Is Korea Being Deindustrialized?

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This study shows that the Korean economy has been deindustrialized since the late 1980s in terms of employment and nominal output in that the share of the manufacturing sector in the economy as a whole has decreased whereas that of the service industry has increased and, in contrast, is not yet at the stage of deindustrialization in terms of real produc tion.

As the result of theoretical and empirical analysis presented here, the deindustrialization in Korea is taking place spontaneously in the course of its economic growth-the more rapid productivity growth in the manufacturing sector and changes in the pattern of consumption due to income growth. In addition, increasing foreign direct investment, which have allegedly been responsible for the hollowing out of manufacturing industry, turn out to have had little to do with the deindustrialization process.

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Key words: deindustrialization, differentials in productivity growth rates, changes in consumption pattern, foreign direct investment

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Ⅰ. Introduction

It is well known that economy's industrial and employment structures reflect its overall development stage and act, at the same time, as a key factor in determining its future course. It is known that primary industry, in general, makes up a relatively higher share at the initial stage of economic development and, thereafter, is gradually replaced by manufacturing as the economy grows. And, finally, as it approaches a stable state, the share of the service industry gets higher while that of manufacturing reduced.

In the case of the Korean economy, the share of manufacturing in total employment, which had peaked at 28% in 1989, has shown a steady decline, eventually standing at approximately 20% as of 2001, while the share of manufacturing output at nominal prices, which turned to a decreasing trend after peaking in the late 1980s, then stayed close to 28%. However, it rose back up to the level of the late 1980s temporarily as the depreciation of the Won during the financial crisis helped restore export competitiveness, more recently though it has shifted back to a downward path.

Moreover, as foreign direct investments("FDI" hereafter) in the manufacturing industry has been on a steady increase since the year 1990, more than a little concern has been raised over deindustrialization, in that the share of services has grown steadily while that of manufacturing has shown a persistent decrease in terms of output and employment. Deindustrialization in terms of output and employment is known to have a critical impact on the overall economic and social structures ranging from current account and growth potential to unemployment and income distribution. Especially where the contraction of manufacturing is mainly driven by its weakened competitiveness or the overvaluation of the currency and not by the natural course of economic movements, it is likely to have a negative influence on economic development. This also applies where, even though on a natural course, deindustrialization proceeds at an excessively rapid speed.

In recent years, arguments have arisen that there is a possibility of a drastic hollowing out of manufacturing and deindustrialization in the near future in that, even though inflows and outflows of foreign investment have both declined, inflows have seen a relatively larger decrease.

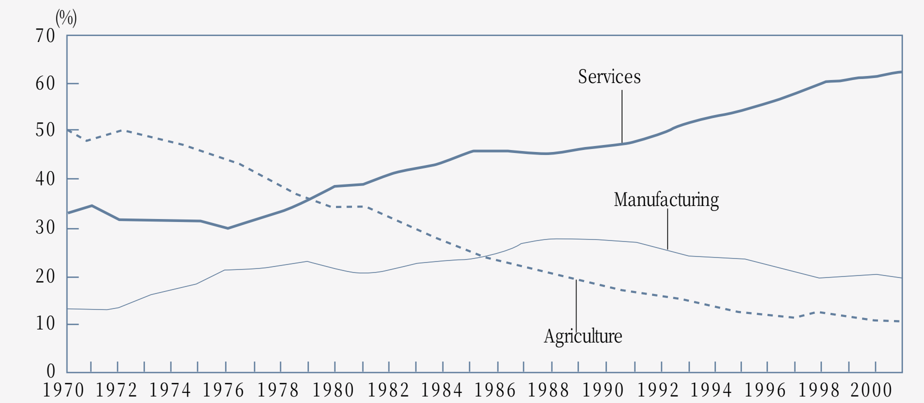
These arguments, however, generally employ all-industry statistics as the data of FDI, rather than those of manufacturing, and neglect the fact that the share of non-manufacturing in FDI is increasing to a great degree. They commit the

fallacy of identifying FDI with the deindustrialization of manufacturing and, furthermore, overemphasize negative effects of expanding FDI.

In this light, it is necessary to carry out more accurate in-depth studies of the trends and causes of deindustrialization in the Korean economy. And empirical analysis of these topics has, however, been hampered by a lack of relevant statistics and insufficient time-series. This paper, in analyzing the trends and causes of Korea's deindustrialization as a part of such an endeavour, attempts to find counter measures to deal with deindustrialization.

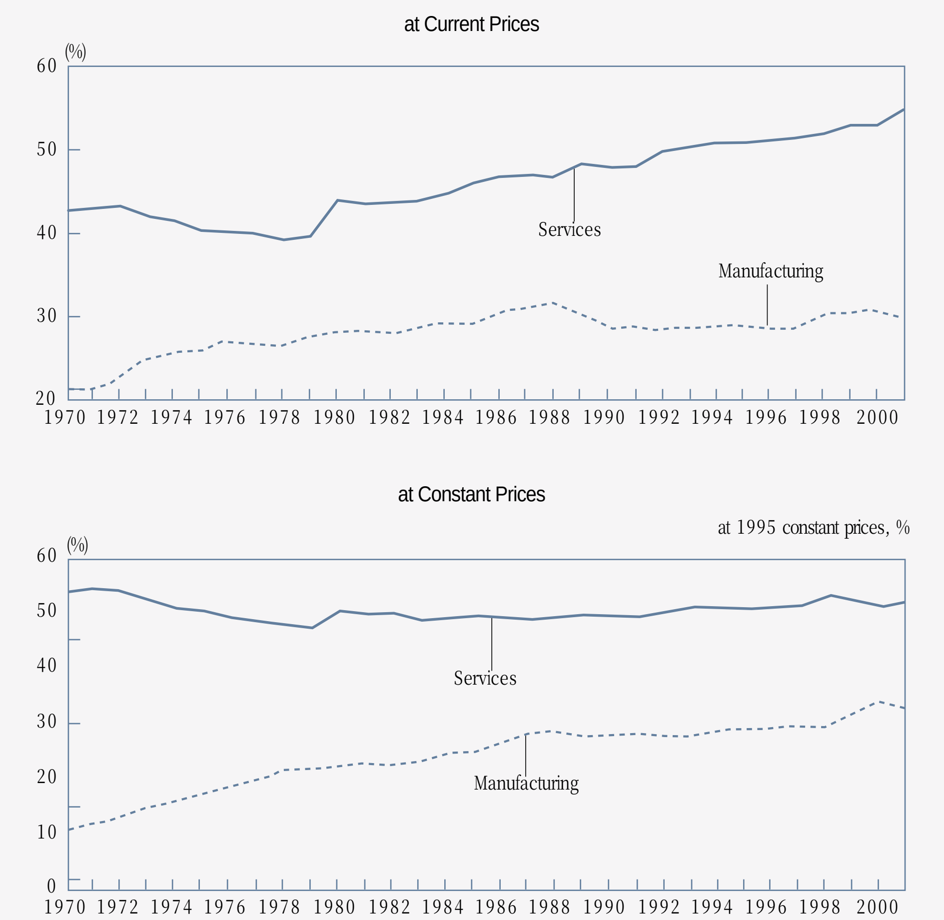
This paper is organized as follows. Chapter Ⅱ explores the trends of deindustrialization in the Korean economy in terms of employment, and nominal and real output. Chapter Ⅲ, making a theoretical and empirical analysis of the causes of Korea's deindustrialization, attempts at a quantitative analysis of what relationships the flight of investment bears to deindustrialization with a view to confirming the validity of the arguments that declining industrial competitiveness is the main cause of the current process of deindustrialization. Finally, in Chapter Ⅳ, I review the results of the analyses and seek out some counter measures against deindustrialization problems.

