PART 4

MARKET DISTORTIONS

AND TRADE

13. The Financing of Export-Oriented Growth in Korea

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THE FINANCING OF EXORT-ORIENTED GROWTH IN KOREA

The economic performance of Korea together with the achievement of Hong Kong, Singapore, and Taiwan over the past two decades is often cited as one of the most striking features of modern economic history. These countries, known as the Asian NICs, have sustained rapid growth of output and employment through their successful promotion of manufactures exports.

From the mid-1960s onward, the Korean government has pursued an outward-looking development strategy which places emphasis on the expansion of manufactures exports. In order to promote exports, the government has provided the exporters, and those engaged in export-related production activities, with a wide range of incentives. Among them, interest-rate subsidies and credit availability have been the major export inducements. The financial incentives require extensive government intervention in the capital market. It is arguable that intervention is both more effective and more efficient than restrictions in the goods market as a means of inducing sectoral allocation of investment at certain stages of development. In Korea, however, the capital-market intervention has resulted in a high degree of financial repression, and the cumulative effect of the capital-market distortions has increased with the transition of the economy to a mature stage of development where allocational criteria are relatively more complex and difficult to devise.

The purpose of this paper is to analyse the effects on the sectoral factor and investment expansion of financing of the export-oriented growth in Korea during the past two decades. In sequence the discussion will treat: the system of export financing; credit rationing and government intervention in resource allocation in general; the association between subsidised credit rationing and the expansion of sectoral output and export; and finally the effect of the export financing system and government credit allocation in general on sectoral investment. Within a neoclassical framework of investment behaviour, the final section analyses empirically the issue of credit fungibility in Korea's manufacturing sector.

GOVERNMENT INTERVENTION IN RESOURCE ALLOCATION AND
EXPORT FINANCING

The Korean government has intervened extensively in the allocation of
resources by controlling interest rates and financial institutions. Most of the
banking institutions have been arms of the government's industrial policy.
The government has behaved as if, in the absence of intervention, some
sectors that are important for development would not receive an adequate
amount of credit while others would receive more than socially and
economically desirable.

With the adoption of an outward-looking development strategy in the mid-
1960s that placed emphasis on promoting exports, the government has sought
to allocate a larger share of investment resources to the export-producing
manufacturing sector. Due largely to this industrial policy, exporters and
those engaged in export-related activities have been by far the most favoured
borrowers at the banks in Korea. Exporters have access to short-term loans
tied to the gross volume of export sales (the term of which does not in general
exceed 30 days) and long-term loans for fixed investment in export-oriented
industries. Export loans are all subsidised and preferential in that they carry
interest rates lower than the general bank lending rates and are made available
only to those who generate exports.

Short-term export loans are automatically extended without limit to those
with valid letters of credit irrespective of the domestic value-added content of
exports. They include loans for production and collection of export goods,
domestic purchases as well as imports of raw materials for exports,
agricultural and fisheries export preparations, and suppliers in foreign
currency. Long-term export loans consist of foreign-currency loans supplied
by domestic banking institutions within the limit of their foreign-exchange
holdings, equipment loans for export industries and export-import bank loans
for export on credit.[1]

As shown in Table 7.1, long-term loans as a percentage of the total export-
related credit were negligible until the mid-1960s. Beginning in 1967, the
share of long-term loans has risen markedly, largely because of a sharp
increase in foreign-currency loans. Excluding the foreign-exchange loans,
the share of long-term loans amounted to about 12 per cent between 1973 and
1980. It should be noted, however, that the institution of foreign-currency
loans did not represent any new element in the export subsidy scheme. These

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[1]Long-term loans are not tied to export-sales but have been extended since 1973 in
a discretionary manner to industries specializing in exports.

loans partially replaced foreign loans, mostly in the form of suppliers' credit for which domestic banks provided payment guarantees and to which exporters had relatively easy access so long as the loans were for the financing of imported intermediate and capital goods to be used in export production. The partial substitution of foreign loans for foreign-currency loans by domestic banks was motivated by the government's effort to allocate more efficiently, and to mitigate the domestic liquidity effect of, growing foreign-exchange holdings.

