

# Structural Change in the Effects of the Exchange Rate on Output in Korea

Hee-Sik Kim\*

*This paper compares the effects of exchange rate shocks on output in Korea between the two periods from 1970 to 1985 and from 1986 to 2001. Theoretically, it is posited that the effects of real depreciation shocks on output may change from positive to negative as the economy transits from a late industrialization phase to an economic liberalization phase. It is contended that the main reason for this lies in the negative effects of real depreciation on investment and the success or failure of institutions in internalizing the demand spillovers, especially those from export expansion. Empirical analysis is carried out, relying on a vector error correction model comprised of such variables as real exports, real investments, real output, broad money, and the real won-dollar exchange rate. It is shown that, in the former stage of economic development, real depreciation contributed to economic growth in Korea by helping industries to export and realize economies of scale in investment. This was facilitated by a dirigiste system which internalized demand spillovers. However, in the phase during which most industries came to mature while the economy began to be more liberal and open, the negative effects of real depreciation on investment arising from the increased costs of importing and debt servicing outweighed its positive effects from export expansion. This change was partly because the spillovers from export expansion to investments had weakened due to a mismatch between social capabilities and the new institutions. Hence, real depreciation in this period contributed to a dampening of output growth.*

Key word: exchange rate, investment, output, phase of economic development

JEL code : F43, O11

\* Senior Economist, International Finance Research Team, International Department, the Bank of Korea. (Tel: 02-759-5962, E-mail: hkims@bok.or.kr)

The author is grateful to Dr. Donggu Chang, team leader of the International Economics Team, Dr. Jeongho Hahm, director of the Institute of Monetary and Economic Research, and commentators in the seminars of the Asia Pacific Economic Association, in the Policy Discussion Meeting of the Institute of Monetary and Economic Research, and in the BIS Fall Economists' Meeting 2004 for their helpful comments and suggestions.

\*\* The views in this paper are the author's own and do not represent those of the Bank of Korea.

## I . Introduction

In the Keynesian open macroeconomic model, an increase in the home-currency price of foreign currency(the exchange rate) usually boosts economic growth by causing a change in expenditures in favor of domestic goods. But this view overlooks the fact that such a depreciation could dampen investment. For an open economy heavily reliant on imports and foreign loans for investment, real depreciation can cause economic growth to slow down by discouraging investment more than it encourages exports. The opposite result is also possible, of course, if the depreciation leads exports to expand to a large extent and the export expansion has such strong domestic linkage effects that it enhances investment more than the depreciation discourages investment by increasing import costs and the debt-servicing burden.

Thus, the net effect of a depreciation on growth may change as the economic structure changes in the course of economic development. In an early stage of so-called *late industrialization*, especially where strong incentives for industrial investment are offered on the basis of export performance, the positive effect of a depreciation through export expansion and its linkages can more than offset the negative effect on investment, and thus the net effect on growth may be positive. This is of particular interest for an economy which has opportunities to realize the benefits of being a late-comer to industrialization *à la* Amsden(1989).

However, in the latter phase of economic development, where the country's industries have become mature, the effect of real depreciation on economic growth may change. As the market mechanism plays a greater role in resource allocation as the economy scraps preferential incentives such as export subsidies and selective credit allocation, many of the spillovers of a depreciation-led export expansion may be lost. Moreover, as the economy opens its markets, the effect of increased exports may leak abroad. Thus, investment will not be induced by export expansion to the same extent as before.

In this respect, the history of Korean economic development provides us with an exemplary case for examining the changing pattern of the effect of the exchange rate on economic growth as an economy develops. The Korean economy has been heavily reliant on foreign inputs; its economic regime has shifted from one characterized by financial repression to one of financial liberalization and opening; and the economy has undergone the transition from an agricultural to an industrial one. In particular, the Korean won has gone through several realignments against the U.S. dollar while maintaining a depreciating trend. In view of all these facts, it can be presumed that the effect of

real depreciation of the won on economic growth might well have undergone a structural change.

This paper examines the changing pattern of the effects of real exchange rate shock on investment and growth in the Korean economy as it has developed and its institutions have changed from a late industrialization regime to an economic liberalization regime in an effort to forge ahead toward a knowledge-based, service economy.

This paper is comprised of four chapters. Chapter II overviews the effects of exchange rate shocks on economic growth in a small open economy, and theoretically posits that the effects of exchange rate realignments on growth can change in accordance with economic development. Chapter III examines the characteristics and determinants of the Korean won-U.S. dollar exchange rate, and empirically analyzes the effects of exchange rate shocks on investment and growth. Chapter IV then summarizes what has been learned and sets out the implications.

## II . Effects of Exchange Rates on Economic Growth

### 1. Effects of Exchange Rate Change in a Small Open Economy

In principle, exchange rate shocks affect not only trade but also investment in a small open economy.<sup>1)</sup> Thus, the net effect on growth is uncertain: the two effects can run counter to each other. As for exports, a depreciation shock increases export volume. However, it tends to cause export prices to drop, and thus the total value of exports may even decrease initially, as argued by the J-curve theory. Therefore, the positive effect on export value may not be so large, at least in the short run.