Figure 1 Share of Employment by Industry in Korea



Notes : Shares of employment in mining and construction are excluded from total employment.
Source : *Survey on Economically Active Population*, NSO

Figure 2 Shares of Value Added in GDP by Industry in Korea



Source : *National Accounts*, the Bank of Korea

Table 1 Growth Rates of Value Added in GDP by Industry in Korea[1)]

at 1995 constant prices, %

	1971-75	76-80	81-85	86-90	91-95	96-97	98-99	2000-01
GDP	7.9	7.0	7.8	9.5	7.5	5.9	2.1	6.2
Manufacturing	18.3	13.4	10.4	12.4	8.5	6.7	6.8	8.8
Services	9.3	8.4	8.8	10.9	8.9	6.6	2.4	6.8

Source : *National Accounts*, BOK

Ⅱ. Trends of Deindustrialization in Korea

In Korea, the share of employment in manufacturing began to decline from the late 1980s. Specifically, employment in manufacturing, which had shown a steady upsurging since the 1970s, peaked at 28% of total employment in 1989, and then turned to a declining trend until it reached around 20% in 2001, as shown in [Figure 1]. And the share of production in manufacturing in nominal terms too has been on a moderate downward trend since reaching a peak in the late 1980s. In contrast to its moderately falling share at current prices, the share of the manufacturing in GDP in value added terms at constant prices still maintained a rising trend during these periods. That is, its share, which remained comparatively steady until the late 1990s after having risen to 28% in the late 1980s, surged dramatically, in the last few years to eventually stand at around 34%(refer to [Figure 2]). This is strongly supported by the fact that growth rates of the manufacturing sector in real value added terms have remained at higher levels than those of the service sector since the 1970s, as reported in [Table 1]. The implication of this analysis is that the Korean economy has already been in the process of deindustrialization from the late 1980s in terms of employment and nominal output but, by contrast, has not yet entered on to a full-blown stage of deindustrialization.

Ⅲ. Causes of Deindustrialization

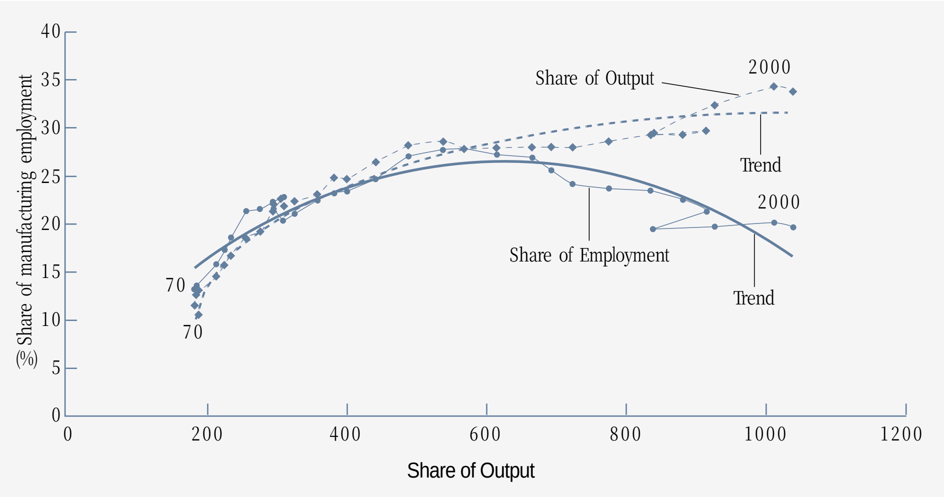
1. Stylized Facts

Deindustrialization has prompted a vigorous debate about its causes and potential implications. Some argue that it is the result of natural and successful economic growth, in other words, it is caused by a shift in patterns of consumption and by higher productivity in the manufacturing sector than in the service sector. In contrast, others suspect that exogenous factors such as the rapid globalization of the market or the appreciation of the currency explain a considerable part of the deindustrialization process.[1)]

Note : 1) Apart from these factors, there is the notion of the "Dutch disease", which was first observed by the experience that discovery of new natural resources was followed by a drastic decline in traditional industries in Nordic countries.

