenario it dropped to 92% of the 1980 amount) with respect to the 35% M2 rule without additional expenditure; in fact it ends up 3% above the 1980 amount and 18% of GNP. GNP now rises at 8.3% in real terms, a further increase of 1.2% on top of the crowding-out case. The current account of course deteriorates; there is now no drop in private fixed capital formation to offset the decline in government saving. The total deficit is under this scenario expected to
increase to 2,700 billion Won or 3.9 billion US$, still well below the 1980 deficit. Also, no noticeable effect on inflation occurs. Finally, exports are expected to grow at a reasonable 12% in real terms.

The conclusion of all this must be clear: the Korean policy measures for '81 (25% M2 growth, 22% increase in nominal government expenditure) are inconsistent with a 20% inflation target and a 5% real growth target, will cause a severe slump in private investment, and will lead to lower growth (4%) and higher inflation (24%) than anticipated. On the other hand, a fiscal stimulus of an additional 7% increase in government expenditure, if financed within the IMF guidelines of 35% M2 growth rate and associated credit ceilings, will generate 7% real growth over '81 without negative impact on inflation and with effects on the current account that will still lead the deficit to decrease compared with 1980. It will do so however via crowding out of private investment; a 35% M2 rule without additional fiscal stimulus will have higher private investment, but 2% less real growth (5% instead of 7%). Finally, 7% additional government expenditure financed via increases in the money supply on top of the 35% increase (leading to a 39% increase over '81) will lead to a growth rate of 8.3%, about half the inflation rate recorded during 1980 (21% instead of 45%) and a current account deficit that is still large compared with '76/77/78 norms (3.9 billion US$ or 5% of GNP) but nevertheless one that represents a substantial improvement over 1980.

7.3.2 Changes in interest rates

There is probably hardly any sector in the economy where more conditions necessary for the optimality of free competition are violated than in the banking sector. One should therefore be careful before advising Korea to deregulate its banking system; even the U.S. is characterized by a heavily
regulated financial sector. Accordingly, we will analyze changes in interest rates within the confines of the current financial system and within current techniques of monetary policy. The conclusion depends critically on this.

Bank lending rates do not play an allocative role (although lending rate differentials may) as lending rates are way below market clearing levels and have been so for decades. Their main impact is on the cash flow of those firms which manage to get loans; changes in rates mainly change the scarcity premium those firms receive. Due to the current precarious financial condition of most Korean firms (because of their high leverage a slow-down in growth hits them especially hard), this is hardly the time for drastic increases in lending rates.

From a macro-economic point of view, time deposit rates are a more interesting problem. There is a widespread notion that higher real time deposit rates lead to higher savings rates. Nevertheless neither theoretical arguments nor empirical evidence is conclusive on this point. From a theoretical point of view, the impact of real rates on saving is unclear because income and substitution effects work in opposite directions. The claim that higher real rates lead to higher savings presupposes that substitution effects dominate.

There exists no empirical evidence involving real time deposit rates that supports either point of view. Time deposit rates consistently end up insignificant coefficients in econometric savings equations.

There are however other ways in which time deposit rates influence economic activity. The details are set out in van Wijnbergen [7], but the argument runs as follows. Higher time deposit rates, whatever their effects on savings, lead to a portfolio shift out of other assets into time deposits, and therefore channel more funds into the banking system. If there are no
binding credit ceilings (which prevent passing through of additional funds to firms via banks), this will help economic activity if the shift is out of an unproductive asset such as cash, and will hurt economic activity if the shift is out of an asset that provides more intermediation than banks (such as the curb market, because of the absence of reserve requirements). Under the current system of monetary policy in Korea the issue becomes simple, because binding credit ceilings have been used since the switch to money growth rules in early 1979. This implies that higher time deposit rates may lead to a shift into time deposits and thus to more funds for banks, but that banks will not be able to translate that into more loans, because of the credit ceilings imposed. The net result will just be an increase in bank reserves. If in this case the shift is out of a productive asset, the result may be severely contractionary, as banks cannot fulfill their intermediation role with credit ceilings in place. Econometric evidence (presented in Appendix A) shows that this is the case in Korea. Substitution is mainly between the curb market and time deposits, not between cash and time deposits; as the curb market presents 100% intermediation (no reserve requirements), a switch out of the curb market into a banking system that is prevented from playing its intermediary role on the margin, will have severely contractionary effects.

These theoretical arguments are borne out by our model. A replay of the 25% M2 rule, without additional government expenditure but with drastically increased time deposit rates (with 10% to 30% throughout 1981) has dramatic results. The increase causes a large shift into time deposits out of the curb market. Banks cannot pass the funds on to firms because of the credit ceiling; UMM rates go through the roof and go on rising throughout the year, until they settle down in the 4th quarter. This leads to a slowdown in investment, which falls to 9% of GNP in the 4th quarter to arrive at a year-
round total of 12% of GNP (see Table 13E), more than 4% less than the 25% M2 growth rule with unchanged time deposit rates. The net impact on growth is very pronounced: this scenario leads to 4.5% less growth than the 25% M2 rule (i.e. a 0.5% fall in real GNP). It should perhaps be stressed that these dramatic results are crucially dependent on the assumption that the large increase in time deposit rates is effected while adhering to the 25% M2 rule. After all, what one does in this case is to restrict the money supply while at the same time making it considerably more attractive to hold money. The net result is a disaster. The lesson is that tight money should go together with high rates of return on alternative assets, not with a high rate of return on the main component of money itself.

7.3.3 Agricultural price reform

I. Introduction

All the preceding runs are based on the assumption of constant nominal food prices in the first three quarters of 1981, and an average increase of 15% in the 4th quarter, which is the schedule the GMF 1/ has in mind for the price of rice. (Rice amounts to somewhat less than half of all expenditure on food.) This may no be overly optimistic if the '81 harvest is "normal," say equal to the '79 results. 2/ Nevertheless, this would leave food prices considerably above world levels; late '79/early '80 agricultural prices were estimated to be two (consumer prices) to three (producer prices) times as high as the corresponding agricultural world prices. The macro-economic consequences of this high-price-of-food policy have been spelled out at various places in our report. A brief recapitulation may be in order.

1/ Grain Management Fund.

2/ This is the assumption made throughout this chapter.
before we present simulation results. Lowering food prices will lead to lower wage claims, which in turn will slow down or reverse erosion of export competitiveness due to real wage pressure. 

Over time, this should help real exports, although a two-quarter delay between wages and export prices and a further quarter delay between export prices and real exports make it unlikely that anything substantial will happen in this respect before about a year has gone by. On the other hand, lowering the real price of food transfers income from high-saving farmers to low-saving urban food consumers, which will immediately lower private saving given everything else; therefore the current account deficit will deteriorate.

Clearly inflation is likely to slow down considerably. First of all, the price of food has a direct influence on the price level (CPI weight of food and beverages: 0.458; WPI weight of agricultural and marine food: 0.17). Second, a lower price of food will lower wage claims and via that route slow down price increases even further.

Given the same path for nominal money growth, this will result in a higher real money stock, in effect a relaxation of monetary control. The resulting lower real cost of credit will slow down inflation even further, and lead to an increase in investment expenditure. All this of course adds up to higher real growth.

The long-run macro-consequences are also substantial. In Appendix B.3 we present some calculations, on how much additional capital stock would be needed in the manufacturing sector to offset the negative impact of a high real price of food (via wage indexation) on external competitiveness. 

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1/ For more details see Appendix B.2 and the introduction, and Chapter 8 of this report.

2/ The model presented there is a 2-goods model, with wages indexed on a weighted average of their two prices, say the price of food and the price of manufactured goods.
results are quite dramatic. Using plausible parameter values, we show that a 10% reduction in the real price of food will lead to a reduction in labor costs (via lower real wages in terms of non-food items) comparable with the reduction that can be brought about by a 9% increase in the capital stock used. This represents roughly three quarters of investment, that would be made superfluous by such a reduction (or, for that matter, undertaken anyhow, with an improvement in competitiveness as a result).

On top of all this come other advantages, like the real income gain to be obtained from a reallocation of resources in line with the dictates of comparative advantage; more on this in the next section.

All this adds up to a strong case for agricultural liberalization. What it does not add up to is a case for liberalization "overnight." Clearly, cutting the producer price of rice by 60%, or even spreading it out over a year (as we will do in the simulation to be presented below), would deal a severe blow to the rice-farming population as it would not allow them enough time to switch to other crops. Good political and humanitarian reasons argue against such a policy. Nevertheless, it is useful to know the macro-economic costs involved in pursuing these basically non-economic goals. It is in this vein that we present the macro-simulations of the consequences of going to world prices of food during 1981.

I. Simulation results

The basic results are summarized in Table 12 and Table 13F. We started from out scenario III assumptions (35% M2 growth, plus an additional fiscal stimulus of 7% over the currently projected level of government expenditure), and added to that a gradual decline of food prices to world levels. The gradual decline involves a smaller overall cut than an
instantaneous reduction would imply, as world food prices are assumed to evolve at the projected world rate of inflation of somewhat less than 9%. The reduction comes down to somewhat over 25% \(^1\)/ for consumer prices and nearly 50% for producer prices.

The results (see Table 13F) should be compared with those obtained under scenario III (Table 13C) which has the same values for policy variables with the exception of food prices. The most dramatic outcome is on inflation (WPI), which drops to 10%, a 12-percentage point reduction from the 22% predicted under scenario III. Eight percentage points are due to direct effects (WPI weight of food is 0.17, so a 50% reduction in food prices will by sheer mechanical accounting knock off 8 percentage points of the WPI rate), an additional 4 percentage point reduction is obtained via reduced wage pressure, etc. Given nominal money targets, the real money stock therefore comes out 12% higher than under scenario III, with the predictable positive impact on investment: this ends up 3% higher than in 1980 in real terms, rather than the more than 8% real fall obtained under scenario III.

Private saving, instead of matching the increase in investment, actually goes down because of the transfer from high savers to low savers implied in the reduction of food prices. The net effect of all this, is of course a deterioration in the current account, to a substantial extent in fact: the deficit increases from 3 billion US$ under scenario III to 4.2 billion US$. The increased investment and consumer expenditure of course does stimulate aggregate demand, which, in view of the considerable slack in the Korean economy, leads to further growth: more than 3 percentage points are added to the 7.1 real growth rate of scenario III to arrive at a 10.3 growth rate for real GNP.

\(^1\)/ Measured, as everywhere else in this report, as log-differences.
The fifth 5-year plan, which would have been the appropriate framework for discussion of issues, has become outdated because of the unanticipated upheavals of the last few years. The result is that there are no hard projections to discuss. What we will do instead is discuss in general terms some of the long-run issues Korea has to come to grips with over the next few years.