As for investment, the effects can differ depending on the economic structure. The Mundell-Fleming model presumes that the exchange rate affects neither the marginal productivity of capital nor the user cost of capital, and the exchange rate does not directly affect the aggregate investment function. However, this

---

Note : 1) In contrast, studies on large economies such as those of the U.S.A., Europe, and Japan show that a nominal exchange rate shock does not bring about a significant change in domestic and export prices and that a real shock also fails to affect real activities. This phenomenon is called a *disconnection puzzle*. Regarding the reason for it, Rogoff(2000) and Engel(2002) point to the closedness of these economies, which makes their international transaction costs greater than domestic transaction costs, and to the practice of local currency pricing by foreign firms exporting to these markets.

feature of the model does not fit well with the reality of a small open economy, highly dependent on imports and foreign borrowing. There real depreciation can lower investment demand by increasing the costs of imported inputs and the foreign debt-servicing burden (Buffie and Won 2001, Gavin 1992, Goldberg 1993, Risager 1988). Recent empirical studies in Korea support the argument that a currency depreciation reduces investment (Kim and Im 2002, Kim and Choi 2000).

Thus, the net effect of a depreciation on output depends on the relative strength of the positive effects from enhanced export competitiveness versus the negative effects from increased import costs and foreign debt-servicing.

## 2 Changes in Real Effects of Depreciation Depending upon Developmental Phase

According to Petty-Clark's law, real GDP per capita increases as an economy shifts along different stages of economic development, i.e., from an agricultural to an industrial economy and from there to a service economy. The transition from an industrial economy to a service economy requires a sufficient accumulation of knowledge, as described by endogenous growth theories (Lucas 1988, Romer 1990). Putting these considerations together, it can be asserted that a developing economy passes through three distinct developmental phases: a late-industrialization phase, a transitional economic liberalization phase when the economy falters in knowledge accumulation due to inadequate institutional adjustments, and a knowledge-based service economy phase.

Transition of an economy from one phase to another means the economy undergoes structural change, and this will affect how the exchange rate influences economic growth. In the late-industrialization stage, industries with the characteristics of economies of scale are likely to suffer from under-investment due to lack of domestic demand. An approach to correcting this problem is to emphasize the role of government in boosting demand by making the currency cheap or encouraging investment by providing selective incentives to firms for investment.<sup>2)</sup> According to the World Bank (1993), which studied the economic development process in the East Asian countries in depth, the high performance of the export-driven growth strategy was possible in Korea because some indigenous institutions complemented the market mechanism in improving

2) The process of late industrialization differs from the early-industrialization of the 18th century in the emphasis it puts on the role of government in realization of the advantages of late-comers to industrialization, through protection of infant industries, coordination of investment among industries, and so on (Amsden 1989).

the allocative efficiency.<sup>3)</sup> In particular, the study highlighted such institutions as selective allocation of domestic credit, foreign capital, and the rights to do business in highly profitable markets. The provision of incentives conditional on export performance fostered contest-based competition among large business groups, the *chaebol*. This helped prevent the *dirigiste* system, which is prone to corruption, from becoming dynamically inefficient. Moreover, these institutions strengthened the conduits linking export expansion to investment in key industries. Under these circumstances, real depreciation not only promoted export expansion but also stimulated investment by helping industries realize economy of scale. Indeed, according to Bhagwati (1988), the incentives to prefer import-substitution to exporting activities were neutralized by the export-promoting trade policy, which was contended to have been the driving force of the rapid growth of the Korean economy during the 1960s~1970s. According to this viewpoint, the realignment of exchange rates in this period prevented the balance from being tilted by tariffs<sup>4)</sup> in favor of the import-substituting infant industries.

Second, in the economic liberalization phase, the economy expands in size and becomes more sophisticated, so that the existing regulations start to hinder, rather than improve, efficiency. Thus trade, entry barriers to industry, finance, and international capital flows begin to be deregulated. As industries become mature and labor expensive, it is hard to find new investment opportunities to achieve economies of scale. Moreover, despite deregulation, the market mechanism is slow to come into operation in governing the investment process in the economy, so that the efficiency of investment may be lowered. This is mainly because of difficulties in building up institutional capabilities in the capital and foreign exchange markets. Accordingly, decreasing returns to scale prevail in many industries and in the economy as a whole.<sup>5)</sup> Under these circumstances, a currency depreciation may succeed in increasing exports, but this export increase may fail to encourage investment. With neither the market mechanism nor a selective intervention system working effectively in the

3) Competitive equilibrium presumes a multitude of competitors. However, in a contest-based competition, a small number of conglomerates compete with each other for obtaining a monopolistic right to conduct a certain kind of business. Despite the small number of competitors, a certain degree of allocative efficiency obtains as a result.

4) In the policy regime characteristic of late industrialization, the currency tends to be overvalued because of high inflation rate. To avoid this from discouraging exports, it becomes necessary to devalue the currency periodically. In the period from 1960 up until 1980, Korea carried out a large scale devaluations on four occasions.

5) For an industry to be mature means in this context that an expansion of industrial production no longer provides increasing returns to scale, because of wage increases and saturation of markets. According to Kim(2000), who studied the sources of productivity change in the manufacturing sector in Korea, there existed increasing returns to scale during the 1970s and 1980s and decreasing returns to scale during the period from 1989 to 1996.

financial sector, the export expansion is not likely to be translated into an increase in investment. Thus, dissonance between economic structure and institutions in this phase make the export-driven growth strategy ineffective.

Finally, in the phase of a knowledge-based service economy, economic growth is sustained by knowledge accumulation.<sup>6)</sup> Here the external value of the currency tends to rise.<sup>7)</sup> A stronger currency means that a domestic firm cannot survive competition in the world market without productivity improvement. The strong currency also facilitates investment by reducing the costs of imports and foreign debt-servicing.