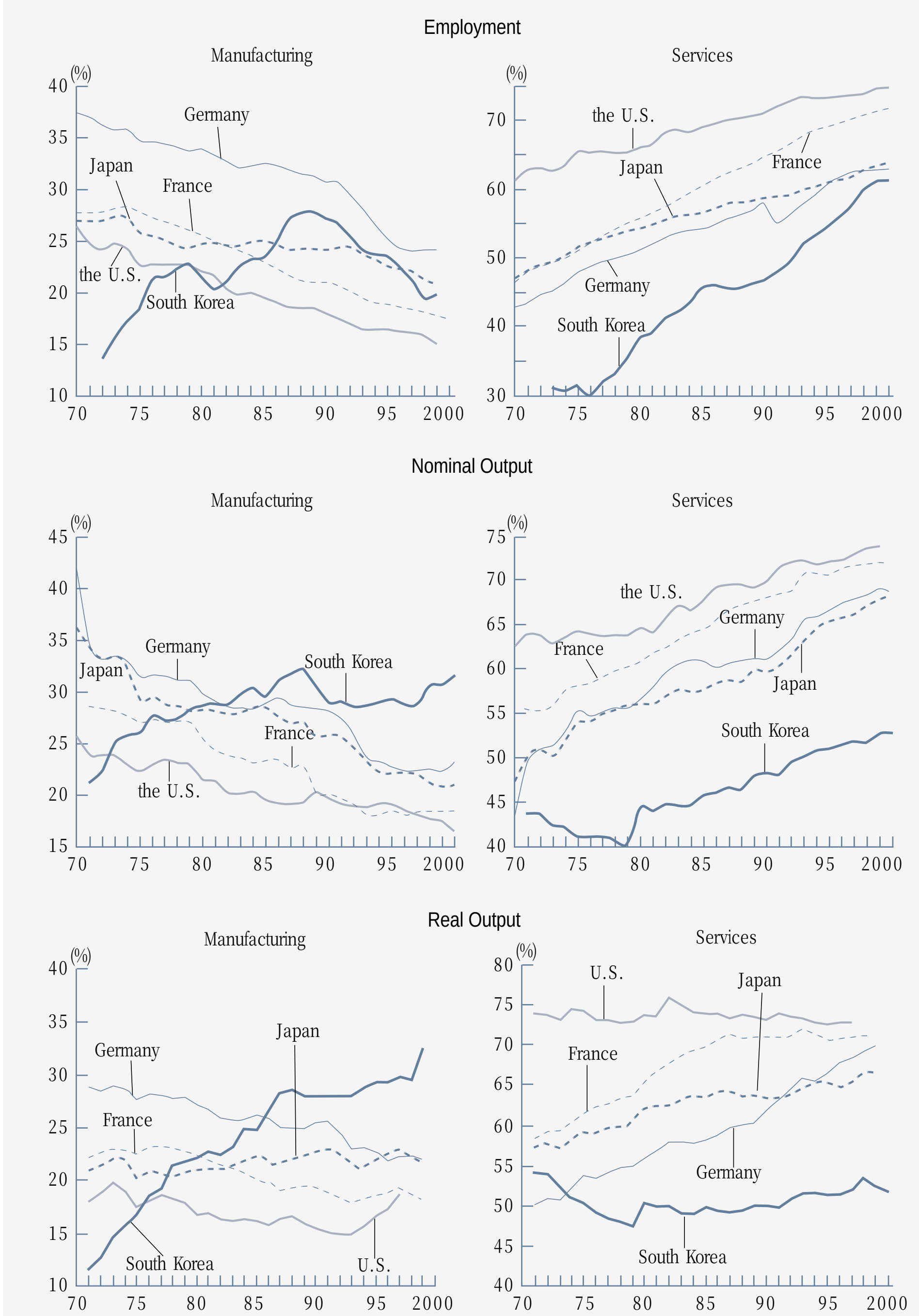
Clark(1957), invoking what economists call Engel's law, maintained that a gradual rise in income standards led to a relatively higher increase in domestic expenditures on services than on manufactured goods and thus to an increase in the share of the service sector within the total economy. And this seems to be the case for Korean economy as shown in [Figure 3]. However, given that in most advanced economies, manufacturing output at constant prices has maintained a relatively constant share, it is not most likely that the shift in spending patterns alone, which resulted from rising living standards, has made a crucial contribution to deindustrialization(refer to [Figure 4]). Rather, some argue that it can be accounted for by the fact that productivity in manufacturing grows faster than that in services on the ground that most advanced countries did not show much decrease in the output share of manufacturing at constant prices in contrast to the steadily declining share of manufacturing employment(Rowthorn and Wells 1987; Baumol, Blackman and Wolff 1989).[2)] Meanwhile, given that the rate of increase of wages in the two sectors, not mirroring the relative difference

Figure 3 Relationship between income per capita, and shares of manufacturing employment and output in Korea



2) In contrast with the arguments above, some critics have asserted that the relatively lower rate of productivity growth in the service sector is largely due to undermeasurement, and its pace will be much higher when the qualitative aspects of productivity growth of services can be measured adequately. Nevertheless, most of the existing empirical evidence supports the conclusion that productivity in manufacturing has grown faster than productivity in services(Rowthorn and Ramaswamy 1997).

Figure 4 Shares of Industries in Major Countries



Sources : OECD Historical Statistics(2001)
National Accounts, BOK
Yang · Kwon(2002)

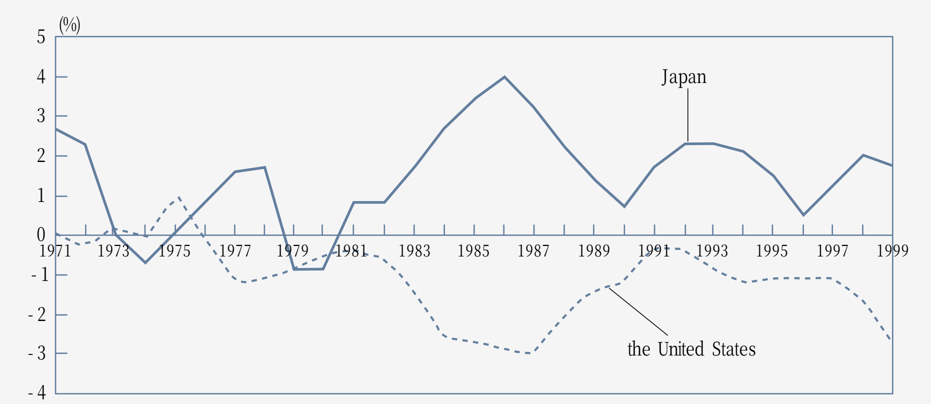
in labor productivity adequately, remains at similar levels, it is likely that deindustrialization in terms of real output is deterred through the channel of a decrease in the relative prices of manufactured goods ⇒ an increase in expenditures on them.[3)]

In addition, Stolper and Samuelson(1941), applying Heckscher-Ohlin's model to the dynamic process of economic growth, showed that labor-intensive industries in the advanced economies cease to have a relative advantage over the low-priced products from developing world, and are thus increasingly displaced by imports, which are traded for less labor-intensive exports. In practice, concerns arise that increasing FDI may be the cause of the continuous decline in the share of the manufacturing sector, in circumstances where declining export competitiveness due to rising income and the appreciation of the exchange value of the Won lead to a slowdown in the growth rate of domestic investment and a steady increase in FDI. However, the observations hitherto suggest that FDI, on the one hand, accelerates the deindustrialization process through decreases in exports and employment and, on the other hand, invigorates domestic manufacturing by productivity growth effects through the international division of labor, an increase in the export and output of raw materials and intermediate goods as the basis of output and sales and by spillover effects on high-tech industries etc.. Besides this, the greater appreciation of the currency than in equilibrium, which may be attributed to growing capital inflows or a failure in foreign currency policy, has always been a controversial element in the debate as to the falling share of that part of traditional manufacturing that has been most vulnerable to price fluctuations. It certainly caused serious trade frictions between the United States and Japan in the 1980s(refer to [Figure 5]).