Fortunately enough, the Korean authorities remain firmly committed to an export-led growth strategy. However, one sector that has never been included in that strategy is agriculture. Although the claim of one high Korean official, that their agricultural sector basically is an extended welfare system, seems a bit strong, it is clearly the case that the desire for self-sufficiency in rice has led to an increasingly inefficient agricultural sector with relative prices far out of line with world prices. The long-run costs of this strategy are not related to efficiency losses in agriculture only. A high real price of food leads to upward pressure on real wages in terms of other goods, given wage indexation on the CPI.\(^1\) Producers of those other goods (exporters among others) either have to accept a cutback in profits, a loss in competitiveness or a cutback in production to realign the real product wage and the marginal productivity of labor. It is via this channel that a high real price of food threatens Korea's competitiveness in export markets. Of course going to world prices of rice overnight is not a sensible reaction; this would not allow enough time for rice farmers to

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\(^1\) In formulas: Say \( \hat{\text{CPI}} = \alpha \hat{\text{Pfood}} + (1-\alpha) \hat{\text{Pothers}} \) and \( \hat{\text{W}} = \hat{\text{CPI}} \) (wage indexation). Then \( \hat{\text{W}} - \hat{\text{Pothers}} = \hat{\text{CPI}} - \hat{\text{Pothers}} = \alpha (\hat{\text{Pfood}} - \hat{\text{Pothers}}) \), or the real product wage in terms of "others" is directly proportional the real price of food in terms of "others."
adjust. A gradual, preannounced reduction of the real price of food (by leaving the nominal price constant, for example), should allow farmers to switch crops. This does not have to lead to declines in farm income: switching to crops more in line with comparative advantage may well in fact increase agricultural income. Further, if crops are chosen that lead to possible "upstream" agriculture-based rural industrial development, farmers may end up doing quite well as they have been doing in Taiwan, which has opted for this strategy. If such a strategy is chosen (a Taiwan style agriculture focusing on vegetables, etc., plus rural food processing industries), the existence of rural roads linking city and country side becomes crucially important. If the fiscal stimulus package advocated in the previous section is opted for, investment in rural infrastructure would therefore be a good candidate: in that way short-run policy and long-run adjustment would go together.

The determination to stick with the export-led growth model creates other challenges. The emergence of other "cheap labor" countries like China may imply that Korea will have to shift its production structure because of its own rising relative labor costs. Its comparative advantage is shifting away from the low-grade textiles, etc., that were once the backbone of its export earnings. Korea sees this issue as the main structural adjustment problem ahead. The authorities have opted strongly for a move into heavy machinery and chemicals. It is quite possible that they are right in this. However, serious studies looking at expected future market developments on the one hand and Korean factor supplies (different labor categories among others) on the other do not seem to have been made in Korea to back this decision up. Outside experts (Bela Balassa in particular) have questioned the wisdom of moving into chemicals in view of its energy intensiveness and have
suggested upgrading of textiles, etc., as possible alternatives. The skilled labor shortages of 1978 may also point to an issue such a study should look at.

A further issue that arises when Korea decides to move into more capital-intensive industries is caused by the increase in the capital/output ratio that such a shift would bring about. As the Harrod-Domar consistency conditions tell us, such an increase leads to lower medium-term growth unless saving rates go up. There may be a conflict here between Korea's plan to gradually rely less on foreign savings (reduce the current account deficit) over the next 5 years and the envisaged shift into more capital-intensive industries. The way out is of course to increase the domestic savings rate. Current taxation measures (taxation of interest income and capital gains for example, a late 1980 development) are going in the wrong direction. Further savings incentives might be given via the financial system, for example in the way Germany makes mortgages available on lower terms if certain savings targets are met. This discussion naturally leads to the question of further financial liberalization, and long-run interest rate policies. This is a subject of a separate IBRD study, so we will not touch on this issue.

Partly with the issue of mobilizing foreign savings and partly with financial reform in mind, Korea has taken several measures to promote direct investment from abroad. This should be encouraged. Further options in this area are promotion of portfolio investment from abroad by establishing some sort of a mutual fund holding shares of different Korean companies; the shares of this mutual fund could then be traded on foreign capital markets. Establishment of such a fund would lead to smaller information collection problems than listing of individual firms would, and would provide a boost to the still fledgling Korean stock market. This has not gotten off the ground,
possibly because a domestic stock market may be too small to allow for properly diversified portfolios. Chances that Korean returns are closely related to say the market return on the New York Stock Exchange seem remote (of course, this can be made quantitative by computing the appropriate $\beta$ from the Markowitz portfolio allocation model), so that diversification would not be a problem for foreigners.

A final issue that is related to financial liberalization is the technique of monetary and exchange rate management the Koreans have opted for since early 1979.

In a relatively underdeveloped financial system, without large open markets in government debt, the current type of M2 growth rules has to rely on credit ceilings and capital controls, both of which are in conflict with financial liberalization. An alternative system of monetary and exchange rate management is discussed in Appendix B.

REFERENCES (Chapter 8)


PART III

TABLES AND DIAGRAMS
## TABLE 1A

DEVELOPMENT OF GNP COMPONENTS (75 prices)

<table>
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<td>1251.57**</td>
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<td>103.31</td>
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<td>Increases in stocks</td>
<td>337.85</td>
<td>193.89</td>
<td>164.57</td>
<td>94.33</td>
<td>511.23</td>
<td>-234.70</td>
<td>-143.54</td>
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<td>Export of Goods &amp; Serv.</td>
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<td>3931.53</td>
<td>4941.88</td>
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<td>5596.20</td>
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<td>11275.51</td>
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<td>4468.91</td>
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### TABLE 1B

DEVELOPMENT OF GNP COMPONENTS (75 prices): Fraction of GNP  
(Perc. increase over last year)

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<td>66.8</td>
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<td>63.8</td>
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<td>(6.5)</td>
<td>(10.3)</td>
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* Rate of changes with respect to corresponding quarter last year.
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<td>260.10</td>
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\[1/\text{Social overhead capital includes construction.}\]
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<th>Construction</th>
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<th>Other</th>
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<th>Non-agriculture GNP</th>
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**TABLE 1D**

INDUSTRIAL ORIGIN OF GNP: Composition (perc. change) 75 prices
### TABLE 2A

**COMPOSITION OF INVESTMENT**

(75 prices)

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* Includes PC and GC
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<td>100</td>
<td>100</td>
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<td>(11.6)</td>
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<td>(1.8)</td>
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<td>14.3</td>
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<td>12.0</td>
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<td>12.9</td>
<td>18.2</td>
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<td>(18.3)</td>
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* Includes PC and GC

** Percentage change with respect to same quarters last year.
TABLE 3A

Savings, Investment and Current Account Current Prices
(billion Won)

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<td>817.9</td>
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<td>V. Government Investment</td>
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<td>657.2</td>
<td>1044.3</td>
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<td>VI. Net Government Savings</td>
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<td>160.7</td>
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<td>VII. CA Surplus (III + IV + statistical discrepancies)</td>
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<td>VIII. Government deficit CA deficit</td>
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<td>IX. CA deficit GNP</td>
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<td>2.4%</td>
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<td>X. Government Investment Government Spending</td>
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<td>32.0%</td>
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<td>XI. Investment Financed by Foreign Sources</td>
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<td>9.5%</td>
<td>2.2%</td>
<td>10.6%</td>
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### TABLE 4A

**BALANCE SHEETS: BOK**

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<tr>
<td>- Net foreign assets</td>
<td>179.7</td>
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### TABLE 4C

**BALANCE SHEET OF THE CONSOLIDATED BANKING SYSTEM (MONETARY SURVEY)**

(In billions of Won)

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Source: Data provided by the Korean authorities.

1/ Provisional
### Table 5

**Unemployment Seasonally Adjusted**

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1/ Equals food and live animals, beverages and tobacco.
2/ Equals mineral fuels, lubricants and related materials.
3/ Equals crude materials, inedible, except fuels, animal and vegetable oils and fats, and manufactured goods classified by materials.

Source: M.E.S.K.
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**TABLE 6C**

KOREAN EXPORTS: LEVELS  
( in thousand U.S. Dollars)

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### TABLE 6E

RATE OF GROWTH OF SEASONALLY ADJUSTED REAL EXPORTS

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<td>Quarter</td>
<td>M2 (% change)</td>
<td>WPIK (% change)</td>
<td>M2/WPIK</td>
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<td>-----------------</td>
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<td>Q4</td>
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<td>Q1</td>
<td>19.7</td>
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</tr>
<tr>
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<td>Q4</td>
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<td>51.0</td>
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## Table 8

**Inflation Breakdown 79-I/80-IV**

### Wholesale Prices

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<th>80-III</th>
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<tr>
<td><strong>II. Predicted Values</strong></td>
<td>17.3</td>
<td>62.9</td>
<td>51.7</td>
<td>13.2</td>
<td>47.5</td>
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<td><strong>III. Fraction of II due to changes in the dollar price of intermediate imports</strong></td>
<td>76.3</td>
<td>102.9</td>
<td>988</td>
<td>507</td>
<td>1,114</td>
<td>.273</td>
<td>.444</td>
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<tr>
<td><strong>IV. Fraction of II due to changes in dollar price of other world prices</strong></td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td><strong>V. Fraction of II due to exchange rate changes (Won/dollar rate)</strong></td>
<td>0.0</td>
<td>.194</td>
<td>.424</td>
<td>.061</td>
<td>.255</td>
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<tr>
<td><strong>VI. Fraction of II due to other domestic factors</strong></td>
<td>23.7</td>
<td>-2.9</td>
<td>.418</td>
<td>.069</td>
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<td>.253</td>
<td>.228</td>
<td>.705</td>
<td>.566</td>
<td>.417</td>
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<tr>
<td><strong>VI.B Fraction of II due to other domestic factors (demand pressure)</strong></td>
<td>0.165</td>
<td>-.159</td>
<td>-.88</td>
<td>-.194</td>
<td>-.135</td>
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### Consumer Prices

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<td><strong>II. Predicted Values</strong></td>
<td>13.2</td>
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<td>38.7</td>
<td>14.7</td>
<td>42.6</td>
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<td><strong>III. Fraction of II due to changes in the dollar price of intermediate imports</strong></td>
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<td>.426</td>
<td>.626</td>
<td>.249</td>
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<td><strong>IV. Fraction of II due to changes in dollar price of other world prices</strong></td>
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<td>9.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td><strong>V. Fraction of II due to exchange rate changes (Won/dollar)</strong></td>
<td>0.0</td>
<td>.124</td>
<td>.318</td>
<td>.068</td>
<td>.146</td>
<td>.171</td>
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<td><strong>VI. Fraction of II due to domestic factors</strong></td>
<td>.234</td>
<td>.601</td>
<td>.256</td>
<td>.306</td>
<td>.605</td>
<td>.514</td>
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<td><strong>VI.A Fraction of II due to changes in agricultural prices</strong></td>
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<td>.370</td>
<td>.789</td>
<td>.739</td>
<td>.606</td>
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<td><strong>VI.B Fraction of II due to other domestic factors (demand pressure)</strong></td>
<td>.103</td>
<td>-.114</td>
<td>-.483</td>
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### Export Prices

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<th>33.1</th>
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<tr>
<td><strong>III. Fraction of II due to changes in the dollar price of intermediate imports</strong></td>
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<td>0.089</td>
<td>.223</td>
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<td><strong>IV. Fraction of II due to changes in dollar price of other world prices</strong></td>
<td>.116</td>
<td>.105</td>
<td>.421</td>
<td>.484</td>
<td>.129</td>
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<td><strong>V. Fraction of II due to exchange rate changes (Won/dollar)</strong></td>
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<td>.376</td>
<td>.431</td>
<td>.443</td>
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<td>38.2</td>
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<td>-.028</td>
<td>-.124</td>
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<td>-.242</td>
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Table 9: Increases in the Transfer to OPEC