Therefore, a realignment of the exchange rate can contribute to sustained growth only when it is appropriate for the economic structure and implemented in an environment in which proper institutions exist that can link export expansion to domestic investment.

### III. Empirical Analysis

#### 1. Characterizing the KRW -USD Rate

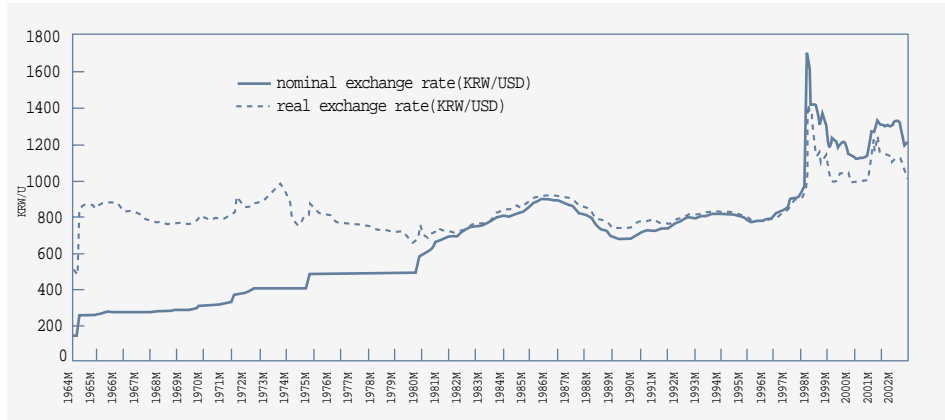
The Korean won began to float somewhat against the U.S. dollar with the introduction of a multiple-basket pegged exchange rate system in February 1980. After that the rate was tightly managed by the government, however. The degree of floating increased when the Market Average Exchange Rate System was adopted in March 1990. In the aftermath of the East Asian currency crisis, the daily fluctuation band was abandoned in December 1997, signifying the beginning of a free floating exchange rate system.

The nominal KRW/USD rate has increased step-wise through intermittent realignments. The major devaluations took place in May 1964 (96.7%) when the dual exchange rate system was abolished, in June 1971 (13.6%) ahead of the August 3rd Emergency Decree in 1972, in December 1974 (21.3%) following the first oil shock, and in January 1980 (19.8%) in the wake of the overheated investment boom in the heavy and chemical industries during the 1970s. After

6) According to the endogenous growth theory, human capital accumulation or accumulation of knowledge is the driving force of economic growth (Lucas 1988, Romer 1990).

7) As an economy moves up the ladder of economic development, income and savings increase while productivity improves. These factors lead to current account surpluses (DeBelle and Faruquee 1996) or stimulate capital inflows, which strengthen the currency.

Figure 1

Long-term Trends of the Won-Dollar Exchange Rate  
(Jan. 1964 ~ Apr. 2002)

the shift to a managed floating system in 1980, the won depreciated against the U.S. dollar from 1980 to 1985, but it then appreciated from 1986 to 1989. The appreciation followed the turnaround of the Korean current account from chronic deficit to a surplus. From 1990 to 1997, the nominal KRW/USD rate remained relatively stable. It depreciated 66.4% from November 1997 to January 1998, however, after outbreak of the currency crisis. Although the won regained some of the lost ground somewhat afterward, it has remained trading at a level considerably below the pre-crisis period.

The trend of nominal depreciation of the won against the dollar can not be fully explained by economic fundamentals such as relative prices. The hypothesis that purchasing power parity holds is not supported by the data.<sup>8)</sup> Particularly, during the period after outbreak of the currency crisis, the won's real depreciation is also evident in Fig. 1. Empirical studies on the determination of the KRW/USD rate also show that the won's exchange rate is affected not only by fundamentals, but also by policy factors such as capital market opening, sterilized intervention, shifts in the exchange rate regime, and foreign reserve policy (Kim and Chang 2002).

8) In an ADF unit root test of the real effective exchange rate of the won using monthly data from January 1980 to December 2001, the hypothesis of a unit root was not rejected at the 5% significance level.

## 2 Effects of Exchange Rate Changes on Growth by Developmental Phase

### A. Analysis of Long-Term Correlation Coefficients

For the purpose of empirical analysis, the sample period from 1970 to 2001 is divided into two sub-periods: a period of late industrialization until 1985 and a period afterwards, reflecting the fact that, from 1986 onwards, economic liberalization was actively pursued in many economic areas ranging from trade,<sup>9)</sup> to industrial entry,<sup>10)</sup> to foreign exchange transactions and to capital account liberalization.<sup>11)</sup>

The long-run correlation between the exchange rate and real variables is examined first to analyze the effect of exchange rate realignment on real variables at low frequency. Five-year growth rates of exchange rates and real variables, and the correlation coefficients thereof, are calculated for the two sub-periods in Table 1.<sup>12)</sup> Table 1 shows that, in both periods, while there is a positive correlation between the nominal exchange rate and exports, the nominal (and real) exchange rate is negatively correlated with investment. The correlation between the nominal exchange rate and growth turns out to be negative in the former period but positive in the latter period.<sup>13)</sup> This implies a structural difference between the two periods that is probably due to the economic liberalization implemented in the latter period.