The export financing system has provided a powerful stimulus to firms to export once they begin production. This system has spread the lending activities of the deposit money banks more broadly throughout the manufacturing sector than would have been the case if the loans had been discretionary. It has also eliminated much of the cost involved in obtaining the rationed loans of the banking system.[2]

Financial incentives in the form of availability of credit at subsided interest rates induce domestic producers to sell abroad, rather than in the home market, as the incentives increase the effective exchange rate for exports. The automatic availability of credit also generates the powerful effect of encouraging investment in export-oriented industries. In a regime where strict credit rationing is administered, credit availability can be a far more important incentive than interest-rate subsidies.[3] When the official interest rates are often held below the expected rate of return to capital, and banks are the major source of credit, business enterprises are highly leveraged and their liabilities are mostly short-term. Under these circumstances, bank credit can be critical for both the success and survival of firms.

In addition to the automatic availability of export-related credits, access to other types of bank credit has been better for exporters than for domestic-market-oriented firms for several reasons. In line with government industrial policies designed to direct more resources to export-generating sectors, financial institutions have been explicitly or implicitly encouraged to support exporters. Therefore, exporters have been treated as preferred customers in the rationing of credit by banks. From the viewpoint of the banks, exporters are also preferred borrower because, unlike domestic-market-oriented

[2]The system has also several defects. See Y. C. Park, "Export-Led Growth and Industrial Transformation in Korea, 1970-80," Institute of Economic Development, Discussion Paper No. 7, Korea University, 1983.

[3]This can be seen more clearly when the export financing scheme is compared with a real depreciation designed to ncourage exports. A real depreciation, like interest subsidies, would favour export sales but does not necessarily imporve exporters' accessibility to bank financing.

enterprises, exporters are assured of credit so long as they maintain a certain rate of growth of export revenues. With a rediscounting facility at the central bank, discounting of export-related bills has been one of the major sources of bank profits. Indeed the banks have had every reason to attract exporters and then support them financially in preference to other customers.

The export financing system in Korea is geared to promote exports by making export sales more profitable and also by encouraging investment in export-oriented industries. The financial incentive scheme may not have always succeeded in keeping the real exchange rate favorable to exporters. However, the coupling of short-term export financing with the preferences given to exporters in the allocation of credit in general has meant that the Korean government has succeeded in allocating a large share of financial resources to exporters. One important question arising from these circumstances is whether the credit-allocation policy that favours exporters has contributed to the investment expansion in export-oriented manufacturing sectors. This question is important because if it can be shown that the allocation policy has had little effect on the investment in export-oriented industries, then one might doubt the efficiency of Korea's export financing scheme. We will return to this question in some detail.

CREDIT RATIONING IN KOREA

The most important form of government subsidy in Korea is to maintain extremely low real interest rates on bank loans by applying fixed nominal rates of interest and at the same time to maintaining high rates of inflation through expansionary monetary policy. These low-interest loans are then rationed to the preferred sectors for export promotion.

Total loans provided through the deposit money banks (DMB), the Korea Development Bank (KDB) and the Korea Export-Import Bank (EXIMB) have steadily increased from about 15 per cent of GNP in 1962-66, to about 32 per cent in 1967-71, about 39 per cent in 1972-76 and about 46 per cent of GNP in 1977-81. During 1962-66, the EXIMB did not exist but the KDB alone provided more than one-third of total bank loans in the form of discretionary policy loans. During 1967-76, the KDB and the EXIMB provided only about 15 per cent of total loans but, due to the rapidly expanding EXIMB activities since the late 1970s, their share in total bank loans expanded to about 18 per cent during 1977-81. Discretionary policy loans provided through the DMB were in the form of a machine-industry promotion fund, a term-loan fund, a medium-industry fund, an export-industry equipment fund, an industrial rationalization fund, a foreign-loan

fund, a national investment fun, and foreign-currency-loan fund, among others. These loans increased from about 10 per cent of total loans in 1962-66 to about 20 per cent in 1967-81. Therefore, the magnitude of loans formally designated as discretionary policy loans amounted to around 36 per cent of total bank loans during 1967-81.