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<td>1. Actual oil imports (billion US dollars)</td>
<td>2.453</td>
<td>3.7787</td>
<td>(5.850)$^1/$</td>
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<td>2. &quot;Normal&quot; pre-price change oil imports$^2/$</td>
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<td>3. Rate of change in the nominal price of oil (fraction of previous years' price)</td>
<td>.325</td>
<td>.60</td>
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<td>4. Rate of change in dollar price of world manufactured goods (fraction of previous years' price)</td>
<td>.145</td>
<td>.13</td>
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<td>5. Rate of change of real price of oil (3-4)</td>
<td>.18</td>
<td>.37</td>
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<td>6. Additional transfer to OPEC (billion US dollars) (5x2)</td>
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$^1/$ Preliminary estimate  
$^2/$ See text for definition
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<th></th>
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<td>1. Current account deficit (billion US dollars)</td>
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<td>2. Outstanding debt (billion US dollars)(^1/)</td>
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<td>10.1</td>
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<td>3. Rate of change dollar price world manufactured goods (as a fraction of previous years' price)</td>
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<td>.145</td>
<td>.135</td>
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<td>4. CA adjustment (2 x 3) (billion US dollars)</td>
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<td>5. Adjusted CA deficit (- indicates a surplus)</td>
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<td>6. Deterioration of adjusted CA deficit</td>
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<td>7. Increase in transfer to OPEC (from Table 9)</td>
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<td>2.0</td>
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\(^1/\) Source: Answers to IMF Questionnaire 1980
### 1981: Fiscal and Monetary Policy Choices and Their Consequences

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<th>G (in b.Won)</th>
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<th>GNPKRSA-1/</th>
<th>GNPKN</th>
<th>IGPRR</th>
<th>CAW (b.Won)</th>
<th>CAD (b.US$)</th>
<th>WPI</th>
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<td>25</td>
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<td>M2 = 25%</td>
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<td>target (35%)</td>
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<tr>
<td>i.e., more credit to gov. less to the private sector</td>
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<tr>
<td>(i.e. no crowding out via availability of credit)</td>
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<td>25</td>
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<td>40,539.6</td>
<td>53.7</td>
<td>314</td>
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<td>like I plus 30%</td>
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<td>time deposit rate throughout 1981</td>
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<td><strong>Scenario VI</strong></td>
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<td>35</td>
<td>110.3</td>
<td>40,584.9</td>
<td>102.9</td>
<td>-2955</td>
<td>-4.2</td>
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<td>like scenario III</td>
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<tr>
<td>(add gov. spending M2 - 35%, crowding out of private inv.)</td>
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<tr>
<td><strong>Food prices gradually towards world levels over 1981</strong></td>
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</tr>
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1/ Sum over 4 quarters of seasonally adjusted real GNP, 1980 = 100

2/ Private real fixed capital formation, 1980 = 100
TABLE 13A

M2 25% IMF G EXPENDITURE PATTERN

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
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<th>Q3</th>
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<td><strong>Government</strong></td>
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</tr>
<tr>
<td>Revenues</td>
<td>2046.8</td>
<td>2285.45</td>
<td>2128.7</td>
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<td>8772.4</td>
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<tr>
<td>Expenditure</td>
<td>2679.3</td>
<td>2330.8</td>
<td>2117.0</td>
<td>2415.0</td>
<td>9542.1</td>
</tr>
<tr>
<td>Saving (budget surplus)</td>
<td>-632.5</td>
<td>-45.4</td>
<td>11.7</td>
<td>-103.6</td>
<td>-769.7</td>
</tr>
<tr>
<td>Percentage of GNP</td>
<td>-0.09</td>
<td>-0.005</td>
<td>0.001</td>
<td>-0.01</td>
<td>-0.02</td>
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<tr>
<td><strong>Private Sector</strong></td>
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<tr>
<td>+ Private Saving</td>
<td>568.4</td>
<td>1557.7</td>
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<td>- Private Investment</td>
<td>1107.2</td>
<td>1693.3</td>
<td>1946.7</td>
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<td>6.7</td>
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<td>22.9</td>
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<tr>
<td>Idem perc. of GNP</td>
<td>.15</td>
<td>.18</td>
<td>.21</td>
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<tr>
<td>C.A. Surplus (Won)</td>
<td>-1171.3</td>
<td>-181.0</td>
<td>-166.8</td>
<td>-60.9</td>
<td>-1580.0</td>
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<td>C.A. Surplus (Dollar)</td>
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<td>-.26</td>
<td>-.24</td>
<td>-.004</td>
<td>-2.204</td>
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<td>C.A. as a perc. of GNP</td>
<td>- .16</td>
<td>-.02</td>
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<td>GNPKN</td>
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<td>GNPKRSA</td>
<td>35.2</td>
<td>35.9</td>
<td>36.4</td>
<td>33.9</td>
<td>141.4</td>
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## TABLE 13B

### M2 35% IMF G EXPENDITURE PATTERN

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<th>Q1</th>
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<th>Q3</th>
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<th>1981</th>
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<td><strong>Government</strong></td>
<td></td>
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<tr>
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<td>2046.7</td>
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<td>2150.3</td>
<td>2324.4</td>
<td>8806.9</td>
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<td>2679.3</td>
<td>2330.8</td>
<td>2117.0</td>
<td>2415.0</td>
<td>9542.1</td>
</tr>
<tr>
<td>Saving (budget Surplus)</td>
<td>-632.6</td>
<td>-45.3</td>
<td>33.3</td>
<td>-90.6</td>
<td>-735.2</td>
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<td>Perc. of GNP</td>
<td>-0.09</td>
<td>-0.005</td>
<td>0.003</td>
<td>-0.008</td>
<td>-0.02</td>
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<td><strong>Private Sector</strong></td>
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<tr>
<td>+ Private Saving</td>
<td>563.8</td>
<td>1578.7</td>
<td>1733.7</td>
<td>2017.0</td>
<td>5893.3</td>
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<td>- Private investment</td>
<td>1104.9</td>
<td>1783.3</td>
<td>1980.1</td>
<td>2558.7</td>
<td>7427.0</td>
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<tr>
<td>Idem in real terms</td>
<td>4.2</td>
<td>6.5</td>
<td>6.9</td>
<td>8.4</td>
<td>26.0</td>
</tr>
<tr>
<td>Idem perc. of GNP</td>
<td>0.15</td>
<td>0.19</td>
<td>0.21</td>
<td>0.17</td>
<td>0.18</td>
</tr>
<tr>
<td>C.A. Surplus (b. Won)</td>
<td>-1173.7</td>
<td>-249.9</td>
<td>-213.0</td>
<td>-632.3</td>
<td>-2268.9</td>
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<tr>
<td>C.A. Surplus (b. US$)</td>
<td>-1.7</td>
<td>-0.37</td>
<td>-0.30</td>
<td>-0.88</td>
<td>-3.25</td>
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<td>C.A. as perc. of GNP</td>
<td>-0.16</td>
<td>-0.03</td>
<td>-0.02</td>
<td>-0.04</td>
<td>-0.05</td>
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<td>GNPKN</td>
<td>7319.2</td>
<td>9245.3</td>
<td>9383.2</td>
<td>14938.2</td>
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<td>GNPKRSA</td>
<td>35.3</td>
<td>36.2</td>
<td>36.7</td>
<td>35.2</td>
<td>143.4</td>
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</table>
TABLE 13C

M2 35% IMF G EXPENDITURE PATTERN PLUS 173 b.WON/QUARTER,
FINANCED BY CUTTING BACK CREDIT TO THE PRIVATE SECTOR, GIVEN M2

<table>
<thead>
<tr>
<th></th>
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<th>Q3</th>
<th>Q4</th>
<th>1981</th>
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<td><strong>Government</strong></td>
<td></td>
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<tr>
<td>+ Revenues</td>
<td>2046.8</td>
<td>2311.6</td>
<td>2167.3</td>
<td>2322.4</td>
<td>8848.1</td>
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<tr>
<td>- Expenditure</td>
<td>2852.3</td>
<td>2503.8</td>
<td>2290.0</td>
<td>2588.0</td>
<td>10234.1</td>
</tr>
<tr>
<td>Saving (budget surplus)</td>
<td>-805.5</td>
<td>-192.2</td>
<td>-122.7</td>
<td>-265.6</td>
<td>-1386.0</td>
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<tr>
<td>Perc. of GNP</td>
<td>-.11</td>
<td>-.02</td>
<td>-.01</td>
<td>- .02</td>
<td>-.03</td>
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<tr>
<td><strong>Private Sector</strong></td>
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<tr>
<td>+ Private Saving</td>
<td>690.8</td>
<td>1232.5</td>
<td>1742.2</td>
<td>2044.6</td>
<td>6094.5</td>
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<td>- Private investment</td>
<td>1105.2</td>
<td>1643.2</td>
<td>1758.3</td>
<td>2284.8</td>
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<td>Idem in real terms</td>
<td>4.2</td>
<td>5.9</td>
<td>6.1</td>
<td>7.5</td>
<td>23.7</td>
</tr>
<tr>
<td>Idem as perc. of GNP</td>
<td>.15</td>
<td>.17</td>
<td>.18</td>
<td>.15</td>
<td>.16</td>
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<tr>
<td>C.A. Surplus (b.Won)</td>
<td>-1219.9</td>
<td>-218.5</td>
<td>-138.8</td>
<td>-505.8</td>
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<td>C.A. Surplus (b.dollars)</td>
<td>-1.8</td>
<td>-.32</td>
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<td>-3.03</td>
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<td>C.A. as perc. of GNP</td>
<td>-.16</td>
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<td>-.01</td>
<td>-.03</td>
<td>-.05</td>
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<tr>
<td>GNPKN</td>
<td>7552.7</td>
<td>9426.5</td>
<td>9508.6</td>
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<td>41550.2</td>
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<td>36.9</td>
<td>37.2</td>
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TABLE 13D

M2 39%, IMF G EXPENDITURE PATTERN PLUS 173 b.WON/QUARTER
FINANCED VIA INCREASES IN M2 GIVEN CREDIT TO THE PRIVATE SECTOR

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<tr>
<td>+ Revenues</td>
<td>2046.7</td>
<td>2311.9</td>
<td>2214.1</td>
<td>2396.9</td>
<td>8969.6</td>
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<tr>
<td>- Expenditure</td>
<td>2852.3</td>
<td>2503.8</td>
<td>2290.0</td>
<td>2588.0</td>
<td>10234.1</td>
</tr>
<tr>
<td>Saving (budgt surplus)</td>
<td>-805.6</td>
<td>-191.9</td>
<td>-75.9</td>
<td>-191.1</td>
<td>-1264.5</td>
</tr>
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<td>Perc. of GNP</td>
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<td>-.02</td>
<td>-.007</td>
<td>-.01</td>
<td>-.03</td>
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<td><strong>Private Sector</strong></td>
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<tr>
<td>+ Private Saving</td>
<td>679.8</td>
<td>1656.8</td>
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<td>2044.8</td>
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<td>1100.1</td>
<td>1836.7</td>
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<td>7.1</td>
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<td>26.6</td>
</tr>
<tr>
<td>Idem perc. of GNP</td>
<td>.15</td>
<td>.19</td>
<td>.21</td>
<td>.17</td>
<td>.18</td>
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<tr>
<td>C.A. Surplus (b. Won)</td>
<td>-1225.9</td>
<td>-371.8</td>
<td>-349.0</td>
<td>-757.0</td>
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<td>C.A. Surplus (b.US$)</td>
<td>-.18</td>
<td>-.54</td>
<td>-.50</td>
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<td>C.A. as a perc. of GNP</td>
<td>-.15</td>
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<td>-.04</td>
<td>-.05</td>
<td>-.06</td>
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<td>9665.2</td>
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<td>GNPKRSA</td>
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<td>37.4</td>
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### TABLE 13E