### B. VEC Model

A vector error correction(VEC) time series model was set up in order to analyze the dynamic effects of exchange rate shocks on real GDP. Included variables were in order<sup>14)</sup> were real exports, real investment, real GDP, a

9) Full-scale Import liberalization was carried out following the revision of the Trade Act of 1967 and its renaming as the External Trade Act in 1986.

10) Following the passage of the Industrial Development Act in 1986, regulations on industrial investment were eased to a great extent in 1990. For example, entry to the petrochemical industry was freed in 1990. Thus, large scale industrial investments began to be initiated by private companies instead of the government.

11) Foreign exchange transactions related to the current account and capital account started to be liberalized from the mid-1980s. For example, issuance of convertible bonds and of depository receipts by domestic firms was allowed in November 1985.

12) The two time periods, 1970~1985 and 1986~2001, were divided into three five-year periods. The long-term growth rates were calculated with a geometric average growth rate formula applied for each period. This approach was adopted because the exchange rate was realigned at 4 to 7-year intervals.

13) The correlation between the rates of change in the nominal exchange rate and real GDP was 0.57 in the former period, and -0.99 in the latter period. The correlation between the rate of change of the real exchange rate and real GDP was -0.09 in the former period and -0.99 in the latter.

14) The reason for the use of the real exchange rate as an exchange rate variable is that the exchange rate of the won



Table 1 5-Year Growth Rates and Correlation Coefficients Thereof

		Rate of Change (%)			
		Nominal KRW/USD (Real rate) <sup>1)</sup>	Real GDP	Investment	Exports
Sub-period 1	1970-'75	7.9 (0.2)	8.0	11.0	25.0
	1975-'80	5.1 (-2.6)	6.9	11.2	16.3
	1980-'85	7.7 (4.3)	6.9	6.1	10.1
	1986-'91	-2.7 (-2.6)	9.5	15.7	10.8
Sub-period 2	1991-'96	2.4 (1.3)	6.6	6.9	14.2
	1996-'01	8.7 (6.0)	4.2	-1.4	13.2
Correl. coeff. with Nominal (Real) exchange rate <sup>2)</sup>	Entire period		-0.68(-0.77)	-0.68(-0.92)	0.36(-0.24)
	Sub-period 1		0.57(-0.09)	-0.48(-0.93)	0.16(-0.51)
	Sub-period 2		-0.99(-0.99)	-0.99(-0.99)	0.65 (0.66)
Correl. coeff. with GDP	Entire period			0.95	0.11
	Sub-period 1			0.46	0.90
	Sub-period 2			0.99	-0.73
Correl. coeff. with Investment	Entire period				0.18
	Sub-period 1				0.79
	Sub-period 2				-0.71

Notes : 1) The real exchange rate against the U.S. dollar is calculated by adjusting the nominal exchange rate with the ratio of U.S. producer prices to those of Korea's.

2) Figures in parentheses represent the coefficients of correlation with the real exchange rate against the U.S. dollar

Sources: *International Financial Statistics*, IMF; *National Accounts*, the Bank of Korea.

monetary aggregate<sup>15)</sup> and the real exchange rate of the won against the U.S. dollar. With this specification of the VAR model, one can allow for the linkages between exports and investment as well as control the effect of monetary policy.<sup>16)</sup>

against the U.S. dollar as determined by the market becomes the policy indicator. In fact, the real effective exchange rate is more appropriate for analyzing the effects of the exchange rate on the economy. However, data for this has been collected only since 1980. The results of an estimation using the real effective exchange rate, instead of the real exchange rate against the U.S. dollar during 1986~2001, though not reported here, show that all the variables respond similarly to external shocks.

15) Interest rates, instead of a monetary aggregate, can also be considered as a monetary policy indicator variable. The reason for the use of a monetary aggregate is that consistent time series data were available for it since 1970. When real yield rates on corporate bonds were substituted for the period 1986~2001, the analytical results remained more or less the same.

16) There is a possibility that the economy has undergone a structural change because of the currency crisis. When the model was applied to the two periods from the first quarter of 1993 to the second quarter of 1997 and from the first quarter of 1998 to the fourth quarter of 2001 in another paper (Lee and Kim 2003), the results were qualitatively similar to those in this paper for the effects of a real exchange rate shock on each variable.

The ordering of the variables assumes that the real exchange rate affects other variables with lags, although the other variables change the real exchange rate contemporaneously. One rationalization for this ordering comes from the fact that data on exchange rates are observed concurrently, whereas those on exports, investment and GDP are observed only with lags. The placing of the exchange rate after the fundamental variables in a VAR model was adopted by Eichenbaum and Evans(1995) to analyze the effects of monetary policy shock on the exchange rate. The exchange rate shock derived from this model can be regarded as exogenous changes in the exchange rate policy or international reserves management.<sup>17)</sup>

The ADF unit root tests do not reject the hypothesis that level variables have unit roots. But they do reject the hypothesis that first differences in the level variables have unit roots with a 1% significance level.<sup>18)</sup> The Johansen cointegration test shows that there exist long-term equilibrium relationship(s) among the variables in both periods.<sup>19)</sup> A VEC model is estimated which takes the cointegration among the variables into account.

Granger tests of causality between the exchange rate and other variables using the VEC model show that the bilateral real exchange rate unilaterally caused investment during the period of the late industrialization phase from the first quarter of 1970 to the fourth quarter of 1985, while it unilaterally caused investment and real GDP in the period of the economic liberalization phase from the first quarter of 1986 until the most current period, i.e., the fourth quarter of 2001.<sup>20)</sup> These results imply that exchange rate shocks due to exchange rate realignments, sterilization policy, and foreign reserve accumulation had important impacts on the real economy.