Short-term export credits and loans for agriculture, fisheries and housing may be classified as non-discretionary policy loans. The magnitude of such loans was about 17 per cent of total loans during 1967-81. This implies that the proportion of formal policy loans slightly exceeded half of total loans (provided through the DMB, the KDB and the EXIMB) during 1967-81. However, commercial bills discounted and loans based on general banking funds were also rationed with the discretion of the government in Korea, and hence they should be regarded as non-policy but discretionary loans. The magnitude of such loans declined from about 30 per cent of total loans in 1967-71 to about 20 per cent in 1977-81.

Overdrafts, loans based on installment savings deposits, loans for the populace, remunerations (Citizens National Bank loans based on installment savings deposits) and loans by the branches of foreign banks might be regarded as non-policy loans free of government discretion, though they still seem to have been subject to favoritism and political influence. The magnitude of such non-discretionary, non-policy DMB loans amounted to around 22 per cent of total loans during 1972-81.[4]

The real interest rate (the difference between the nominal interest rate and the rate of change in GNP deflator) on one-year time deposits amounted to about −10.7 per cent per annum on average in 1954-65, 10.0 per cent per annum during the high-interest-rate era of 1965-71, and −3.4 per cent per annum in 1972-81. The real interest rate applied to discounts of commercial bills amounted to −7.3 per cent annum on average in 1954-64, 9.5 per cent annum per in 1965-71, and −1.7 per cent per annum in 1972-81.[5]

The weighted average real interest rate on foreign loans amounted to 2.1 per cent per annum during 1967-71 and −7.4 per cent per annum during 1972-76.[6] During 1977-79, Korea maintained a fixed exchange rate (at W 484 per US dollar) in spite of the fact that domestic prices were rising at about 19 per

[4]They amounted to only about 12 per cent of total loans in 1962-66 and about 19 per cent in 1967-71.

[5]W. Hong, "Export-Oriented Growth and Trade Patterns of Korea," Paper presented at NBER Conference, *The Global Implications of the Trade Pattern of East and Southeast Asia*, Kuala Lumpur, January 1984.

[6]W. Hong, *Trade, Distortions and Employment Growth in Korea*, Seoul: Korea Development Institute, 1979, p. 201.

cent per annum while the weighted average price level of its major trade partners, the US and Japan, was rising at about 6 per cent per annum, applying equal weights to both countries. Since the Eurodollar average interest rates amounted to about 11 per cent per annum during 1977-79, the real interest rates on Korea's foreign borrowing could not have exceeded –2 per cent during 1977-79.[7] Naturally, the foreign borrowings have also been strictly controlled by the government.

The total volume of domestic loans provided through the DMB, the KDB and the EXIMB amounted to about 39 per cent of GNP in 1972-76 and about 46 per cent of GNP in 1977-81. We may approximate the real interest rates on entire loans provided by all banking institutions in Korea with the real interest rates applied to the discounts of commercial bills.[8] On the other hand, the estimated average real rates of return on investment in the Korean manufacturing sector amounted to about 22 per cent during 1972-79. (See Hong, 1984.) If we take the difference between the real rate of return on investment and the real interest rate as the subsidy rate associated with domestic bank loan allocations, the annual provision of credit subsidies in Korea amounted to at least 10 per cent of GNP each year on average in the 1970s. At 10 per cent of GNP, the domestic credit subsidy must be judged large enough to significantly affect the pattern of Korea's output and trade. Furthermore, there were also low-interest foreign loans allocated directly to entrepreneurs amounting to about 6 per cent of GNP each year on average in the 1970s.

SUBSIDIZED CREDIT RATIONING AND EXPANSION
OF SECTORAL OUTPUT AND EXPORT

In this section we will examine the association between sectoral credit rationing and sectoral factor substitution, and the expansion of output and

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[7]Since 1980, there were significant devaluations and worldwide high interest rates which effectively terminated the era of low-cost foreign borrowing for Korean businessmen.