M2 25% IMF G EXPENDITURE PATTERN, 30% TIME DEPOSIT RATE

THROUGHOUT 1981

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<td><strong>Government</strong></td>
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</tr>
<tr>
<td>Revenues</td>
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<td>8433.6</td>
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<td>2330.8</td>
<td>2117.0</td>
<td>2415.0</td>
<td>9542.1</td>
</tr>
<tr>
<td>Saving (budget surplus)</td>
<td>-632.6</td>
<td>-39.6</td>
<td>-131.9</td>
<td>-304.4</td>
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</tr>
<tr>
<td>Perc. of GNP</td>
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<td>-.005</td>
<td>-.01</td>
<td>-.02</td>
<td>-.03</td>
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<td><strong>Private Sector</strong></td>
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<tr>
<td>+ Private Saving</td>
<td>650.3</td>
<td>1566.5</td>
<td>1939.4</td>
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<td>4.3</td>
<td>3.8</td>
<td>16.2</td>
</tr>
<tr>
<td>Idem perc. of GNP</td>
<td>.15</td>
<td>.12</td>
<td>.14</td>
<td>.09</td>
<td>.12</td>
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<tr>
<td>C.A. Surplus (b.Won)</td>
<td>-1143.0</td>
<td>378.7</td>
<td>506.3</td>
<td>571.5</td>
<td>313.5</td>
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<td>C.A. (b.US)</td>
<td>- 1.7</td>
<td>.55</td>
<td>.72</td>
<td>.80</td>
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<td>C.A. as a perc. of GNP</td>
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<td>.05</td>
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<td>.008</td>
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<td>9293.9</td>
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<td>135.5</td>
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TABLE 13F

M2 35% IMF G EXPENDITURE PLUS 173 $WON/QUARTER, FINANCED BY
CUTTING BACK CREDIT TO THE PRIVATE SECTOR GIVEN M2, AGRICULTURAL PRICES
GRADUALLY TO WORLD PRICES OVER 1981

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<th>1981</th>
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<td><strong>Government</strong></td>
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</tr>
<tr>
<td>+ Revenues</td>
<td>2046.8</td>
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<td>8793.6</td>
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<td>2503.8</td>
<td>2290.0</td>
<td>2588.0</td>
<td>10234.1</td>
</tr>
<tr>
<td>Saving (budget surplus)</td>
<td>-805.5</td>
<td>-222.7</td>
<td>-141.7</td>
<td>-270.6</td>
<td>-1440.5</td>
</tr>
<tr>
<td>Perc. of GNP</td>
<td>-.11</td>
<td>-.02</td>
<td>-.01</td>
<td>-.02</td>
<td>-.03</td>
</tr>
<tr>
<td><strong>Private Sector</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>+ Private saving</td>
<td>154.3</td>
<td>1685.3</td>
<td>1769.0</td>
<td>1368.1</td>
<td>5576.8</td>
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<tr>
<td>- Private investment</td>
<td>1086.9</td>
<td>1696.8</td>
<td>1892.8</td>
<td>2414.6</td>
<td>7091.1</td>
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<tr>
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<td>.21</td>
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<td>-265.5</td>
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<tr>
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<td>-.38</td>
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<td>Q3</td>
<td>Q4</td>
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<td>+ Private Saving</td>
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<td>6.6</td>
<td>7.5</td>
<td>7.2</td>
<td>25.4</td>
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<td>Idem perc. of GNP</td>
<td>.15</td>
<td>.19</td>
<td>.23</td>
<td>.14</td>
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<td>-193.6</td>
<td>-298.6</td>
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<td>GNPKRSA</td>
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<td>36.3</td>
<td>36.9</td>
<td>37.6</td>
<td>146.0</td>
</tr>
</tbody>
</table>
FIGURE 1

COMPETITIVENESS OF KOREAN EXPORTS
VELOCITY OF INVENTORIES IN MANUFACTURING
REAL CREDIT TO PRIVATE SECTOR

CLAIMS OF DEPOSIT MONEY BANKS ON PRIVATE SECTOR, DEFATED BY WPI
I Share of net credit to the government in the Monetary Base

II Share of credit to commercial banks in the Monetary Base

III Share of Net Foreign Assets in the Monetary Base
REAL PRODUCT WAGE (EXPORT)

Manufacturing wage deflated by export price
REAL CONSUMPTION WAGE

MANUFACTURING WAGE DEFLECTED BY CPI
WON-YEN EXCHANGE RATE

END OF PERIOD VALUES

REAL EXPORTS OF GOODS AND SERVICES

TOTAL EXPORTS DEFLATED BY UNIT VALUE INDEX OF EXPORTS

FIGURE 7
GROWTH OF REAL SEASONALLY ADJUSTED EXPORTS

ANNUALIZED PERCENTAGE CHANGES
REAL PRICE OF INTERMEDIATE IMPORTS
(IN TERMS OF GOODS FOR DOMESTIC AND EXPORT MARKETS RESP.)


WON PRICE OF INTER. IMPORTS OVER WPI AND WON PRICE OF KOR EXPORT

FIGURE 9
REAL PRICE OF OIL

Nominal price index of oil over price index of world manu. goods
INFLATION (WPI)

ANNUALIZED QUARTER TO QUARTER RATE OF CHANGE
The graph shows the real-time deposit rate from 1972 to 1980. The x-axis represents the years 1972 to 1980, quarterly. The y-axis represents the real-time deposit rate ranging from -0.4 to 0.3. The formula for the real-time deposit rate is \( \ln(1+RTD/100) - \ln(1+CPI/100) \).
INTEREST RATE DIFFERENTIAL BETWEEN UMM AND TD

$\ln(1+\text{UYM}/100) - \ln(1+\text{TD}/100)$
REAL UMM RATE

\[ \ln (1 + \text{RUMM}/100) - \ln (1 + \text{CPI}/100) \]
PART IV

APPENDICES
A. TECHNICAL APPENDIX

A.0 LIST OF VARIABLES FOR MODELS A.1 AND A.2

Hats indicate percentage changes. Percentage changes always refer to quarter-to-quarter log differences annualized via the formula

\[ \hat{x} = 100 \cdot \left( 1 + \ln[x] - \ln[x(-1)] \right)^4 - 1 \]

- CAD Current account surplus (billion US dollars)
- CAW Current account surplus (billion Won)
- CPKA Food and beverage component in CPI (1975 = 100)
- CPIK Consumer Price Index (all cities, 1975 = 100)
- CPKNA "Non-food & beverage" component in CPI (1975 = 100)
- CPKNR "Non-cereals" component in CPI (1975 = 100)
- CPKR Cereals component in CPI (1975 = 100)
- CPRN Private consumption expenditure (nominal, billion Won)
- CPRRCP Private consumption expenditure (real, deflated by consumer price index)
- DCAR Change in real food consumption compared with base level run
- DINV Increase in inventories (billion Won)
- E Total exports of goods and services in real terms (deflator unit value index of exports)
- e Exchange rate (Won per US dollar)
- GEXPN Central government expenditure (billion Won)
- GNPKN Nominal GNP (billion Won)
- GNPKRSA Seasonally adjusted real GNP
- GNPPOT Potential output
- IGPRR Real private fixed capital formation
- IGPRN Nominal private fixed capital formation
- LNGEXF Competitiveness of Korean exports \{\ln \left( \frac{PEX}{e \cdot WPFA} \right) \}
LSCBN Nominal (end of period) value of Deposit Money Bank Credit to the private sector (billion Won)

M1 Narrow money (currency in hand of the public plus demand deposits). End of period, billion Won.

M2 Broad money (M1 plus time, savings and foreign currency deposits). End of period, billion Won.

MCAPR Volume of capital goods imports

MINTR Volume of intermediate imports

MNWCAP Won value of capital goods imports (billion Won)

MNWINT Won value of intermediate imports (billion Won)

MNWOTH Won value of other imports (billion Won)

MNWTOT Won value of total imports (billion Won)

PMCAP* Price index of dollar price of capital goods imports (1975 = 100, contract prices)

PMAG* Price index of dollar price of food & beverages imports (1975 = 100, contract prices)

PMIW Won price of intermediate imports (1975 = 100)

PEX Won price of Korean exports (1975 = 100, derived from the unit value index)

PMINT* Price of intermediate imports (dollar-index, 1975 = 100, based on actual contract prices)

REX Interest rate on export loans charged by DMB’s (annual percentage rate)

RTD Actual interest rate on 6-month time deposits at DMB’s (annual percentage rate)

RUMM Interest rate on the curb market (annual percentage rate)

S1, S2, S3 Seasonal dummies

TAXR Central government revenues (billion Won)

TD Time, savings and foreign currency deposits at DMB’s (billion Won)

USA Seasonally adjusted unemployment rate (percentage of the labor force unemployed)

W Wage rate in the manufacturing sector (1975 = 100)
WPF* Trade-weighted geometric average of Japanese and US wholesale prices converted on a dollar basis (1975 weights, US 0.543, Japan 0.457)

WPIK Wholesale price index (1975 = 100)

WPKA Agricultural and marine foods component of WPIK (1975 = 100)

WPKNA Non-agricultural component of WPIK (1975 = 100)

WPKNR "Non-grains" component of wholesale price index (1975 = 100)

WPKR Grains component of wholesale price index (1975 = 100)

XA Value added in agriculture, forestry and fisheries (1975 prices)

XABL Value of XA in base-level run

YRF* Trade-weighted geometric average of US and Japanese real GNP (1975 weights, US 0.543, Japan 0.457)
A. TECHNICAL APPENDIX

A.1 LIST OF EQUATIONS OF THE MODEL WITHOUT EXPLICITLY MODELLED AGRICULTURAL SECTOR

Monetary instruments are direct credit limits and capital controls (SIMULTMCC).

LIST OF EQUATIONS 1/

I. Wage-Price Sector

(1) \[ WPKNR = -7.94299 + 7.79475 \times S1 + 10.5955 \times S2 + 0.542371 \times \]
\[ \ln(1 + \frac{\text{PMIW}}{100}) - 0.02 \times (1 + \frac{\text{WPKNR}(-1)}{100}) - 0.06 \]
\[ (1 + \frac{\text{WPKNR}(-2)}{100}) + 0.15 \times \text{PMIW} + 0.33 \times \text{PMIW}(-1) + \]
\[ 0.10 \times \text{PMIW}(-2) + 0.21 \times \hat{W}(-1) - 0.07 \times \hat{W}(-2) + \]
\[ 0.15 \times \hat{W}(-3). \]

(2) \[ WPIK = 0.0696 \times WPKR + (1 - 0.0696) \times WPKNR. \]

(3) \[ \ln(W) = -0.679332 - 0.0518397 \times S1 - 0.379257 \times (\ln(W(-1)) - \]
\[ \ln(CPIK(-1))) + 0.195215 \times (\ln(CPIK) - \ln(CPIK(-1))) + \]
\[ 1.14107 \times \ln(W(-1)) + 0.519798 \frac{1}{\text{USA}(-1)}. \]

(4) \[ CPIK(T) = 4.51575 + 0.641021 \times WPKNR + 0.11373 \times WPKNR(-1) \]
\[ + 0.26851 \times CPKR. \]

(5) \[ \text{PEX(T)} = -0.922845 + 0.362299 \times (e \times WPf\ast) - 0.348162 (1 + \text{subs rate}) + \]
\[ 0.208422 \times \hat{W}(-2) + 0.125197 \times \text{PMIW} + 3.63197 \times (1 + \frac{\text{rex}}{100}). \]

1/ Definitional equations linking levels and rates of change, etc., are omitted. A more detailed report on the model with the theoretical background and more on the econometrics (t-statistics, estimation method, etc.) is provided in part I of this Working Paper.
II. Financial Sector

(6) \[ \ln(M1/CPIK) = 0.03541 - 0.545709 \times \ln(1 + \frac{CPIK}{100}) + 0.06 \times \ln(\frac{GNPKN}{CPIK}) + 0.9477 \ln(CPIK(-1)) \cdot \]

(7) TD = M2 - M1.