Empirical analyses of the causes of deindustrialization have been performed in various ways and by a number of researchers since the 1980s when exports from the newly industrialized economies such as South Korea, Taiwan and Hong Kong began to show dramatic increases. Lawrence(1987), through an empirical test on the European countries, concluded that deindustrialization in those countries was the result of successful economic development, largely explained by the shift of consumption patterns due to rising income standards and the differences in productivity growth between industries. Rowthorn and Wells(1993), and Rowthorn and Ramaswamy(1997, 1998), in their literature on OECD countries, derived similar results showing that such internal factors as the

3) In the case of Korea, inflation rate in the service sector has remained at a relatively higher level than that in the manufacturing sector

[Figure 5] Trade Balances of the U.S. and Japan[1)]



Note : (Trade Balances/GDP)×100
Source : *Historical Statistics*, OECD

different pace of productivity growth and shifts in expenditure patterns were the main reasons for deindustrialization while North-South trade played very little role in them. By contrast, regression analysis by Saeger(1997) on the 21 OECD countries, which was the same sample as those used by Rowthorn and Ramaswamy(1997, 1998), showed that differences in productivity growth and trade with non-OECD countries made 40% and 25~30% contributions respectively to the falling share in manufacturing employment. This implies that trade with developing economies and the subsequent relocation abroad of output bases in manufacturing are one of the main causes of deindustrialization. However, only empirical tests on each country will confirm what brings about the contraction of the manufacturing sector in the economy since the reasons for deindustrialization vary according to the economic structure and phase of economic development of individual economies. In the case of Korea, a lack of availability of related data and the excessively short time-series of those that do exist have deterred accurate empirical analysis.

2. Empirical Analysis

This section will examine empirically what has made substantial contributions to the shift in Korean industrial structures on a theoretical fundamental of the trends and causes of deindustrialization. Meanwhile, it has been strongly argued that reduced competitiveness in domestic manufacturing followed by its relocation in China and Southeast Asia, constituted the main cause of a collapse of foundation for output, contradicting the results of the general analysis that deindustrialization is mostly explained by industrial development and a shift in consumption patterns, as mentioned above. Given this, in order to provide an in-depth investigation of the validity of this argument, this section will undertake an econometric analysis of the influence FDI on foreign trade.

A. General Causes of Deindustrialization

I undertook some econometric tests regarding what has contributed to the decline of the manufacturing sector in the Korean economy in terms of employment and of real output, invoking the model set up by Rowthorn and Ramaswamy(1998). First, I attempted to find out what explains the falling share of manufacturing employment, setting up model [1]. The primary regressors in the equation are income per capita, difference in labor productivity growth between sectors, and trade balances of manufactured goods. And, I also included human capital, percentage of female employment and investment ratio as miscellaneous factors which may affect the symptom.

$$\log ES_t = a_0 + a_1 \log PI_t + a_2 (\log PI_t)^2 + a_3 \log PD_t + a_4 BP_t + a_5 MP_t + a_i X_{it} + \xi \qquad (1)$$

ES : percentage of the number of employees in manufacturing in the total employees

PI : GDP per capita at constant prices

PD : differences in labor productivity growth rate between sectors(labor productivity in manufacturing /labor productivity in non-manufacturing)

BP : ratio of trade balance of manufactured goods to nominal GDP

MP : ratio of imports of manufactured goods from developing world to nominal GDP

X_i : miscellaneous variables such as human capital, ratio of female employment and investment ratio

More specifically, I employ per capita GDP at 1995 constant prices as an income variable in order to capture how much effect shifts in spending patterns due to rising income standards exert on the share of manufacturing output. And I set it up in the form of a quadratic function, considering that the scatter-plot between income standards and output shares of manufacturing is of inverse U-shape. In turn, the impacts of shifts in competitiveness of manufacturing as a whole or of increasing trade with less developed economies on manufacturing output and employment are proxied by both percentages of trade balances of manufactured goods[4] and of imports of manufactured goods from the neighboring less-developed economies(ASEAN-Singapore + China) out of nominal output. Besides these, miscellanesous variables are included in this model in that high demand for investment goods stimulates manufacturing output, especially that of the machine industry, while the active economic participation of female labor force(Fuchs 1980) and better-qualified human capital(Saeger 1997), probably, increase employment and the output share of the service sector. Dummy variable for the years 1998 and 1999 is also included to capture the structural shock on employment and output of the foreign currency crisis.

Next, the regression model was set up as in model (2) with a view to investigating which factors account for changes in shares of manufacturing output at constant prices. Although employing almost the same regressors as in the model set up above, in this model, I replaced the differences in labor productivity with relative prices of manufactured goods.

$$\log PS_t = \delta_0 + \delta_1 \log PI_t + \delta_2 (\log PI_t)^2 + \delta_3 \log RP_t + \delta_4 BP_t + \delta_5 MP_t + \delta_i X_{it} + \xi \qquad (2)$$

PS : percentage of the number of employees in manufacturing among the total employees

RP : relative prices of manufactured goods(GDP deflators of manufactured good/GDP deflator)

These regressions are undertaken by the OLS(Ordinary Least Square)[5] and GMM(Generalized Method of Moments) methods, employing yearly data from 1970 to 2001. Meanwhile, unit-root tests of the variables show that rejecting the null hypothesis of stationarity, they are all to be integrated of order one, I(1). Cointegration tests through the Johansen test method show that there exists a stable and significant long-run cointegrating relation among these variables. And, as instrument variables in the GMM, I choose a current term of each regressor and, in turn, a lagged term, in case they are thought to have

4) Manufactured goods described above cover chemicals and chemical products, manufactured goods broken down as raw materials, machinery and transport equipment, and miscellaneous manufactured articles, which are classified as classes 5~8 in SKTC(Standard Korean Trade Classification).

5) For OLS estimation, serial correlations among disturbance terms are solved through Cochrane-Orcutt methods.

endogeneity.