[8]The weighted average real interest rate on entire loans provided by all banking institutions in Korea amounted to –14.4 per cent per annum in 1962-64, 4.1 per cent in 1965-71 and –6.2 per cent in 1972-76. The real interest rate applied to discounts of commercial bills amounted to –7.1 per cent, 0.5 per cent and –2.5 per cent in each period. This implies that the rates on disconunts of commercial bills overestimate the real interest rates on total bank loans by 4 to 7 per cent. See Hong, *Trade, Distortions and Employment Growth in Korea*, pp. 162-201.

exports in Korea during the period 1971-82. Most of the labour-intensive manufacturing sectors listed in Table 7.2, such as clothing, footwear, electronics, telecommunication equipment, miscellaneous manufactures, miscellaneous chemicals, metal products, electrical machinery and equipment, maintained very low loan-value-added ratios (L-VA ratios) amounting to around 60 per cent of the manufacturing average during 1971-82. The low L-VA of a sector does not by itself imply that the sector has received relatively unfavorable treatment in loan allocation. The very nature of the sector may not require a high L-VA ratio. However, given the subsidised rates of interest applied to bank loans, the below-average L-VA ratio implies the relatively small amount of subsidy allocation 'per value added' in the sector.

In spite of the relatively low L-VA ratios, all these labour-intensive sectors maintained very high 'gross' rates of return thought the 1970s and the early 1980s.[9] Furthermore, most of these sectors achieved either significant factor substitutions or significant expansion of output or both. Although the share of labour-intensive manufactures in total manufactures exports declined from about 90 per cent in 1970 to about 65 per cent by 1980, clothing, footwear, textiles and miscellaneous manufactures equipment were the major export sectors of Korea throughout the period 1970-80. Furthermore, the export of electronic and telecommunication equipment, metal products, electrical machinery, non-metallic mineral products and miscellaneous chemicals expanded very rapidly during the period.

Textiles and wood products were the most capital capital-intensive sectors among this labour-intensive manufacturing group. The textiles sector has consistently revealed relatively low rates of return, maintained the above-average L-VA ratios and yet achieved the below-average rates of output expansion and factor substitution. The wood products sector, which was the leading export sector of Korea in the late 1960s and early 1970s, revealed average or below-average rates of return during 1971-82 but maintained very high L-VA ratios and achieved significant factor substitutions. The share of textiles in total manufactures exports (12 per cent) did not change while the share of wood products dropped from about 14 per cent to 2.5 per cent during 1970-80. In spite of the very high L-VA ratios, the wood products sector revealed the poorest performance in output and export expansion among the

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[9]The 'gross' rate of return on capital is defined as the ratio of non-labour share of value-added to capital stock. Capital stock consists of physical assets and net working capital. The gross rates of return and L/VA ratios presented in Table 7.2 represent the average annual figure for the periods 1971-82, respectively.

labour-intensive group of sectors.

The capital-intensive manufacturing sectors, consisting of shipbuilding, automobiles and their parts, large-scale machinery manufacturing, non-ferrous metal products, industrial chemicals including fertilizers, iron and steel products, and cement, revealed very low gross rates of return during 1971-73. And yet all these sectors maintained relatively high L-VA ratios during 1971-82, implying a relatively large amount of subsidy allocation per value added in the form of low-interest bank loans. The rates of return revealed by these sectors in the early 1980s (1980-82) were still very low.[10] In Table 7.2, these sectors are listed under the heading 'low return/high L-VA group.' Despite their low return, the shipbuilding sector achieved a significant output expansion, and the automobiles and parts and cement sectors achieved significant factor substitutions while the large-scale machine manufacturing, non-ferrous metal products, and iron and steel products sectors achieved both significant output expansion and significant factor substitutions during 1971-82. Furthermore, with the exception of non-ferrous metal products, the share of each of these capital-intensive manufactures in total manufactures exports significantly expanded during 1970-80. Indeed, shipbuilding and iron and steel have become major, if not the most important, export sectors of Korea since the late 1970s. In terms of rates of return and export expansion, the non-ferrous metal products sector revealed the poorest performance among the above capital-intensive group of sectors.[11]

In spite of the relatively low L-VA ratios, most of the labour-intensive manufacturing sectors constituted the major export sectors of Korea. On the other hand despite very high L-VA ratios, many capital-intensive sectors

[10]Shipbuilding, automobiles and parts, large-scale machinery manufacturing and industrial chemical sectors revealed above-average rates of return during the high growth period of 1974-79.