17) In this type of VAR model, the residual in the monetary policy indicator equation is interpreted as a monetary policy shock. Applying the same logic to this model, the residual in the real exchange rate function can be regarded as an exchange rate policy shock. This represents change in the real exchange rate that cannot be explained by shocks in economic fundamentals such as economic growth monetary policy.

18) ADF Unit Root Test Result

	1970 Q1 ~ 1985 Q4		1986 Q1 ~ 2001 Q4	
	level	1st difference	level	1st difference
real GDP per capita				
Exports	-2.24	-4.34***	-0.37	-5.33***
Investment	-0.76	-6.51***	-2.31	-3.94***
Real GDP	-0.51	-5.11***	-1.88	-4.90***
Monetary aggregate (M2)	-2.34	-5.63***	0.60	-8.01***
Real exchange rate	-0.96	-5.62***	-0.84	-4.17***

Note: \*\*\*indicates the 1% significance level.

19) According to Johansen's trace test, there was a cointegration relationship during the period from the first quarter of 1970 to the fourth quarter of 1985; and two cointegration relationships from the first quarter of 1986 to the fourth quarter of 2001.

Next, the analysis of the impulse-response function<sup>21)</sup> reveals that, in response to a generalized one standard deviation exchange rate shock, exports increased with some lags in both the late industrialization phase and the economic liberalization phase. The response of exports to the depreciation shock in the latter phase was twice as large as that in the former, as shown in Figures 2a and 2b. The increased sensitivity of exports to an exchange rate shock in the latter period seems to reflect the economy's having come to rely on exchange rate depreciation for export expansion more than it had in the previous phase, because of the fact that other export incentives were abolished under the economic liberalization policy.

The response function of investment to the impulse of an exchange rate shock shows that investment decreases in response to depreciation in both phases, as implied by the results from the bivariate correlation coefficient analysis. The responses of investment in the latter phase were almost three times as large as those in the former phase, as seen from the second columns of Figures 2a and 2b. The dampening of investment in this case might be attributable to the fact that real depreciation worsened the profitability of firms by increasing the costs of imports and debt servicing more than it improved their profitability by expanding exports.

The response of investment to a shock in exports is examined to analyze the exports-investment linkage structure, which plays an important role in the transmission channels of the exchange rate impulse. The results show, as in the correlation analysis, that an increase in exports had a negative impact on investment in the economic liberalization phase, after having had a positive impact on investment in the late industrialization phase, as seen in the first columns in Figures 3a and 3b. From this result, it can be inferred that, even though export expansion had large enough spillovers on the economy to

20) VEC Test of Granger Causality (p-value) between the Real Exchange Rates and Exports, Investment, GDP and Broad money		
	1970 Q1 ~ 1985 Q4	1986Q1 ~ 2001Q4
Real exports real exchange rate	0.85	0.85
Real investment real exchange rate	0.34	0.95
Real GDP real exchange rate	0.26	0.31
Broad money real exchange rate	0.55	0.61
Real exchange rate real exports	0.90	0.70
Real exchange rate real investment	0.01***	0.02**
Real exchange rate real GDP	0.18	0.01***
Real exchange rate broad money	0.60	0.01***

Notes: 1) The Model lag is set to one in accordance with the Schwartz Criterion.

2) \*\*\* and \*\* denote significance at the 1% and 5% levels, respectively.

21) The responses to generalized impulses were set out by Pesaran and Shin (1998) in order to overcome the problems of ordering in a VAR model.

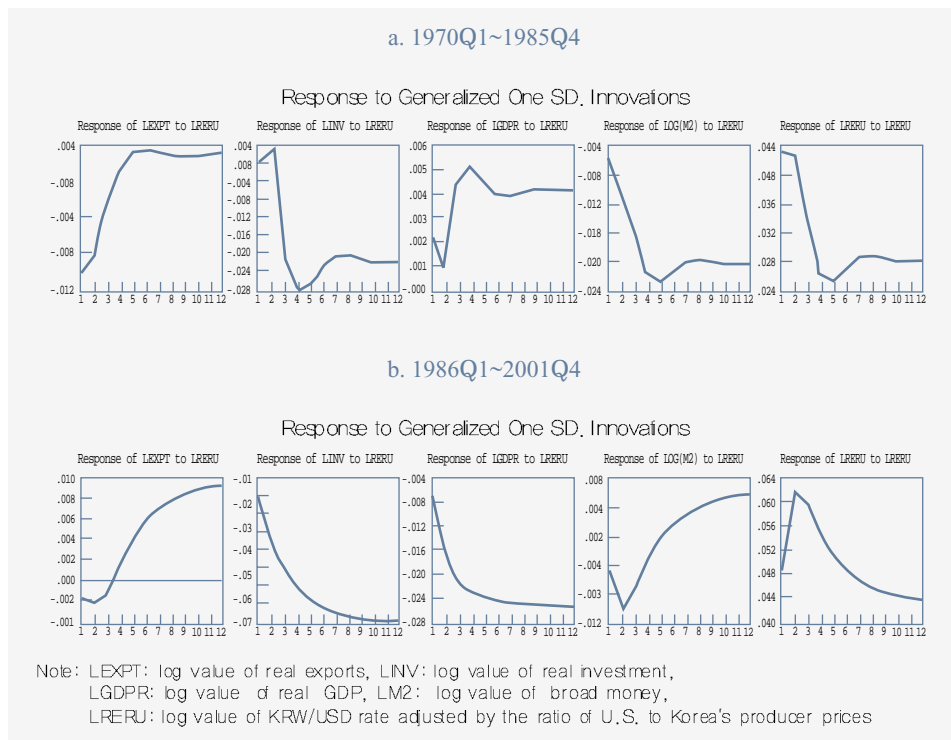
stimulate investment in the late industrialization phase, things had changed so that the the opposite was true in the economic liberalization phase. That is, export expansion in this period led to increased foreign procurement of parts and materials by firms as import barriers were lowered. Moreover, export expansion was accompanied by shrinking domestic demand since the factories producing