The estimation results of model (1), which are presented in [Table 2], suggest that the decline of the share of manufacturing employment in Korean economy is accounted for largely by the shift in such internal factors as expenditure patterns, the differential growth of productivity and the investment ratio, and the trade balance of the manufacturing sector. In addition, it is estimated that the first-order coefficient on income per capita is positive whereas the second-order coefficient on it is negative, which is compatible with the hypothesis that the function of income standards, and the share of manufacturing employment and output assumes an inverse U-curve. By contrast, imports of manufactured goods from the developing world, human capital and the ratio of female employment neither turn out to be statistically significant nor do they correspond to the related theories and stylized facts in the signs and the magnitude of the

Table 2 Determinants of Shares of Manufacturing Employment

	Log(ES)$_t$				
	OLS(1)	OLS(2)	OLS(3)	OLS(4)	GMM(1)
Intercept	-3.77 (1.28)	-3.40 (1.25)	-1.17 (0.35)	-3.11 (0.89)	-7.13 (2.09)**
log(PI)	3.14 (3.63)***	2.95 (3.66)***	2.25 (2.33)**	2.80 (2.74)**	4.06 (4.10)***
$[\log(PI)]^2$	-0.24 (3.37)***	-0.22 (3.39)***	-0.17 (2.13)**	-0.21 (2.57)**	-0.31 (3.89)***
log(PD)	-0.73 (6.76)***	-0.72 (7.73)***	-0.73 (6.46)***	-0.65 (5.76)***	-0.66 (4.96)***
BP	0.007 (3.19)***	0.007 (3.58)***	0.004 (2.03)**	-	0.01 (2.20)**
MP	0.003 (0.82)	-	-	-	-
HK	0.18 (0.94)	-	-	-	-
WM	-0.001 (0.17)	-	-	-	-
INV	0.02 (3.68)***	0.02 (3.78)***	0.02 (3.50)***	0.01 (2.77)***	0.02 (3.05)***
Dum	-0.07 (3.24)***	-0.07 (3.31)***	-	-	-0.03 (1.41)
D.W.	1.57	1.33	1.49	1.52	-
$\bar{R}^2$	0.99	0.99	0.99	0.99	0.97

Notes: 1) Figures in parentheses are t-values and *, **, *** means that the estimates are significant at the 10%, 5% and 1% levels, respectively.
2) Instrument variables for GMM are one-year lagged variables of income, trade balance and the investment ratio, and simultaneous ones of differences in productivity growth and a dummy.

estimates.

Next, the regression results of model [2] that examines which factors are accountable for a shift in manufacturing output at constant prices are, similar to the estimation results in terms of employment, that changes in consumption patterns, relative prices of manufactured goods, investment ratio and trade balance of manufactured goods have made statistically significant contributions to changes in the share of manufacturing output in real terms(refer to [Table 3]). In contrast, the shift in output structures due to increasing imports from emerging economies turns out to have had little influence on deindustrialization, which is attributable to the fact that the weakening of the base of traditional manufacturing caused by trade with emerging markets is offset by growth in exports of high-tech industries. In particular, when dividing contributions made by shifts in expenditure patterns, employing a quadratic function between income and shares of real output, I draw the conclusion that the share of spending on manufactured goods turns to a decreasing trend at a level of real GDP per capita[6] of approximately 900 to 1,200 million Korean won. This implies that with rising income standards, increases in expenditure on services overwhelm the substitution effect caused by decreases in the relative prices of manufactured goods, and the share of manufacturing output at constant prices will turn to a gradually decreasing trend.

Additionally, in analyzing contributions to deindustrialization made by each factor as shown in [Table 4], such internal factors as rising income and faster growth of manufacturing productivity have made relatively greater contributions to the phenomenon than do the external factors. Specifically, it is estimated that 113% of total changes in the share of manufacturing employment for the 1990s are accounted for by the faster growth of manufacturing productivity, 9% by increasing demand for services and -15% by increases in trade. In this light, it is concluded that the dramatic deindustrialization in terms of employment in recent years is the consequence of successful economic development, such as the rapid automation in the manufacturing sector rather than being caused by displacement due to imports from NIEs(Newly Industrialized Economies) or the weakened competitiveness of domestic manufacturing.

6) * Trends of real GDP per capita in Korea

(10 thousand Korean Won)

	1990	1992	1994	1996	1998	2000	2001
real GDP per capita	614.5	693.5	776.1	884.8	852.8	1018.0	1041.4

Table 3 Determinants of Shares of Manufacturing Output

Regressors	Log(PS)$_t$ OLS(1)	OLS(2)	OLS(3)	OLS(4)	GMM(1)
Intercept	-2.30 (1.03)	-1.43 (0.68)	0.13 (0.06)	-1.41 (0.67)	1.88 (0.87)
log(PI)	2.21 (2.99)***	1.86 (2.73)*	1.54 (1.96)*	1.85 (2.67)**	1.09 (2.15)**
$[\log(PI)]^2$	-0.16 (2.68)**	-0.13 (2.40)**	-0.11 (1.73)*	-0.13 (2.37)**	-0.08 (2.08)**
log(RP)	-0.39 (2.16)**	-0.37 (2.09)**	-0.49 (2.66)**	-0.39 (2.27)**	-0.56 (2.11)**
BP	0.008 (3.91)***	0.009 (4.10)***	0.01 (3.15)***	0.01 (3.96)***	0.02 (3.57)***
MP	0.004 (0.99)	-	-	-	-
HK	-0.006 (0.03)	-0.02 (0.08)	-	-	-
WM	-0.004 (1.05)	-0.005 (1.20)	-	-	-
INV	0.01 (2.23)**	0.01 (2.26)**	0.01 (2.13)**	0.01 (2.26)**	0.02 (1.86)*
Dum	-0.06 (2.37)**	-0.06 (2.32)**	-	-0.05 (2.17)**	-0.04 (2.29)**
D.W.	1.86	1.61	1.48	1.59	-
$\bar{R}^2$	0.98	0.98	0.99	0.99	0.99
Turning Point[2]	998.5	1279.0	1096.6	1230.8	909.1

Notes: 1) Figures in parentheses are t-values and *, **, *** mean that the estimates are significant at the 10%, 5% and 1% levels, respectively.
2) Instrument variables for GMM are one-year lagged variables of income, trade balance and the investment ratio, and simultaneous ones of differences in relative prices and dummy.
3) Turning points means GDP per capita at constant prices at the point that where the share of manufacturing output at constant prices arrives at a peak with the exclusion of substitution effects at quadratic correlation between the share of manufacturing output and income standards.

Table 4 Contributions of Various Factors to Deindustrialization

	Internal Factors				External Factors	Miscellaneous	Δlog(ES)
	Income	Productivity	Investment	Total			
1970-79	0.24 (44.0)	-0.12 (-22.3)	0.17 (30.2)	0.29 (51.9)	0.04 (8.0)	0.22 (40.1)	0.55 (100.0)
1980-89	0.16 (63.8)	0.01 (5.1)	0.04 (17.4)	0.21 (86.3)	-0.01 (-4.9)	0.05 (18.6)	0.25 (100.0)
1990-2001	-0.03 (8.8)	-0.37 (112.9)	-0.02 (7.1)	-0.42 (128.8)	0.05 (-15.4)	0.04 (-13.4)	-0.32 (100.0)

Notes: 1) Contributions of each regressor are calculated by multiplying changes of each regressor with the estimates.
2) Figures in parentheses are contribution ratio(%).