[11]The synethic fibre yarn sector has also maintained above-average L/VA ratios and achieved significant factor substitutions but may be exceptional in the sense that this sector could maintain very high gross rates of return. Sugar refining, rubber types, and pulp and paper products sectors maintained below-average L/VA ratios and yet these sectors revealed very high rates of return and achieved significnat factor substitutions and output expansions. The high rates of return revealed in these sectors might be explained by the high rates of protection accorded to them, but all these sectors achieved substantial increases in export shares. Petroleum refining, which has been the most capital-intensive manufacturing sector in Korea, did not maintain very high L/VA ratios. The pertoleum refineries were mostly financed by direct foreign investments. This sector revealed very low rates of output expansion, factor substitution and export increase.

failed to become the export leaders. However, some of them did become the leading export sectors while most of the other capital-intensive manufacturing sectors were able to achieve rapid export expansion in the 1970s. As a result, the share of capital-intensive manufactures in total manufactures exports expanded from about 9 per cent in 1970 to about 31 per cent in 1980. If we exclude textiles and wood products from the labour-intensive group of manufacturing sectors listed in Table 7.2, their share in total manufacturing fixed assets expanded from about 12 per cent to about 18 per cent during 1971-82. On the other hand, the share of the 'low return/high L-VA' sub-group of capital-intensive sectors in total manufacturing fixed assets expanded from about 30 per cent in 1971 to about 46.7 per cent in 1982. That is, the rates of expansion of the shares in total manufacturing fixed assets were very similar, about 50 per cent and 56 per cent, for both the very profitable labour-intensive subgroup and the much less profitable capital-intensive subgroup respectively.

The relatively low L-VA ratios maintained by the labour-intensive manufacturing sectors imply that these sectors received a relatively small subsidy per value added in the form of low-interest bank loans. However, the very nature of labour-intensive manufacturing may not require the maintenance of L-VA ratios as high as those in capital-intensive manufacturing. The fact that extremely high rates of return have been revealed in the very labour-intensive sectors, such as clothing and footwear, may imply that those sectors did not really need any subsidy at all. Abundant labour and low wage rates themselves might have been sufficient bases for a rapid expansion of outputs and exports of those sectors. Hence, whatever subsidy was given to them through the low-interest loans was a windfall income transfer, especially after the initial phase of infant export marketing. For instance, low-interest short-term trade credits have been allocated to all export activities at a uniform rate per dollar exported. As a result, there seems to have been enormous income transfers to the exporters of very labour-intensive goods. This may partly explain the phenomenal expansion of some business groups which have started mainly as exporters of clothing and footwear to become large conglomerates.

If the subsidised loans were allocated to selected entrepreneurs without any specified obligations, they would maximize the windfall income transfers from the government simply by investing in more profitable labour-intensive projects. However, even when subsidised loans were allocated on condition that capital-intensive projects were undertaken, presumably to generate external economies, the negative real interest rates applied to such loans meant that the entrepreneurs could still gain sizeable profits by obediently

undertaking such projects instead of rejecting the loan rationing altogether. Furthermore, it is possible to make large profits by cheating the government and smuggling significant portions of such funds to other more profitable projects. This may partly explain aggressive diversification into the labour-intensive consumer goods, service and real estate sectors by some business groups which started mainly as the manufactures of capital-intensive goods.