(8) \[ \ln(1 + \frac{r_{um/100}}{100}) = [0.363306 + 0.0253294 \times S1 + 0.0184845 \times S2 + 0.00777241 \times S3 + 1.62652 \times \ln(1 + \frac{r_{TD/100}}{100}) - 0.377511 \times \]

\[ \ln(1 + \frac{CPIK}{100}) + 0.0199769 \ln(\frac{GNPKN}{CPIK}) + 0.928395 \times \ln(\frac{TD(-1)}{CPIK(-1)}) - \frac{TD}{\ln(CPIK)}] \cdot 0.886417. \]

(9) \[ dLSCBN = \frac{LSCBN}{WPIK} - \frac{LSCBN(-1)}{WPIK(-1)}. \]

III. The Real Sector

(10) \[ \ln(E) = -2.0717 - 0.252856 \times S1 + 0.0997165 \times S2 - 0.0633504 \times S3 - 0.426609 \times (\ln(\frac{pex}{ex \times wpf*})) + 0.166251 \ln(YRF*) + 0.928395 \ln(E(-1)) \cdot \]

(11) \[ \ln(MINTR) + 10.9347 + 0.63761 \times S1 + 0.466894 \times S2 + 0.517034 \times S3 + 1.35231 \times \ln(\frac{GNPKN + MNWINT}{WPIK}) - 0.845126 \times (\ln(\frac{PMINT* \times e}{ex})) - 0.213699 \times (\ln(\frac{PMINT \times e}{WPIK})) - 0.340169 \times (\ln(\frac{1 + r_{um/100}}{1 + WPIK/100})) - 0.118263 \times (\ln(\frac{1 + r_{ex/100}}{1 + \frac{ex}{ex/100}})). \]

(12) \[ \ln(MCAPR) = 6.65834 + 0.987687 \times S1 - 0.19877 \times S2 - 0.360873 \times S3 + 1.1608 \times \ln(IGPRR). \]

(13) \[ CAW = EXT - MNWINT - MNWCAP - MNWOTH. \]

(14) \[ CPRRCP = 0.766846 + 1.56526 \times S1 + 1.79979 \times S2 + 2.19915 \times S3 - \]

\[ 3.26479 \times \ln(\frac{1 + r_{um/100}}{1 + CPIK/100}) + 0.310462 \frac{GNPKN - TAXR}{CPIK} + 0.566526 \times CPRRCP(-1). \]
(15) \[ \text{TAXR} = -14.578 + 0.0549793 \times \text{GNPKN}(-1) + 0.0689948 \times \text{GNPKN}(-2) + 0.286911 \times \text{MNWTOT}(-1) \].

(16) \[ \text{IGPRR} = 2.47645 - 2.11178 \times S1 + 2.50271 \times S2 - 0.405772 \times S3 - 4.91832 \times \ln[\frac{1 + r_{\text{MM}}(-1)/100}{1 + WPIK(-1)/100}] + 0.762664 \times d\text{LSCBR}(-1) + 0.616734 \times \text{IGPRR}(-1) \].

(17) \[ \text{GNPKN} = \text{CPRN} + \text{IGPRN} + \text{DINV} + \text{GEXPN} + \text{CAW} \].

(18) \[ \text{GNPPOT} = -0.227105 + 0.0187254 \times \text{IGPRR}(-1) + 0.0377311 \times \text{IGPRR}(-2) + 1.03415 \times \text{GNPPOT}(-1) \].

(19) \[ \text{USA} = 1.09915 + 1.228 \left[ \frac{\text{GNPPOT}(-1) - \text{GNPKRSA}(-1)}{\text{GNPPOT}(-1)} \right] + 0.704461 \times \text{USA}(-1) \].

(20) \[ \text{GNPKRSA} = \frac{\text{GNPKN}}{\text{WPIK} \times \text{SA}} \].
A. TECHNICAL APPENDIX

A.2 LIST OF EQUATIONS OF THE VERSION WITH AGRICULTURAL SECTOR (SIMULTMAG) 1/

I. Wage Price System

1. WPNA = \(-12.7 + 8.0 \ S1 + 10.9 \ S2 + 0.48 (\ln(1 + \text{RUMM}/100)) - 0.02 (1 + \frac{\text{WPNA}(-1)}{100}) - 0.06 (1 + \frac{\text{WPNA}(-2)}{100}) + 0.19 \ \text{PMIW} + 0.33 \ \text{PMIW}(-1) + 0.10 \ \text{PMIW}(-2) + 0.26 \ \text{W} - 0.07 \ \text{W}(-1) + 0.15 \ \text{W}(-2)\)

2. \text{WPIK} = 0.1753 \ \text{WPA} + (1 - 0.1753) \ \text{WPNA}

3. \ln(\text{W}) = -0.68 - 0.055 \ S1 + 0.20 \ \text{CPIK} + 0.52 x \frac{1}{\text{USA}} + 1.14 \ \ln(\text{W}(-1))

4. \text{CPIK} = 0.542 x (12.1 + 0.92 \ \text{WPNA} + 0.07 \ \text{WPNA}(-1)) + (1 - 0.542) \ \text{CPKA}

5. \text{Pex} = -0.92 + 0.36 (e x \text{WPF}^*) - 0.35 (1 + \text{subs rate}) + 0.204822 \ \text{W}(-2) + 0.125197 \ \text{PMIW} + 3.63197 (1 + \text{REX}/100)

6. \ln(\text{QEXF}) = \ln(\text{PEX}) - \ln(e x \text{WPF}^*)

---

1/ Parameters are rounded off. A listing of the model with all the details is provided below. Definitional equations linking levels and rates of change in variables are omitted.
II. Financial Sector

7. $\ln(M_1/CPIK) = 0.085 - 0.06 S_1 - 0.03 S_2 + 0.02 S_3$
   \begin{align*}
   &- 0.40 \ln(1 + CPIK) + 0.02 \ln\left(\frac{GNPKN}{CPIK}\right) \\
   &+ 0.98 \ln(M_1(-1)/CPIK(-1))
   \end{align*}

8. $\ln\left(\frac{1 + RUMM}{100}\right) = [0.36 + 0.03 S_1 + 0.02 S_2 + 0.01 S_3$
   \begin{align*}
   &+ 1.63 \ln(1 + RTD/100) - 0.38 \ln(1 + CPIK) \\
   &+ 0.02 \ln\left(\frac{GNPKN}{CPIK}\right) + 0.93 \ln(TD(-1)/CPIK(-1)) \\
   &- \ln(TD/CPIK)\right)/0.89
   \end{align*}

9. $TD = M_2 - M_1$

10. $DLSCBR = \frac{LSCBN}{WPIK} - \frac{LSCBN(-1)}{WPIK(-1)}$

III. Real Sector

11. $\ln(E) = - 2.01 - 0.25 S_1 + 0.10 S_2 - 0.06 S_3$
    \begin{align*}
    &- 0.43 \left[\ln(PEX) - \ln(e \times WPF^*)\right] \\
    &+ 0.17 \ln(Y_f^*) + 0.93 \ln(E(-1))
    \end{align*}
12. $\ln(MINTR) = 10.9 + 0.64 S1 + 0.47 S2 + 0.52 S3$
   + 1.35 $\ln(\frac{GNPKN + MNWINT}{WPIK})$
   $- 0.85 [\ln(e \times PMINT^*) - \ln(PEX)]$
   $- 0.21 [\ln(e \times PMINT^*) - \ln(WPIK)]$
   $- 0.34 [\ln(1 + \frac{RUMM}{100}) - \ln(1 + \frac{WPIK}{100})]$
   $- [\ln(1 + \frac{REX}{100}) - \ln(1 + \frac{PEX}{100})]$

13. $\ln(MCAPR) = 6.65 + 0.99 S1 - 0.20 S2 - 0.36 S3 + 1.16 \ln(IGRR)$

14. $MNWOTH = [MNOTHREX + (DCAR - XA + XABL) \times P_{ag}] \times e$

15. $DCAR = 0.229 \times [\frac{(CPRN - 10.18 CPA - 4.55 CPNA)}{CPA} - \frac{(CPRN - 10.18 CPA - 4.55 ePNA)}{CPA}]$

16. $CAW = EXTW - MNWINT - MNWCAP - MNWOTH$

17. $CPRRCP = 2.15 + 0.51 S1 + 0.33 S2 + 0.75 S3$
   $- 2.94 [\ln(1 + \frac{RUMM}{100}) - \ln(1 + \frac{CPIK}{100})]$
   $+ 0.12 \frac{YDAGN}{CPIK} + 0.50 \frac{YDNAGN}{CPIK} + 0.42 CPRRCP(-1)$

18. $TAXR = -14.6 + 0.05 GNPKN + 0.07 GNPKN(-1) + 0.29 MNWTOT$
19. \[ IGRRAL = 2.48 - 2.11 S1 + 2.5 S2 - 0.41 S3 - 4.92 \left[ \ln(1 + \frac{RUMM(-1)}{100}) - \ln(1 + \frac{WPIK(-1)}{100}) \right] + 0.76 DLSCBR(-1) + 0.82 IGRRAL(-1) \]

20. \[ GNPKN = CPRN + IGRN + G - GMFDSAV + DINV + CAW \]

21. \[ GNPPOT = -0.23 + 0.02 IGPRRAL(-1) + 0.04 IGPRRAL(-2) + 1.03 GNPPOT(-1) \]

22. \[ USA = 1.10 + 1.23 \left( \frac{GNPPOT(-1) - GNPKRSA(-1)}{GNPPOT(-1)} \right) + 0.704661 USA(-1) \]

23. \[ GNPKRSA = \frac{GNPKN}{WPIK \times SA} \]
A. TECHNICAL APPENDIX

A.3 NOTES ON THE EXTENSION OF SIMULTNCC WITH AN AGRICULTURAL SECTOR

1. Agricultural exports from Korea are small and consist mainly of export of fish to Japan. They are not further considered here. Land-based agriculture is predominantly for domestic consumption and consists mainly of rice and barley production. Producer prices and consumer prices differ more than is justified by transportation costs, etc.; the Grain Management Fund sits in between with sizable subsidies. Imports are allowed in to match discrepancies between supply and demand that arise after the GMF sets its buying and selling price. The GMF deficit is part of the budget deficit.

2. The supply of agricultural output in real terms \( (X_A) \) is considered exogenous, not an inappropriate choice if one keeps in mind that we only project one year ahead. Quarterly data on quantities and the total nominal agricultural component of GNP are available. The producer price index used here is the one that made these two compatible (GNP deflator for agricultural output).

No matching demand data are available. As we only need deviations from base-level run values for consumption and imports of foods, we applied the Linear Expenditure budget allocation model with assigned parameters to the deviations of food consumption from base-level values. Such deviations can come about because of changes in real consumption or in relative food prices. For details of this procedure see Taylor [1]. The parameters are derived from actual values of the Korean budget shares and Taylor's "stylized facts" of a substitution indicator \( \sigma^C = 0.5 \) and an income elasticity \( \eta_A = 0.5 \).
Finally, we used the available quarterly data on agricultural and non-agricultural GNP to estimate a consumption function allowing for different propensities to consume by farmers and non-farmers. This allows us to trace the effects on aggregate demand of the rural/urban income transfers implied by changes in the relative price of food.