B. FDI and Deindustrialization

The estimation results above show that deindustrialization in Korean economy is largely accounted for by the differential growth of manufacturing and service productivity and the shift in expenditure patterns due to rising income standards. Nonetheless, there have been some studies(Berman et. al 1994 ; Freeman 1995) which showed that trade with the developing world or FDI has had significant relations with output or employment in the manufacturing sector, and there is a general perception that FDI, which has shown a dramatic increase in recent years, may be the main cause of accelerating deindustrialization in the near future. Therefore, this paper performs an additional empirical analysis to find what effects the increase in FDI has had on deindustrialization. Prior to the regression analysis, taking a look at trends of FDI in the Korean manufacturing sector at [Table 5], the share of FDI in GDP saw a dramatic increase to approximately 0.3% during the 1990s, which is a little larger than 0.15% of the United States and smaller than 0.5% of Japan. This result implies that Korean economy is currently in a structurally different stage from that of Japan in that outflows of FDI in Japan exeed inflows to a large extent.

Meanwhile, [Figure 6] shows that the FDI of the manufacturing sector in Korea has moved in a similar way to domestic investment, which implies that crowding-out effect of FDI on domestic investment is negligible, given that both of them are affected by economic activities in the same direction. The low substitution relation between FDI and domestic investment is, presumably, attributable to the fact that outflow sectors have largely been concentrated on those with low competitiveness or currently taking low share in domestic output.

In addition, the employment shares of sectors, from which investment outflows have increased dramatically since the 1990s, have not seen a

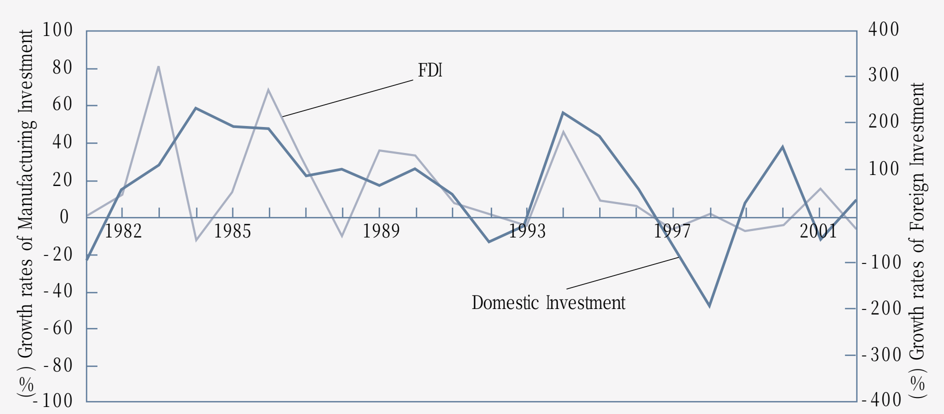
Table 5 Shares of Inflows and Outflows of Manufacturing FDI in GDP in Korea, Japan and the United States

Annual Average, %

	1981-85	1986-90	1991-95	1996-2000	2001
Korea	0.02(0.19)	0.10(0.36)	0.26(0.20)	0.36(1.17)	0.35(0.73)
the U.S.	0.03(0.09)	0.02(0.35)	0.13(0.20)	0.15(0.46)	0.19(0.25)
Japan	-	0.52(0.04)	0.31(0.04)	0.48(0.10)	0.35(0.07)

Note : 1) Figures in parentheses are shares of FDI in GDP and amounts of inflows are all on a net basis.
Sources: *Yearly Bulletins on Foreign Investment*, Export-Import Bank of Korea
Statistics of Foreign Investment, Ministry of Industry and Resources
Database Ministry of Finance of Japan, *Foreign Direct Investment in the U.S.*, BEA

Figure 6 Growth Rates of Manufacturing Domestic and Foreign Investments



Note : Manufacturing investment growth rate in Survey on Planning of Investment released by Korea Development Bank is employed for the data of domestic investment growth rates.
Source: *Yearly Bulletins of Foreign Direct Investment*, Export-Import Bank of Korea
Surveys on planning of Investment, Korea Development Bank

Table 6 Proportions of Foreign Investment by Manufacturing Sectors

Unit: %

	1981	1985	1990	1995	1998	2001
Food & Beverage	22.3(8.3)	10.9(8.0)	6.9(7.1)	4.3(8.2)	3.6(9.2)	3.4
Textiles, Apparel	4.1(29.7)	3.8(25.5)	13.8(19.6)	16.1(15.9)	12.1(16.8)	11.0
Shoes & Leather	3.7(2.4)	2.2(2.6)	3.8(2.3)	4.1(3.3)	2.7(2.2)	2.4
Wood&Furniture	3.3(3.0)	6.8(2.7)	2.4(2.8)	2.5(3.0)	1.6(2.8)	1.2
Paper, Printing	3.6(4.4)	1.3(4.4)	3.6(4.4)	2.1(5.6)	1.9(5.5)	1.5
Petroleum&Chemicals	23.3(5.2)	17.8(4.7)	9.4(5.0)	7.3(7.0)	7.1(5.8)	7.8
Non-metallic Mineral	8.1(12.1)	28.5(13.0)	3.5(13.7)	5.9(8.7)	3.6(8.4)	3.2
Basic Metal	19.4(4.3)	8.1(4.1)	28.0(4.1)	9.7(4.1)	8.1(5.2)	6.5
Fabricated Metal	- (4.5)	8.6(5.2)	3.9(5.9)	4.8(5.7)	3.0(5.6)	2.3
Machinery	- (4.1)	0.4(5.1)	1.1(7.1)	5.8(8.8)	7.0(9.5)	8.1
Telecommunication	1.3(11.9)	5.9(13.6)	6.4(16.7)	21.4(17.5)	29.0(16.8)	37.3
Vehicle, Transportation equipment	0.03(6.2)	0.01(7.3)	13.2(8.2)	10.7(9.5)	16.4(10.1)	11.6
Miscellaneous	10.9(3.8)	5.8(3.9)	3.9(3.1)	5.2(2.7)	3.8(2.2)	3.5

Note : Figures in parentheses are shares of the numbers of the employees by each sectors out of the total manufacturing employed.
Sources : Export-Import Bank of Korea Database
Input-Output Model, the BOK

suggestion of appreciable changes. This is interpreted as rough evidence of there being little correlation between FDI and employment. That is, the employment shares of business sectors, outflows of which have grown drastically in the 1990s, such as electronics and telecommunication, and vehicle and transportation equipment, have not changed greatly while there is little correlation between foreign investment and employment shares in the sector which assumed a relatively high proportion of investment outflows in the 1980s, such as petroleum, steel and food&beverage production. In other words, we do not find it rational to conclude that the recent growth of manufacturing FDI has triggered deindustrialization in employment and real production.