Most capital-intensive manufacturing sectors have maintained relatively very high L-VA ratios in the 1970s. Perhaps the nature of capital-intensive manufacturing might require the maintenance of L-VA ratios even higher than those observed in Korea. However, the very low gross rates of return revealed by most of the capital-intensive manufacturing sectors in Korean may imply that the substantial expansion in outputs and exports and the substantial increases in the capital-intensity of their production techniques may own much to the subsidy element associated with credit rationing. It can be argued that such sector-specific subsidised credit rationing was an optimal growth policy for Korea, justified by the observed high growth rates of the Korean economy in the 1970s. Similarly, the accumulating foreign debt and the low growth performance of the Korean economy in the 1979-82 period raises suspicions about both the efficiency and the continued wisdom of the credit rationing system.

EMPIRICAL EXAMINATION OF CREDIT DIVERSION IN MANUFACTURING

Overview

In intervening in the financial markets, the government is not interested in the sectoral allocation of credit per se but in effecting the allocation of physical resources. As noted above, the Korean government has followed, for the past twenty years, an industrial policy designed to allocate more resources to export-producing manufacturing sectors. To what extent has the Korean government succeeded in attaining this objective? It is undoubtedly an extremely difficult question to answer even at a theoretical level and one that requires reliable microeconomic data for an empirical examination. The key to the answer lies in the fungibility of credit. If credit fungibility is easily achieved, the government cannot expect to be successful in effecting what it considers to be an optimal allocation of physical resources. But it is difficult to measure the degree of credit fungibility.

The fungibility issue could be examined at the two stages of the credit allocation process. At the first stages, which is related to the lending

behaviour of financial institutions, it is possible that the financial intermediaries may simply evade or ignore the credit guidelines and directives. That is, the financial intermediaries themselves may be guilty of the credit diversion. This problem does not appear to have been serious in Korea because of the government's close supervision of the day-to-day operations of the DMB and other financial intermediaries.

At the second stage of credit allocation, which is related to the behaviour of borrowers, it is conceivable that a large part of bank credit has been diverted to the uses of real resources other than those designated by the government. One possible reason for this diversion is that the DMB and the KDB do not have an effective system of credit-use supervision. Even if they do have one, the management of these financial institutions would not be very much concerned about and hence would not actively supervise the actual use of bank credits, because the management is not responsible for the provision of directed and policy loans. The lack of autonomy in bank management may have aggravated credit diversion.

One piece of evidence supporting a high degree of credit fungibility is that firms invest heavily in real assets. A special measure issued in September 1980 shows that business groups and corporations hold a large share of their total assets in the form of real assets such as land and buildings.[12] Their holdings of these assets, the government points out, were far greater than the level that is normally required for their business operations. The presumptions here are that businesses invest in real assets as a hedge against inflation and a provision of collateral for bank loans, and that the bulk of their holdings were financed by bank loans in the first place. One large business group, which was once a ranking exporter, was so heavily involved in real-estate speculation financed by export loans that it went bankrupt in 1978 when its export earnings fell sharply and the real-estate boom cooled off. Undoubtedly, there have been numerous similar cases among smaller business groups.

Framework of Analysis

As the discussion in the preceding section suggests, the degree of diversion in credit use rests on a number of economic and institutional factors and its analysis is ultimately an empirical issue. In this section, we attempt to measure empirically the degree of credit fungibility in several sectors of Korea's manufacturing industry, using an investment demand model.[13]

Let us assume that there are two sources of funds for investment. One source consists of firms' internal reserves, the capital market, and the

unregulated money market where funds are available by competition between firms. The second source lies in the organized financial institutions that allocate credit according to the priorities and criteria set by the government. Under this assumption, a sectoral share of total funds may be described by a weighted average of the sectoral shares of government-controlled and private funds,

where F_i is the ith sector's total fund share, ω_1 is the weight for the

$$F_i = \omega_1 GF_i + (1 - \omega_1) PF_i \tag{1}$$

government-controlled fund, and GF_i and PF_i are government-controlled and private fund shares in the ith sector, respectively. If credit fungibility is negligible, F_i is the sectoral share of nominal investment. In the absence of government intervention ($\omega_1 = 0$), F_i reflects a competitive sectoral allocation of investment resources. Recipients of government-controlled funds may not necessarily use the credit for the financing of the stipulated projects and may divert it to the financing of other investment activities. To estimate this credit-diversion effect, we introduce a fungibility parameter, θ, into equation (1).