Table 2 Sources of Output Growth in Manufacturing

	Chenery, Robinson, and Syrquin (1986)		Bank of Korea (2000)			
	55-63	63-73	75-80	80-85	85-90	90-95
Export Expansion	12	48	73.4	115.2	51.0	79.7
Import-substitution	42	-2	16.7	14.0	6.8	-2.6

Note : Each ratio is relative to the domestic demand expansion.

Figure 2 Response of Each Variable to Exchange Rate Impulse

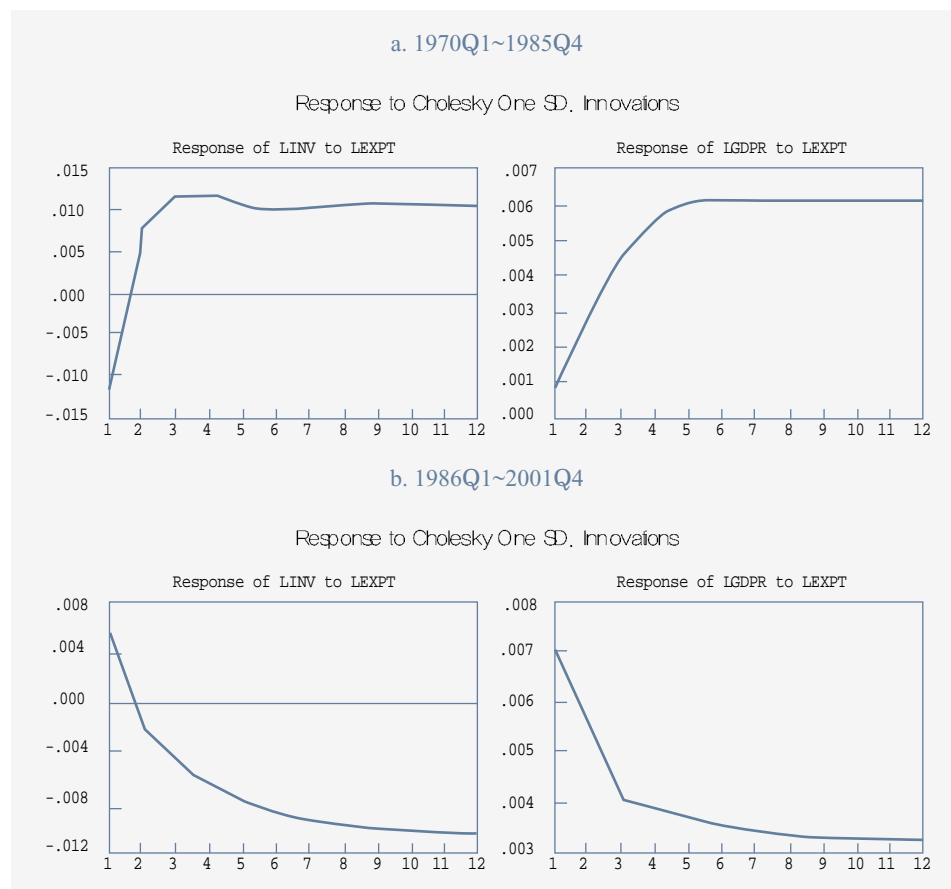


parts moved abroad, and export profitability deteriorated because of the increased competition with cheap foreign products. In fact, according to research on the sources of industrial growth using the input-output tables (Bank of Korea 2000), the contribution of the import-substitution effect gradually declined. During the period of 1990–1995, it contributed negatively to the growth of manufacturing output, as shown in Table 2. This is attributable to the heightened dependency on imports that arose as a consequence of import liberalization. This kind of structural change in the economy caused the positive effects of export shock on growth to be weaker in the latter period than in the former period as shown in the second columns of Figures 3a and 3b.

Lastly, analysis of the responses of real GDP to a real depreciation shock shows that while GDP increased in response to real depreciation in the late

Figure 3

Responses of Investment and Real GDP to Export Impulse



industrialization phase it decreased during the economic liberalization phase.<sup>22)</sup> The difference seems to stem from the changes in export-investment linkages and in the responses of exports and investment to real depreciation.

Meanwhile, the variance decomposition of the forecast error variance for investment shows that, whereas in the late industrialization phase real depreciation shock could explain only 7.1% of the forecast error variance for investment in one year, it was able to explain 34.5% of it in the economic liberalization phase (see Table 3). This means that real depreciation was one of the main factors that caused contraction in investment, particularly during the latter period. This also implies that the promotion of exports by way of a weak currency policy is no longer conducive to growth. Rather, such a policy is likely to undermine the growth potential by reducing investment.