On these bases, this section investigates the causality between FDI and manufacturing exports through a VEC-based Granger Causality test.

$$\begin{aligned} \Delta EX_t &= a + \sum_{i=1}^{2} \beta_i \Delta EX_{t-i} + \sum_{i=1}^{2} \gamma_j \Delta FDI_{t-j} + \delta(EX_{t-1} - \xi FDI_{t-1}) + \varepsilon_{1t} \\ \Delta FXI_t &= \eta + \sum_{i=1}^{2} \theta_i \Delta FXI_{t-i} + \sum_{i=1}^{2} \lambda_j \Delta EX_{t-j} + \mu(FDI_{t-1} - \rho EX_{t-1}) + \varepsilon_{2t} \end{aligned} \quad (3)$$

EX : seasonally adjusted exports of goods at constant prices
CA : seasonally adjusted trade balances of goods at constant prices
FDI : FDI of manufacturing sectors over GDP deflator

As a result, depicted in [Table 7], while exports(trade balance) of manufactured goods have had a long-run causal effect on FDI in the 1980s, FDI has come to Granger cause exports(trade balance) of manufactured goods in the short and long run since the 1990s. The implication is that the FDI, which had been undertaken with a view to evading trade barriers and frictions with developed economies caused by a surge in exports and penetration into markets in the 1980s, changed its objective to the construction of bases in such regions as China, Southeast Asia and East Europe in the 1990s for exports by industries that had lost their competitiveness.

Based on the analysis result above, regression analysis will be undertaken for the purpose of investigating whether FDI is responsible for changes in exports and the trade balance of manufacturing sector and thus blamable for deindustrialization. I employ FDI as well as foreign income and the real effective exchange rate as factors that explain changes in exports, and add domestic income to these factors in analyzing changes in the trade balance. In addition, this analysis utilizes GMM (Generalized Method of Moments) especially in order to address the endogeneity problem among the regressors, for

Table 7 Results of VEC-based Granger Causality Test

H_0	1981. 1/4~1990. 4/4		1991. 1/4~2002. 2/4	
	x^2-statistics[1)]	Error correction term[2)]	x^2-statistics	Error correction term
export FDI	1.861(0.394)	-0.12(2.55)**	1.122(0.571)	0.11(1.68)
FDI export	1.007(0.605)	-0.02(0.46)	4.655(0.097)*	-0.20(2.26)**
trade balance FDI	1.579(0.454)	-0.10(2.62)**	0.330(0.848)	-0.03(3.01)***
FDI trade balance	0.654(0.721)	0.02(0.38)	23.834(0.000)***	-0.37(4.27)**

Notes: 1) x^2-statistics above are reported in order to test the null hypothesis of not including lagged variables of the regressors through Block exogeneity Wald test and figures in parentheses are P-values.
2) Error correction terms are lagged error terms(t-1) in long-run cointegrating equations. Figures in parentheses are t-statistics and *, **, *** means that the estimates are significant at the 10%, 5% and 1% levels, respectively.

the period from the 1st quarter 1981 to the 2nd quarter of 2002. And the 1st quarter lagged variables of all the variables but foreign income are selected as instrument variables.

$$EX_t = EX(GDP^*_t, REEX_t, FDI_t) \qquad (4)$$

$$\begin{aligned} CA_t &= EX(GDP^*_t, REEX_t, FDI_t) - MP(GDP_t, REEX_t, FDI_t) \qquad (5) \\ &= CA(GDP_t, GDP^*_t, REEX_t, FDI_t) \end{aligned}$$

EX : seasonally adjusted exports of manufactured goods at constant prices,
CA : seansonally adjusted balance of trade of manufactured goods at constant prices
FDI : Foreign Direct Investment over GDP deflator,
$REEX$: real effective foreign exchange rate index(Korean won basis)
GDP^* : seasonally adjusted GDP of the United States at constant prices,
GDP : seasonally adjusted GDP of Korea at constant prices

Estimation result suggests that FDI has had significant positive effects on exports of manufactured goods but, in contrast, does not have significant effects on the trade balance even though it is of negative sign. Most probably, the reason for the phenomenon is that favorable effects that rising FDI exerts on exports, such as penetration into foreign markets and increasing demand for raw materials and intermediate goods overwhelm the export-decreasing effects triggered by the relocation of output bases abroad. Besides this, the effects of FDI on trade balance of manufactured goods turn out not to be statistically significant, suggesting that the substitution effects of goods produced by host-

countries for domestic production are not significant. This implies that FDI does not cause the share of domestic output and employment in manufacturing sector to fall; in other words, deindustrialization.

$$\begin{aligned} Log(EX)_t &= -10.86 + 2.25 Log(GDP^*)_t - 0.20 Log(REEX)_t + 0.19 Log(FDI)_t \\ &\quad\ (2.54)^{**}\ (4.39)^{***} \qquad\qquad (1.43) \qquad\qquad (3.25)^{**} \\ \overline{R^2} &= 0.89,\ \text{IV:Log}(GDP^*)_t,\ \text{Log}(REEX)_{t-1},\ \text{Log}(FDI)_{t-1} \qquad (6) \end{aligned}$$

$$\begin{aligned} Log(CA)_t &= -4.21 - 2.29 Log(GDP)_t + 6.02 Log(GDP^*)_t \\ &\quad\ (0.49)\ (2.13)^{**} \qquad\qquad (6.14)^{***} \qquad\qquad (7) \\ &\quad - 1.53 Log(REEX)_t - 0.06 Log(FDI)_t \\ &\quad\ (2.36)^{**} \qquad\qquad (0.19) \\ R^2 &= 0.55,\ \text{IV: Log}(GDP)_{t-1},\ \text{Log}(GDP^*)_t,\ \text{Log}(REEX)_{t-1},\ \text{Log}(FDI)_{t-1} \end{aligned}$$

Ⅳ. Conclusion

Concerns over the possibility of the Korean economy's deindustrialization and hollowing out of manufacturing have arisen as, after peaking at the end of the 1980s, employment share of manufacturing sector turned to a downward trend and, moreover, manufacturing firms have, in recent years, increasingly transferred their plants and headquarters to China or South-eastern Asian countries. Nevertheless, empirical analyses of these development are far from sufficient. Accordingly, this paper has provided outlines of the trends of the Korean economy's deindustrialization and analyzed its causes from both theoretical and empirical aspects.