References:

A. TECHNICAL APPENDIX

A.4 A MODEL OF THE KOREAN COMMERCIAL BANKING SECTOR

At the beginning of the decision period the bank knows its stock of demand deposits, the composition and size of its asset portfolio and its indebtedness to the central bank (BoK, Bank of Korea) and to foreigners (via the Eurodollar market). The decision problem for the bank is, by how much to increase its domestic lending and its borrowing abroad so as to maximize its expected profits, subject to:

1. an end-of-period reserve requirement $\rho$
2. its obligation to meet all requests for loans by exporters at a given rate of interest; the bank can however rediscount a fraction $\alpha$ of its export bills at a preferential rate at the BoK.

We will assume that the bank (called DMB, Deposit Money Bank, from here on) has prior beliefs on the distributions of the net increases in export loans $L_{e1}$ and demand deposits $N$ over the coming period. Assume these prior beliefs can be summarized by the distribution functions:

\[
\begin{align*}
    f &= f(L_{e1}), L_{e1} \sim (-d_1 L_{e0}, d_2 L_{e0}), \quad EL_{e1} = d_3 L_{e0} \text{ with } d_2 > d_3 > d_1, \\
    g &= g(N), N \sim (-g_1 D_0, g_2 D_0), \quad EN = g_3 D_0 \text{ with } g_2 > g_3 > g_1.
\end{align*}
\]

At the beginning of the period its balance sheet is

\[
\begin{array}{c|c|c|c|c|c|c|c}
A & L & P & D_0 & E_0 & N & L_{ne0} & L_{e0} \\
\hline
\rho D_0 + \alpha E_0 & L_{e0} & D_0 & L_{ne0} & D_0 & E_0 & & \end{array}
\]

with $L_{e0}$ beginning of period volume of loans to exporters

$P D_0 + E_0$ non-exporters

$L_{e0}$ demand deposits $L_{ne0}$

$E_0$ represents free reserves if it is positive, and net indebtedness to the BoK if it is negative. It includes the rediscounted fraction of the export loans $L_{e0}$, $\alpha L_{e0}$. 

\[\text{(1)}\]
At the end of the period the DMB's balance sheet is:

<table>
<thead>
<tr>
<th>A</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>$pD_0 + E_0 + E_1$</td>
<td>$D_0 + N$</td>
</tr>
<tr>
<td>$L_{e0} + L_{el}$</td>
<td>$L_{f0} + L_{fl}$</td>
</tr>
<tr>
<td>$L_{ne0} + L_{nel}$</td>
<td>$L_{f1}$</td>
</tr>
</tbody>
</table>

with $E_1 = (1-\rho) N + L_{f1} - (1-\alpha) L_{el} - L_{nel}$. Define $N^*$ as the deposit inflow that will exactly enable the DMB to meet its reserve requirements at the end of the period given all other items in its balance sheet.

Further define

$$E^+ = E_1 \text{ if } E > 0, \quad E^- = 0 \text{ if } E < 0.$$\

Then profits over the period will be

(2) $Pr = r_e E_e + r_{ne} L_{ne} - r_d a_L e + r_d E^- - r_d E^+ - (r^* + a(L_1)) L_f - r_{dd} D$

where we incorporated the assumption that the marginal costs of borrowing abroad are an increasing function of the DMB's total indebtedness $L_f$ to foreigners ($a'>0$). Foregone interest earnings on excess reserves are included as a loss factor (the term $r_d E^+$).

Using (1) and (2) we can derive an expression for the expected profits

$$EPr = (r_e - ar_e d_e) L_{e0} (1+g_3) + r_{ne} (L_{ne0} + L_{nel}) - r_{dd} D_0 (1+g_3) - (r^* + a(L_1))(L_{f0} + L_{fl})$$

$$+ r_d ((1-\rho) D_0 (1+g_3) + L_{f1} - (1-\alpha) L_{e0} d_3 - L_{nel})$$

$$- (r_d + r_1) \int_{L_{e0}}^{L_{e0}} \int_{L_{fl}}^{L_{fl}} f(N) g(L_{el}) dNdL$$

where we used the fact that

$$\int_{x}^{X} f(y) dy = \int_{X}^{\infty} f(y) dy - \int_{X}^{x} f(y) dy.$$

\[1\] I.e. $N^* = (1-\rho)^{-1}(L_{nel} + (1-\alpha) L_{el} - L_{f1} - E_0)$.
Appendix A.4

The bank maximizes $E_{Pr}$ with respect to $L_{nel}$ and $L_{f1}$, net additional domestic lending and net additional foreign borrowing.

This leads to the first order conditions

\[ (3) \frac{\partial Pr}{\partial L_{nel}} = r_1 + (r_1 + r_d)(1-\psi) - r_d = 0, \quad \text{where} \]
\[ \psi = \int \int_{\{L_{e1}\}} \frac{N^* = ((1-a)L_{el} + L_{nel} - L_{f1})/(1-\rho)}{-g_1 D_0} f(L_{el})g(N)dNdL_{el} \]

After rearranging, this gives

\[ (3a) \quad \psi = \frac{2*r_1}{(r_1 + r_d)} \]

Maximizing with respect to $L_{f1}$ gives

\[ (4) \frac{\partial Pr}{\partial L_{f1}} = - (L_{f}a' + r* + a) + r_d - (r_1 + r_d)(1-\psi) = 0 \]

or

\[ (4a) \quad \psi = \frac{(L_{f}a' + r* + a)}{(r_1 + r_d)} \]

It is easy to verify that the second order conditions for a maximum are satisfied. Clearly for the FOC to hold with equality, $r_d$ has to be higher than $r_1$ to prevent banks from making profits on "loans from the window." This is in fact the case in Korea (the discount rate charged on loans made to cover reserve shortfalls is in fact a penalty rate higher than the lending rate).

From (3a) and (4a) it immediately follows that
(5) \[ a' L_f^1 + r^* + a = r_1 \]

so that the first comparative statics result is

(5a) \[ dL_f^1 = d(r_1 - r^*)/(2a') \]

Equation (5) simply says that it is optimal to borrow from abroad until the marginal cost of obtaining more loans equals the lending rate, whatever the value of all the other parameters and variables in the system.

From (3a) we can derive

(6) \[ \psi_{L_{nel}} dL_{nel} + \psi_\rho d\rho + \psi_a da + \psi_{L_e 0} dL_e 0 + \psi_{L_f 1} dL_f 1 + \psi_{D_0} dD_0 \]

\[ + (\psi_{r_1} - 2r_1/(r_1 + r_d)^2) dr_1 + (\psi_{r_d} + 2r_1/(r_1 + r_d)^2) dr_d = 0 \]

where

\[ \psi_{L_{nel}} = \int_{\{L_{e_1}\}} (1-\rho)^{-1} f(N^*) g_{L_{e_1}} > 0 \]

\[ \psi_\rho = \int_{\{L_{e_1}\}} (1-\rho)^{-2} (D_0 + (1-\alpha) L_{e_1} - L_f^1) f(N^*) g_{L_{e_1}} > 0 \]

\[ \psi_\rho > 0 \] because \( D_0 + N^* > 0 \) for all possible values of \( N^* \), the deposit outflow can obviously not exceed the initial stock of deposits.

---

1/ Note that \( N^* \) depends on \( L_{e_1} \) (see footnote, page 2 of this appendix).
\[ \psi_\alpha = -(1-\rho)^{-1} \int_{0}^{L_{e1}} (L_{e0} + L_{el}) f(N^*) g \, dL_{el} < 0 \]

\[ \psi_{L_{e0}} = d_2 \int_{-g_1D_0}^{(d_2L_{e0})(1-\alpha) + L_{nel} - L_{f1})/(1-\rho) } f dN g(d_2L_{e0}) \]

\[ \psi_{L_{e0}} = d_1 \int_{-g_1D_0}^{d_1L_{e0}(1-\alpha) + L_{nel} - L_{f1})/(1-\rho) } f dN g(-d_1L_{e0}) \]

\[ \psi_{L_{e0}} = \frac{(1-\alpha)}{1-\rho} \int_{0}^{L_{e1}} f(N^*) g dL_{el} \]

Now \( d_2 > d_1 \); so under the reasonable assumption of symmetry of the pdf \( g \) around its mode \((g(d_2L_{e0}) = g(-d_1L_{e0}))\), this expression is unambiguously positive: the first two terms can be rewritten as:

\[ g(d_2L_{e0}) \left( (d_2-d_1) \int_{-g_1D_0}^{d_2L_{e0}(1-\alpha) + L_{nel} - L_{f1})/(1-\rho) } f dN + d_1 \int_{-d_1L_{e0}(1-\alpha) + L_{nel} - L_{f1})/(1-\rho) } f dN \right) > 0 ; \]

The third term is always positive, so \( \psi_{L_{e0}} > 0 \).

\[ \psi_{D_0} = - \int_{L_{e1}} f(N^*) g dL_{el} + g_1 \int_{L_{e1}} f(-g_1D_0) g dL_{el} \]

Under the reasonable assumption of a unimodal pdf \( f \), \( f(-g_1D_0) \leq f(N^*) \);

also \( g_1 < 1 \) (outflow can never exceed the initial stock). So
\[ \psi_{D_0} < 0 \]

Finally,

\[ \psi_{L_{f1}} = - (1-\rho)^{-1} \int f(N^*) g dL_{e1} < 0. \]

All this leads, after insertion in (6), to a supply of loans to the non-exporting sector

\[ (7) \quad L_{ne} = L_{ne}(r_1, r_d, \rho, \alpha, L_{e0}, L_f, D_0) \]

Of course one can substitute out \( L_f \) using (5a) if one so wishes.
Appendix B.1

ANTI-INFLATION STRATEGIES

Section 1: The Rate of Money Growth as an Anti-Inflation Tool: Long-Run Trivia versus Short-Run Surprises

In the long run, inflation equals the rate of money growth (suitably corrected for real income growth and all that). This is trivially true; if not, the real money stock would asymptotically approach zero or infinity. Monetarists of varying degree of sophistication have, from there, jumped to the conclusion that curbing the rate of money growth is the only and/or optimal way to curb inflation in the short run.

Four points explain why this conclusion is unwarranted, as recent examples (Chile, US, UK to mention a few) amply demonstrate. The first three are outlined in Section 1, the 4th comes up in Section 3.

A. Prices and wages in the real world (as opposed to those in Milton Friedman's books and TV series) move sluggishly, because of long (one year or more) labor contracts, sluggish expectations (which may be perfectly rational if, for example, the authorities have a history of frequent policy reversals), etc. Tight money breaks the cycle by creating a large enough recession to slow down wages more than prices and so finally prices, too. It is crucial to note that a recession is a necessary element in such a strategy.

One way out is to supplement the tight money policy with wage (and possibly price) controls: this gives the same LR result but allows lower inflation during the transition. This, in turn, implies a higher real money stock during the transition and accordingly lower unemployment. Wage controls alone do not "cure" inflation, they only work as a supplement to tight money policies.

B. The velocity problem: This is a perfectly orthodox (as opposed to point C, which is unorthodox) objection. A lower steady state inflation
rate will lead to a lower velocity of money balances as their real return increases. So somewhere along the transition path, this increased demand for real balances will have to be met by an increase in the real money supply. The only way monetarists allow this to happen is by letting prices increase less than the target rate over some part of the transition path; with money on the target rate, this will increase the real money stock. (See Fig. 1, area II > area I.) As prices are slowed down via recession, this inflicts unnecessary hardship on the economy.