These results do not change when the real GDP of the U.S.A. is included as an exogenous variable in the VEC model. This negates the possibility that both the

Table 3 Variance Decomposition of Forecast Error Variance of Investment

a. 1970Q1~1985Q4					
Quarters	LEXPT	LINV	LGDP	LOG(M2)	LRERU
1	2.3	97.7	0.0	0.0	0.0
4	4.0	78.2	10.7	0.1	7.1
8	4.3	74.5	11.6	0.1	9.6
12	4.5	73.3	12.0	0.1	10.1
b. 1986Q1~2001Q4					
Quarters	LEXPT	LINV	LGDP	LOG(M2)	LRERU
1	4.4	95.6	0.0	0.0	0.0
4	0.8	63.6	0.4	0.7	34.5
8	0.9	49.0	0.6	1.0	48.5
12	1.0	44.3	0.6	1.1	53.1

22) That a depreciation has contractionary effects on investment and growth in an externally dependent, small scale economy is confirmed by the results of panel analysis of six East Asian states (Moreno 1999). Choi (1999) showed that, up until 1989, real depreciation increased the production of the mining and manufacturing industries in Korea; since the 1990s, however, it has had a negative impact on industrial production. Furthermore, even when the sample period was confined to the four-year period from the first quarter of 1993 to the second quarter of 1997 and the four-year period from the first quarter of 1998 to the fourth quarter of 2001, real depreciation turns out to have had contractionary effects (Lee and Kim 2003).

won depreciation and the investment contraction were caused by global economic slowdown (see Fig. A2).

#### IV. Summary and Policy Implications

This paper has analyzed the effects of real exchange rate changes on output in Korea between the period from 1970 to 1985, which is categorized as a late industrialization phase, and that from 1986 to 2001, which is identified as an economic liberalization phase. Theoretically, it was posited that the effect of real depreciation on output might change from positive to negative as the economy moved from the former phase to the latter. In the former phase, the positive effects of a depreciation on growth by enhancing export competitiveness would outweigh its negative effects by increasing import costs and the debt-servicing burden. This is mainly because the spillovers from export expansion would be successfully internalized by a dirigiste regime. In the latter phase, however, the opposite would obtain, as the dissonance between economic structure and institutions would obstruct the internalization of the investment interdependence and demand spillovers.

The results from empirical analysis support this intuition. Real depreciation shocks had significantly positive effects on exports and significantly negative effects on investment both in the late industrialization phase and in the economic liberalization phase; however, the net effects on output were positive in the former, and negative in the latter. During the late-industrialization period, real depreciation shocks contributed positively to economic growth by promoting exports and helping domestic firms exploit economy-of-scale opportunities. This seems to have been made possible by instrumentalities that took care of possible market failures in the early stage of economic development; these included the financial incentives provided to firms according to their export performance with a view to encouraging investment. During the economic liberalization period, however, the results show that real depreciation shocks have deterred economic growth. The apparent reason for this is that the spillover effects from export expansion were weakened. More fundamentally, however, it seems to stem from the fact that, while new opportunities have been introduced by deregulation and market opening, the institutional or social capabilities required to take advantage of them have not been built up.

These findings imply that export promotion through a cheap currency policy

can no longer contribute to sustained growth once economic liberalization begins. However, since the exchange rate matters for economic growth, exchange rate policy should be designed in such a way that it facilitates the transition of the Korean economy to a knowledge-based service economy. This policy would be comprised of such measures as firstly, eliminating the won's long-term depreciation trend; and secondly, having the won float at around a certain level by strengthening economic fundamentals. Stability of the exchange rate level is conducive to investment by domestic firms as well as foreign firms. Allowing some volatility is also important, because volatility encourages hedging and thus draws in transactions, adding liquidity to the market. Meanwhile, it should be remembered that seeking a stable level for the exchange rate by means of intervention will do more harm than good, because it will increase the vulnerability of the economy to external shocks, such as those due to the sudden reversal of steady debt inflows.

Therefore, any effort to make the exchange value of a currency value stable should be accompanied by efforts to make the country's economic fundamentals strong. In this respect, it is advisable that the policy leadership should grow out of the old paradigm of the export-driven growth strategy to a new paradigm of promoting growth through facilitating knowledge accumulation. Moreover, to avoid the possibility of a strong currency decreasing exports or causing de-industrialization (Pieper 1998), it would be best to implement the strong currency policy gradually and with a long time horizon, and for it be accompanied by policies to improve the efficiency of investment, through for example fostering industrial clusters *à la* Porter (1990).