The results of these analyses may be summarized as follows. Whereas the Korean economy already entered the stage of deindustrilization in terms of employment and nominal output from the late 1980s, deindustrilization has not begun yet in terms of real output. The chances are, however, that as the increasing demand for manufactured goods caused by the fall of their relative price is overwhelmed by the increase in demand for the service sector that accompanies rising income standards, the Korean economy will gradually enter onto the stage of deindustrialization even in terms of real output. It is estimated that deindustrialization in the case of the Korean economy is not attributable to a failure in competitiveness in domestic manufacturing or the dramatic growth of North-South trade, but is predominantly the consequence of successful economic growth largely caused by the relatively faster growth of productivity in the manufacturing sector and the shift of consumption patterns according to rising income standards. In addition, another estimation result shows that increasing FDI in the manufacturing sector has not had an appreciable influence on the trade balance. And, therefore, it may be concluded that in the case of the Korean economy, FDI is not directly related to the hollowings of manufacturing(or deindustrialization) triggered by the overall relocation abroad of output bases due to weakened competitiveness.

It is likely that this deindustrialization is accompanied by sluggish growth and, if it proceeds at an uncontrollably rapid speed, may result in a variety of problems, such as increasing structural unemployment or a deepening of income inequality, etc. Therefore, it is thought that, in order to cope effectively with the above-mentioned problems caused by deindustrialization, ⅰ) we should foster intensively on the sectors whose productivity rises with relatively greater rapidity and which contribute to the growth of other sectors to a large degree, such as information&communication, distribution and financial services, ⅱ) improve the flexibility of labor and capital markets, ⅲ) stimulate intra-industry competition and, thereby, induce the voluntary improvement of productivity by eliminating unnecessary entry barriers to service sectors and extending its openness, and ⅳ) make every endeavor to firmly establish a social safety net to guard against rising unemployment and a widening income gap.

Meanwhile, concerns over sluggish growth caused by deindustrialization may lead policymakers to consider measures to slow deindustrialization in a rather artificial and aggressive way, for instance, by extending policy support for manufacturing or cracking down upon inflows of production inputs to the service sector. Such industrial policies may help achieve high growth and low unemployment over the short term but, in the long term, they ⅰ) will lower the capacity to meet the increasing demand for services in accordance with higher income and, thereby, deteriorate the trade balances in the service sector, ⅱ) will, most likely, weaken the competitiveness of manufacturing by delaying the growth of productive services as well. Furthermore, it is possible that ⅲ) the rapid growth of labor productivity in manufacturing will trigger a decline in labor demand ⇒ the delay of the growth of the service industry which has a high labor absorption capacity ⇒ the reduction of the labor absorption capacity of the overall economy ⇒ increased unemployment.

Thus, if deindustrialization occurs naturally in the course of economic

development and, at the same time, not with such rapidity as to cause concern, it is preferable to emphasize a policy of minimizing the adverse effects that may accompany its progress rather than restricting deindustrialization itself in an artificial way.

This paper is considered meaningful in that it has investigated the trends and causes of deindustrialization in the Korean economy by reviewing trends of deindustrialization from a variety of aspects and providing both theoretical and empirical explanations of why the share of manufacturing has seen structural change.

Nevertheless, since this paper has limitations in that it does not adequately and methodically shed light on the effects of deindustrialization on the economy as a whole, it remains for future empirical studies to find the extent to which growth and employment are affected by deindustrialization.

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Appendix. The Results of Unit-root test and Cointegration test

Results of Unit-root test(I)

	ADF		PP	
	I(0)	I(1)	I(0)	I(1)
Log(PI)	-2.156	-5.133***	-2.523	-5.413***
Log(ES)	-2.067	-3.901**	-1.167	-3.767**
Log(PS)	-3.235	-4.358***	-3.352*	-4.389***
Log(PD)	-1.308	-4.040**	-0.917	-3.984**
Log(RP)	-2.336	-4.233**	-2.981*	-6.095***
BP	-2.902	-5.021***	-2.712	-5.813***
MP	-2.309	-3.652**	-2.978	-5.184***
HK	-2.172	-4.021**	-1.833	-7.308***
WM	-2.320	-4.599***	-3.016	-7.247***
INV	-2.144	-5.369***	-1.935	-4.151***

Note: The lags are chosen by default on e-views 4.0 and *, **, *** means that the null hypotheses of having unit-roots are rejected at 10%, 5% and 1% levels respectively.

Results of Unit-root test(II)

	ADF		PP	
	I(0)	I(1)	I(0)	I(1)
Log(EX)	-0.172	-4.315***	-0.257	-9.968***
Log(CA)	-1.223	-4.837***	-1.323	-9.003***
Log(FDI)	-1.120	-3.932***	-0.744	-7.187***

Note: The lags are chosen by default on e-views 4.0 and *, **, *** means that the null hypotheses of having unit-roots are rejected at 10%, 5% and 1% levels respectively.

Johansen Cointegration test

LOG(PS), Log(PI), [Log(PI)]^2, Log(RP), BP, INV

H_0: r	5% Critical	5% Critical	Max-Eigen St.	5% Critical	Eigenvalue
None	244.16**	131.70	75.65**	46.45	0.9197
r≤1	168.52**	102.14	56.49**	40.30	0.8479
r≤2	112.03**	76.07	41.45**	34.40	0.7489
r≤3	70.58**	53.12	24.74	28.14	0.5617
r≤4	45.83**	34.91	20.14	22.00	0.4889
r≤5	25.70**	19.96	17.33*	15.67	0.4388
r≤6	8.36	9.24	8.36	9.24	0.2433

Log(ES), Log(PI), [Log(PI)]^2, Log(PD), BP, INV

H_0: r	Trace St.	5% Critical	Max-Eigen St.	5% Critical	Eigenvalue
None	242.65**	131.70	79.33**	46.45	0.9289
r≤1	163.32**	102.14	49.71**	40.30	0.8093
r≤2	113.61**	76.07	34.09	34.40	0.6790
r≤3	79.52**	53.12	30.05*	28.14	0.6327
r≤4	49.47**	34.91	24.65*	22.00	0.5603
r≤5	24.82**	19.96	18.40*	15.67	0.4584
r≤6	6.43	9.24	6.43	9.24	0.1928

LOG(EX), LOG(FDI)

H_0: r	Trace St.	5% Critical	Max-Eigen St.	5% Critical	Eigenvalue
None	32.16**	19.96	21.67**	15.67	0.3518
r≤1	10.49*	9.24	10.49*	9.24	0.1891

LOG(CA), LOG(FDI)

H_0: r	Trace St.	5% Critical	Max-Eigen St.	5% Critical	Eigenvalue
None	37.61**	19.96	31.25**	15.67	0.4648
r≤1	6.36	9.24	6.36	9.24	0.1194