C. **Short-run supply-side effects of tight money.** This is a more recent point, stressed by Cavallo [2], Bruno [1] and van Wijnbergen [4]. In countries where a large part of variable costs (wages, intermediate imports) is financed via credit, the cost of credit is part of the costs of production and will be passed through into prices. This implies that the short-run impact effect on inflation is perverse, the initial impact of a reduction in money growth will be an increase in the inflation rate. Cavallo presents evidence for Argentina, van Wijnbergen [3] for Chile and, in [4], strong evidence of the relevance of this phenomenon for Korea.

Points A, B and C indicate that relying only on curbing money growth to fight inflation (current Korean policy) will have disastrous stagflationary results and should be strongly advised against. Points B and C, plus the fact that wages are not the driving force behind Korean inflation in 1980 (as they were in early '79), indicate that a money growth rule plus income policy is also not advisable. An alternative strategy that takes points A, B and C into account and allows for disinflation without recession is outlined in Section 2.
Section 2: Policy Alternatives

If reduction in the money growth rate is a costly way of bringing inflation down, what are the alternatives?

One set of policy measures would combine the absence of long-run effects of one-shot changes in the level with the long-run effectiveness of changes in the growth rate of money. An initial increase in the level of M2, coupled with a subsequent reduction in the growth rate, if "tuned" correctly, will reduce inflation over time and avoid the perverse impact effects: the perverse impact effects of the lower growth rate are offset by the beneficial effects of the increase in the level. In the long run only the growth rate matters, so this way one gets the best of both worlds. There is a snag of course: any anti-inflation package relying on lower money growth rates, but starting out with an increase in the level of the money stock, will run into serious credibility problems. Similar packages could be worked out however with the increase in the level of M2 replaced by a decrease in time deposit rates; instead of increasing the money supply one would then reduce (the level of) money demand.

Such a policy package would also meet a more orthodox objection brought up by Robert Mundell: assume a lower growth rate of money succeeds in slowing down the inflation rate. This means that the return on holding money, minus the inflation rate, will have gone up. Accordingly, real money demand will be higher than before in the new equilibrium. So somewhere along the adjustment path, the real money stock will have to increase to accommodate this. Stringently enforced money growth rate rules do this by causing a prolonged recession, leading to an inflation rate lower than money growth somewhere along the adjustment path, thus increasing the real money stock. Our policy package would solve this problem (known as the velocity problem or the
Mundell effect) painlessly via the one-shot increase in the money supply "up front."

Still to be solved however is the problem that lower M2 growth takes so much time to slow down inflation, even if we solve the perverse impact effects via either the one-shot increase in the level of M2 or a lower time deposit rate early on in the program. One alternative can be constructed that would solve this problem too: I have a variant of the crawling peg experiment, tried out by Argentina and Chile recently, in mind: a slow-down in the rate of devaluation. If implemented correctly (which in my opinion was not done in either Argentina or Chile) perverse impact effects (a real appreciation in this case) can probably be avoided, while a slow-down in the rate of devaluation would have a much faster impact on inflation than slower money growth because of its impact on local currency prices of intermediate imports such as oil. I have discussed this policy elsewhere (van Wijnbergen [5]).

Section 3: Inflation and Relative Prices: Structural Causes of Inflation

In sections 1 and 2, we looked at inflation simply as a uniform change in all prices, leaving all relative prices unchanged. In many cases, however, inflation goes together with large relative price shifts, in response to structural imbalances in the economy. Through various linkages, this results in all prices going up, although some more than others. This is called "structural inflation." Examples are inflationary outbursts led by food prices after bad harvests or longer-lasting agricultural imbalances, or the Korean inflation of early '79. In that case shortages of skilled labor, created during the incoherent dash into heavy machinery and chemicals during '76-78, and combined with government pressure not to allow wage differentials to increase, led to rapid wage-led inflation.
In such cases it is often possible to slow down inflation by doing something about the structural imbalances that started the process to begin with. Examples for the two cases cited above are allowing lower food prices via higher imports of agricultural goods in the first case; in the second case a short-run response would be to allow wage differentials to increase, a long-run response either to stimulate supply of skilled labor via more education, etc. and/or to change the structure of production away from skilled-labor intensive goods.

Almost never is a tight money induced recession an efficient way of curing structural inflation.

REFERENCES


APPENDIX B.2

A note on the relation between relative food prices and competitiveness and capital requirements of the manufacturing sector in Korea.

1. An increase in the real price of food will lower the real wage in terms of food. If workers attempt to maintain the real wage in terms of the goods they buy (i.e. they index to the CPI, which consists of food and non-food items), wage pressure will lead to an increase in the real wage in terms of other goods (among which exports).

This in turn will lead to a loss of competitiveness unless the real wage increase is offset by higher productivity. The question we will try to answer in this note is: If the real price of food goes up, say by 10%, how much additional capital is needed to increase productivity in the non-agricultural sector enough to maintain external competitiveness, the higher real wages caused by the increase in real food prices notwithstanding?

2. Formally, wage indexation on the CPI means

\[ \hat{W} = \hat{P}_A + (1 - \beta) \hat{P}_M \]

This can be reshuffled to get

\[ \hat{W} - \hat{P}_M = \beta(\hat{P}_A - \hat{P}_M) \]

In Korea \( \beta = 0.458 \) (food and beverages weight in the CPI).

Now consider the non-agricultural sector. In order to keep the argument reasonably uncluttered, we adopt some stark simplifications. Assume, then, that the non-agricultural sector produces one good, sold to foreigners and Koreans alike, at the same price. World demand ("ours" and "theirs") for that good will depend on world real income and the relative price of the Korean "other" good in terms of foreign goods. Wage earners only consume food and imported goods, not the export good.
In setting their output price, Korean non-agricultural entrepreneurs will try to maximize profits subject to the demand constraint (2).

Assume a production function separable in capital $K$ on the one hand and labor and intermediate imports $M_I$ on the other:

\begin{equation}
F(K, L, M_I) = K^{1\frac{1}{a}} g(L, M_I)^{\frac{1}{a}}
\end{equation}

Profit maximization given foreign prices, wages and the capital stock leads to the maximization problem:

\begin{equation}
\max P_{\text{other}} X - WL - P_I^* M_I \text{ st } \frac{1}{1} X = K^{1\frac{1}{a}} g(L, M_I)^{\frac{1}{a}}
\end{equation}

Solving (4) gives a pricing equation:

\begin{equation}
P_{\text{other}} = \frac{(a-1)\sigma}{1+(a-1)\sigma} P^*_M + \frac{\lambda}{1+(a-1)\sigma} \hat{W} + \frac{(1-\lambda)}{1+(a-1)\sigma} P^*_I - \frac{a}{1+(a-1)\sigma} \hat{K}
\end{equation}

Now consider the question: given relative prices in the world ($\hat{P}_M^* - \hat{P}_I^* = 0$), with how much must Korea increase its non-agricultural capital stock to maintain competitiveness $\frac{P_{\text{other}}}{P^*_M}$ in the face of rising real wage pressure ($\hat{W} - \hat{P}_M > 0$)?

Equation (5) can provide us with the answer. Inserting $\hat{P}_M^* - \hat{P}_I^* = 0$

\begin{itemize}
  \item $1/ W$ Wage rate
  \item $P^*_M$ Price of imported intermediates
  \item $L$ Labor services used
  \item $M_I$ Imports of intermediates
\end{itemize}
and \( \hat{p}_M - \hat{p}_{\text{others}} = 0 \) (i.e., maintain competitiveness) and some rearranging gives

\[
\lambda(\hat{u}_M - \hat{p}_M) = \frac{a-1}{a} \hat{K}
\]

Combining (1a) and (6) gives us the answer to our final question:

by how much must Korea increase its capital stock in the non-agricultural sector to maintain external competitiveness given real wage pressure caused by changes in the real price of food?

1a \[ \hat{u} - \hat{p}_M = \beta (\hat{p}_A - \hat{p}_M) \]

6 \[ \lambda(\hat{u}_M - \hat{p}_M) = \frac{a-1}{a} \hat{K} \]

7 \[ \hat{K} = \frac{a}{(a-1)} \lambda \beta (\hat{p}_A - \hat{p}_M) \]

3. Now some numbers. From (3) we see that \( 1 - \frac{1}{a} = \frac{a-1}{a} \) is the capital share \( \psi_K \) in gross non-agricultural output. The share in non-agricultural value added is 0.42, the value added/gross output ratio is about 2/3 in manufacturing, so \( \psi_K = 0.28 \). This in turn leads to a value for \( a \) of 1.4.

The wage share in total variable costs (gross output minus what goes to capital) \( \lambda \) is 0.54, a number that can be derived from the data given in the previous sentence. \( \frac{1}{\beta} \), the foodshare in the CPI, is 0.458. Putting all this together gives us the required increase in the non-agricultural capital stock after say a 10% increase in the real price of food:

\[
W_A = 1 - \psi_K = 1 - 0.42 = 0.58
\]

\[
\psi_L = \psi_K \times \frac{\text{Value Added}}{\text{Gross Output}} = 0.58 \times \frac{2}{3} = 0.39
\]

\[
\lambda = \frac{WL}{WL + \frac{P*I}{M*I}} = \frac{WL}{GO} \times \frac{GO}{GO-rpk} = \psi_L(1-\psi_K)^{-1} = 0.54
\]

\[
\text{GO} : \quad \text{Gross Output} = \text{Value Added} + \frac{P*I}{M*I}
\]
K = \frac{1.4}{1.4 - 1} \times 0.54 \times 0.458 \times 10\% = 9\%

If we take '76 as a "normal" year as far as investment/GNP and average capital output ratio is concerned, this 9% increase in K translates into about 75% of one year of investment.

\left(\frac{I_{76}}{\text{GNP}_{76}} = 0.25, \text{ guess } \frac{K}{\text{GNP}} = 2 \rightarrow K = 9\% \text{ represents } \frac{3}{4} \text{ of } \frac{I}{\text{GNP}} \times \frac{\text{GNP}}{K} = 12.5\% \right).