## References

- Amsden, A., *Asia's Next Giant: South Korea and Late Industrialization*. New York: Oxford University Press, 1989.
- The Bank of Korea, "Analysis of Sources of Korean Economic Growth Using Input-Output Tables," 2000.
- Bhagwati, Jagdish N. "Export-Promoting Trade Strategy: Issues and Evidence," *The World Bank Research Observer* 3, 1988, pp. 27~57.
- Buffie, Edward F., and Yongkul Won, "Devaluation and Investment in an Optimizing Model of a Small Open Economy," *European Economic Review*, August 2001.
- Choi, Changkyu, "Exchange Rates, Exchange Rate Volatility and Investment in Korea: An Empirical Investigation," *The Bank of Korea Economic Papers*, vol 4(1), June 2001.
- Debelle, G. and H. Faruquee, "What Determines the Current Account? A Cross-sectional and Panel Approach," *IMF Working Paper* 96/58, 1996.
- Eichenbaum, Martin and Charles L. Evans, "Some Empirical Evidence on the Effects of Shocks to Monetary Policy on Exchange Rates," *The Quarterly Journal of Economics*, November, vol. 110, 1995, pp. 975 – 1009.
- Engel, Charles, "Expenditure Switching and Exchange Rate Policy," NBER working paper 9016, 2002.
- Gavin, Michael, "Monetary Policy, Exchange Rates, and Investment in a Keynesian Economy," *Journal of International Money and Finance*, vol. 11, no. 2, 1992, pp. 145~161.
- Goldberg, Linda S., "Exchange Rates and Investment in United States Industry," *The Review of Economics and Statistics*, vol. 75, no. 4, 1993, pp. 575~588.
- Kim, B. H., and Im H.J., "Investment Behavior in Korea," *The Bank of Korea Economic Papers*, vol. 6(1), July 2004.
- Kim, Y.C., and Y.C. Choi, "The Effect of Changes in the Won-Dollar Exchange Rate on Investments by Manufacturing Sector (Korean)," *The Bank of Korea Economic Analysis*, 2000. III, pp. 56 –88.
- Kim, Hee-Sik, "Inter-industrial Productivity Spillovers in Korean Manufacturing," *The Bank of Korea, Economic Papers* 3(2), November 2000, pp. 164-197.
- Kim, Hee-Sik, and Donggu Chang, "Changes in Structural Features of Won-Dollar Rate Determination and the Effect of Monetary Policy on the

- Exchange Rate in Korea," The Bank of Korea *Economic Papers*, vol 6(1), July 2003.
- Lee, Yeonho, and Hee-Sik Kim, "Macroeconomic Policy Options under the Korean Won's Appreciation against the U.S. Dollar (Korean)," The Bank of Korea *Research on Finance and Economy*, no. 157, June 2003.
- Lucas, Robert E., Jr, "On the Mechanics of Economic Development," *Journal of Monetary Economics*, vol. 22, July 1988, pp. 3–42.
- Moreno, Ramon, "Depreciation and Recession in East Asia," *Federal Reserve Bank of San Francisco, Economic Review*, 1999, no. 3, pp. 27~40.
- Pesaran, M. Hashem, and Y. Shin, "Generalised Impulse Response Analysis in Linear Multivariate Models," *Economics Letters*, vol. 58, 1998, pp. 17–29.
- Risager, Ole, "Devaluation, Profitability and Investment: A Model with Anticipated Wage Adjustment," *Scandinavian Journal of Economics* 90, no. 2, 1988.
- Rogoff, Kenneth, "Why Not a Global Currency?" *American Economic Review*, vol. 91, May 2001, pp. 243~47.
- Romer, P.M., "Endogenous Technical Change," *Journal of Political Economy*, vol. 98: S71-S102, 1990.
- World Bank, *East Asian Miracle: Economic Growth and Public Policy*, London: Oxford University Press, 1993.
- Yang, D.W., and T.Y.Kwon, "Issues for Balanced Growth between Domestic and Export Industries: Recent Discussions on Economic Transformation toward Domestic Demand-Driven Growth (Korean)," The Bank of Korea, *Research on Finance and Economy*, vol. 128, 2002.7.

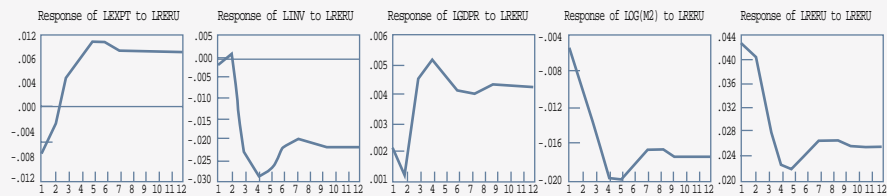
## APPENDIX

Fig A1

The Effects of a Depreciation Shock  
(With U.S.A. Real GDP Included as an Exogenous Variable)

a. 1970Q1~1985Q4

Response to Generalized One SD. Innovations



b. 1986Q1~2001Q4

Response to Generalized One SD. Innovations

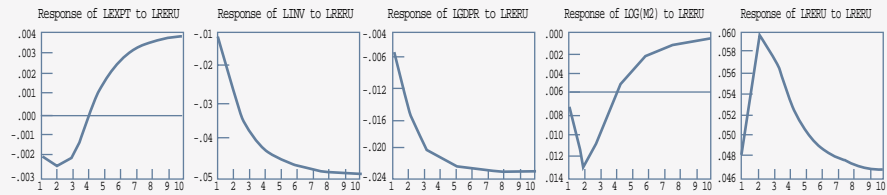
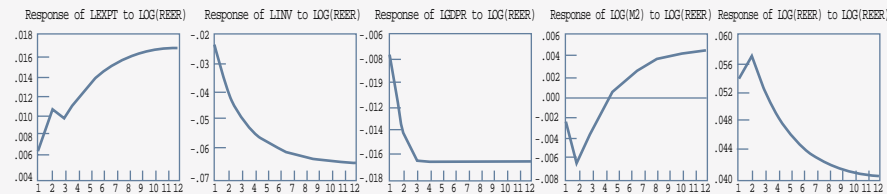


Fig A2

The Effects of a Depreciation Shock  
(With Real Effective Exchange Rate in the VEC Model)

a. 1970Q1~1985Q4

Response to Generalized One SD. Innovations



Note:  $-\text{LOG}(\text{REER})$ : negative log value of real effective exchange rate for the Korean Won