So the final conclusion is that a 10% increase in the real price of food necessitates an increase in the capital stock equivalent to 3/4 of one year's investment in order to increase productivity enough to maintain competitiveness in the non-agricultural sector.
### APPENDIX C: BASIC ECONOMIC FACTS ON KOREA

#### KOREA: BASIC DATA

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<tbody>
<tr>
<td>At current market prices</td>
<td>17,021</td>
<td>22,918</td>
<td>29,072</td>
<td>35,009</td>
</tr>
<tr>
<td>At 1975 market prices</td>
<td>12,432</td>
<td>13,877</td>
<td>14,759</td>
<td>13,921</td>
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</table>

| GNP per capita (at current U.S. dollars) | 965 | 1,279 | 1,610 | 1,515 |

#### Real GNP and prices (annual rates of change in per cent)

<table>
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<tr>
<th></th>
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<tbody>
<tr>
<td>Consumption</td>
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<td>11.0</td>
<td>7.4</td>
<td>-0.9</td>
</tr>
<tr>
<td>Private</td>
<td>6.5</td>
<td>10.3</td>
<td>8.7</td>
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<td>Government</td>
<td>11.3</td>
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<td>Fixed investment</td>
<td>26.6</td>
<td>39.4</td>
<td>9.7</td>
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<tr>
<td>Exports of goods and nonfactor services</td>
<td>25.7</td>
<td>17.5</td>
<td>-3.6</td>
<td>9.6</td>
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<tr>
<td>Imports of goods and nonfactor services</td>
<td>23.8</td>
<td>29.1</td>
<td>8.6</td>
<td>-6.8</td>
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<tr>
<td>Agriculture and fisheries</td>
<td>2.1</td>
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<td>6.7</td>
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<tr>
<td>Manufacturing</td>
<td>14.4</td>
<td>20.7</td>
<td>9.8</td>
<td>-1.2</td>
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<tr>
<td>Social overhead</td>
<td>20.6</td>
<td>21.3</td>
<td>8.8</td>
<td>4.1</td>
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<tr>
<td>Real GNP</td>
<td>10.3</td>
<td>11.6</td>
<td>6.4</td>
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<td>Wholesale prices</td>
<td>10.1</td>
<td>12.2</td>
<td>23.8</td>
<td>44.2</td>
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#### Wages and productivity in manufacturing (Annual rates of change in per cent)

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<td>Nominal wages</td>
<td>33.8</td>
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<td>Real wages</td>
<td>21.5</td>
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<td>Labor productivity</td>
<td>10.4</td>
<td>12.0</td>
<td>15.8</td>
<td>9.9</td>
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#### Money and credit (annual rates of change in per cent)

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<td>25</td>
<td>21</td>
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<tr>
<td>Quasi-money</td>
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<td>41</td>
<td>27</td>
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<tr>
<td>Broad money</td>
<td>40</td>
<td>35</td>
<td>25</td>
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<tr>
<td>Domestic credit</td>
<td>24</td>
<td>46</td>
<td>36</td>
<td>36</td>
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#### Public finance (in billions of won)

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<td>Central Government</td>
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<td>4,408</td>
<td>5,990</td>
<td>7,645</td>
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<td>Expenditure</td>
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<td>5,445</td>
<td>6,699</td>
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<tr>
<td>Revenue</td>
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<td>-300</td>
<td>-545</td>
<td>-946</td>
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<tr>
<td>Consolidated public sector</td>
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<td>8,526</td>
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<td>4,385</td>
<td>5,779</td>
<td>7,214</td>
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<tr>
<td>Revenue</td>
<td>-476</td>
<td>-616</td>
<td>-440</td>
<td>-1,312</td>
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KOREA: BASIC DATA (Cont'd)

Balance of payments (in millions of US$)

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</thead>
<tbody>
<tr>
<td>Exports, f.o.b.</td>
<td>10,047</td>
<td>12,711</td>
<td>14,705</td>
<td>17,100</td>
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<tr>
<td>Imports, f.o.b.</td>
<td>-10,523</td>
<td>-14,491</td>
<td>-19,100</td>
<td>-22,000</td>
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<tr>
<td>(oil imports)</td>
<td>(-2,000)</td>
<td>(-2,200)</td>
<td>(-3,360)</td>
<td>(-5,850)</td>
<td></td>
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<tr>
<td>Trade deficit</td>
<td>-476</td>
<td>-1,780</td>
<td>-4,395</td>
<td>-4,900</td>
<td></td>
</tr>
<tr>
<td>Current account deficit</td>
<td>13</td>
<td>-1,085</td>
<td>-4,151</td>
<td>-5,300</td>
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<tr>
<td>Overall balance</td>
<td>1,392</td>
<td>-432</td>
<td>-532</td>
<td>-1,200</td>
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</table>

International reserves (in million of U.S. dollars, end of period)

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<tr>
<th>Year</th>
<th>1977</th>
<th>1978</th>
<th>1979</th>
<th>1980</th>
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<tr>
<td>Gross international reserves of banking system</td>
<td>4,306</td>
<td>4,938</td>
<td>5,710</td>
<td>6,400</td>
</tr>
<tr>
<td>As per cent of import of goods and services</td>
<td>32.3</td>
<td>26.3</td>
<td>23.7</td>
<td>22.9</td>
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</table>

Selected financial ratios (in percent)

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</thead>
<tbody>
<tr>
<td>Current account deficit of the balance of payments/GNP</td>
<td>--</td>
<td>2.3</td>
<td>6.9</td>
<td>9.1</td>
</tr>
<tr>
<td>Fixed investment/GNP</td>
<td>27.3</td>
<td>31.1</td>
<td>32.5</td>
<td>28.3</td>
</tr>
<tr>
<td>Domestic saving/GNP</td>
<td>25.1</td>
<td>26.4</td>
<td>26.6</td>
<td>24.4</td>
</tr>
<tr>
<td>Public sector deficit/GNP</td>
<td>2.8</td>
<td>2.7</td>
<td>1.5</td>
<td>3.7</td>
</tr>
<tr>
<td>Central government deficit/GNP</td>
<td>1.9</td>
<td>1.3</td>
<td>1.9</td>
<td>2.7</td>
</tr>
<tr>
<td>Oil import/total imports of goods and services</td>
<td>17.3</td>
<td>14.3</td>
<td>17.6</td>
<td>26.6</td>
</tr>
<tr>
<td>External debt/GNP</td>
<td>25.2</td>
<td>23.2</td>
<td>29.1</td>
<td>40.3</td>
</tr>
<tr>
<td>External debt service as percent of GNP</td>
<td>3.4</td>
<td>3.7</td>
<td>5.0</td>
<td>6.4</td>
</tr>
<tr>
<td>as percent of exports of goods and services</td>
<td>10.8</td>
<td>12.6</td>
<td>15.3</td>
<td>16.9</td>
</tr>
</tbody>
</table>

Ratio of interest payments on external debt to exports of goods and services (percent) | 5.0 | 5.1 | 6.9 | 9.3 |

Exchange rate

US$1 = W 659.9 (December 31, 1980)

1/ Excluding valuation adjustment for foreign currency loans to domestic residents.

2/ Effective December 29, 1980.
BALANCE OF PAYMENTS, 1977-80
(in millions of U.S. dollars)

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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Trade balance</td>
<td>-476</td>
<td>-1,780</td>
<td>-4,395</td>
<td>-4,900</td>
</tr>
<tr>
<td>Exports, f.o.b.</td>
<td>10,047</td>
<td>12,711</td>
<td>14,705</td>
<td>17,100</td>
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<tr>
<td>Imports, f.o.b.</td>
<td>-10,523</td>
<td>-14,491</td>
<td>-19,100</td>
<td>-22,000</td>
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<tr>
<td>Oil and oil products</td>
<td>(-2,000)</td>
<td>(-2,200)</td>
<td>(-3,360)</td>
<td>(-5,850)</td>
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<tr>
<td>Other</td>
<td>(-8,523)</td>
<td>(-12,291)</td>
<td>(-15,790)</td>
<td>(-16,150)</td>
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<tr>
<td>Services (net)</td>
<td>266</td>
<td>223</td>
<td>-195</td>
<td>-800</td>
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<tr>
<td>Investment income</td>
<td>-594</td>
<td>-742</td>
<td>-1,290</td>
<td>-1,750</td>
</tr>
<tr>
<td>(Gross interest payments)</td>
<td>(-650)</td>
<td>(-931)</td>
<td>(-1,354)</td>
<td>(-2,080)</td>
</tr>
<tr>
<td>Overseas construction</td>
<td>657</td>
<td>1,049</td>
<td>1,397</td>
<td>1,500</td>
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<tr>
<td>Other</td>
<td>203</td>
<td>-84</td>
<td>-302</td>
<td>-550</td>
</tr>
<tr>
<td>Transfer (net)</td>
<td>223</td>
<td>472</td>
<td>439</td>
<td>400</td>
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<tr>
<td>Current account</td>
<td>13</td>
<td>-1,085</td>
<td>-4,151</td>
<td>-5,300</td>
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<tr>
<td>Private short-term capital</td>
<td>21</td>
<td>-1,171</td>
<td>844</td>
<td>2,000</td>
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<tr>
<td>Medium - and long-term capital</td>
<td>1,451</td>
<td>2,123</td>
<td>3,058</td>
<td>2,500</td>
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<td>Private direct investment (net)</td>
<td>72</td>
<td>61</td>
<td>16</td>
<td>70</td>
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<td>Loans to private sector</td>
<td>1,262</td>
<td>1,930</td>
<td>1,622</td>
<td>1,355</td>
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<tr>
<td>Loans to public sector</td>
<td>768</td>
<td>980</td>
<td>1,378</td>
<td>1,555</td>
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<td>Amortization</td>
<td>-677</td>
<td>-1,135</td>
<td>-1,365</td>
<td>-1,380</td>
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<td>Trade credits (net)</td>
<td>-276</td>
<td>-13</td>
<td>-109</td>
<td>-230</td>
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<td>Errors and omission</td>
<td>-93</td>
<td>-299</td>
<td>-305</td>
<td>-425</td>
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<tr>
<td>Allocation of SDRs</td>
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<td>-</td>
<td>22</td>
<td>25</td>
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<td>Change in Net Foreign Assets of the consolidated banking system (BOK and DMB)</td>
<td>1,090</td>
<td>-732</td>
<td>-2,048</td>
<td>-2,330</td>
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Sources: Data provided by the IMF.
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<tr>
<td>GNP</td>
<td>42.2</td>
<td>47.3</td>
<td>54.7</td>
<td>61.9</td>
<td>80.2</td>
<td>100.0</td>
<td>117.7</td>
<td>136.9</td>
<td>165.1</td>
<td>198.9</td>
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<td>42.3</td>
<td>47.6</td>
<td>54.9</td>
<td>62.2</td>
<td>80.4</td>
<td>100.0</td>
<td>118.6</td>
<td>137.2</td>
<td>165.8</td>
<td>199.6</td>
<td>250.3</td>
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<td>Private consumption</td>
<td>40.7</td>
<td>46.4</td>
<td>53.1</td>
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<td>100.0</td>
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<td>General Government</td>
<td>39.4</td>
<td>45.0</td>
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<td>76.8</td>
<td>100.0</td>
<td>132.1</td>
<td>157.5</td>
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<td>46.2</td>
<td>53.2</td>
<td>57.9</td>
<td>77.7</td>
<td>100.0</td>
<td>117.8</td>
<td>136.9</td>
<td>165.1</td>
<td>198.9</td>
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<td>Gross domestic capital</td>
<td>40.2</td>
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<td>49.1</td>
<td>58.8</td>
<td>81.1</td>
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<td>108.5</td>
<td>119.6</td>
<td>136.2</td>
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<td>Exports of goods and</td>
<td>40.2</td>
<td>45.2</td>
<td>52.3</td>
<td>64.9</td>
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<td>110.9</td>
<td>120.7</td>
<td>132.8</td>
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<td>Imports of goods and</td>
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<td>38.9</td>
<td>45.0</td>
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<td>80.9</td>
<td>100.0</td>
<td>100.3</td>
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<td>Mining and manufacturing</td>
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<td>50.7</td>
<td>57.5</td>
<td>64.5</td>
<td>92.3</td>
<td>100.0</td>
<td>114.9</td>
<td>127.3</td>
<td>142.2</td>
<td>167.5</td>
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<td>58.3</td>
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<td>83.0</td>
<td>100.0</td>
<td>115.3</td>
<td>126.4</td>
<td>141.1</td>
<td>165.9</td>
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<tr>
<td>Agriculture, forestry &amp;</td>
<td>37.0</td>
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<td>60.7</td>
<td>80.3</td>
<td>100.0</td>
<td>116.9</td>
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<td>189.3</td>
<td>218.2</td>
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<tr>
<td>Others</td>
<td>42.9</td>
<td>47.7</td>
<td>55.0</td>
<td>61.5</td>
<td>80.3</td>
<td>100.0</td>
<td>120.0</td>
<td>140.8</td>
<td>170.9</td>
<td>213.6</td>
<td></td>
</tr>
</tbody>
</table>
World Bank Publications of Related Interest

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Wafik Grais
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300 pesetas.

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Gershon Feder
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Bela Balassa

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