where $0 \le \theta \le 1$. FH_i is now the share of total funds in the ith sector that takes

$$FH_i = \theta_i GF_i + (1 - \theta_i) PF_i \tag{2}$$

into consideration the possibilities of credit diversion. If one dollar of government-controlled credit allocated to the ith sector is completely diverted to another sector, then $\theta = 0$ and $FH_i = PF_i$, which is the case of perfect fungibility. If there is no credit diversion, then $\theta = 1$ and $FH_i = F_i$. In this case the government authorities can exercise almost complete control over the sectoral allocation of investment by manipulating GF_i.

In order to estimate the value of θ, we introduce a rationally distributed lag investment function developed by Jorgenson.[14] Investment in real terms, I_t, is defined by

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[12]This measure required 1,217 large firms to report their holdings of land and buildings, classified into those used for business operations and others presumably held for real estate speculation.

[13]Developed by D. W. Jorgenson 'The Theory of Investment Behaviour.' in R. Ferber, ed., *Determinants of Investment Behaviour*, New York: NBER, 1967, and extended by T. Kwack, *Investment Allocation in a CCE Model for Korea, mimeo*, Korea Development Institute, 1983.

where NI_t is net investment,   is the rate of depreciation, and K_{t-1} is the stock of capital at $t - 1$. Following Jorgenson and Kwack,[15] We assume that NI_t is

$$I_t = NI_t + K_{t-1} \tag{3}$$

described as
where L is the lag operator, $K*$ the desired stock of capital at t, FCR is the real volume of government-controlled credit, and the fungibility parameter.

$$NI_t = \frac{}{(1 - L)} K_t^* + \frac{}{(1 - L)} FCR_t \tag{4}$$

Equation (4) can be rewritten as
By substituting equation (5) into equation (3) and from a repeated substitution, we obtain

$$NI_t = \sum_{j=0}^{x} {}^{j} K_{t-j}^* + \sum_{j=0}^{x} {}^{j} FCR_{t-j} \tag{5}$$

Equation (6) is a general investment function, which is assumed to be applicable to the investment behaviour of all sectors of the economy.

$$I_t = K_t^* + NI_{t-1} + K_{t-1} + FCR_t. \tag{6}$$

The desired capital stock   is derived from the profit maximization of firms over time,
where K_t is the price of capital goods, and   is expected change in q.

$$K_t^* = V_t^n / q_t ({}_t + - \dot{q}_t^E), \tag{7}$$

In our study we will estimate several versions of equation (6) mainly to examine the size of . It is easy to verify that   in equation (6) is indeed the parameter measuring the degree of credit fungibility introduced in equation (2). To do so we write a sectoral investment function based on equation (6) as follows:
The first two terms of equation (8) represent the amount of real investment in

[14]ibid.
[15]ibid.

the ith sector that will be realized in a competitive financial environment

$$I_i = \sum_{j=0}^{x} \beta^j K_{t-j}^* + \gamma K_{t-1} + \sum_{j=0}^{x} \delta^j FCR_{-j}. \tag{8}$$

The third term reflects the effect of government intervention on sectoral investment (ΔG_i) or the amount of investment induced by government credit allocation. Thus, sectoral investment I_i can be written as

Estimation Results

$$I_i = I_i^* + \Delta G_i. \tag{9}$$

Multiplying both side of equation (9) by the capital-good price q_i, we have

$$I_i q_i = I_i^* q_i + \Delta G_i q_i. \tag{10}$$

Dividing equation (10) by total investment $I = \sum I_i q_i$, we have

$$\frac{I_i q_i}{\sum I_i q_i} = \frac{I_i^* q_i}{\sum I_i^* q_i} \cdot \frac{\sum I_i^* q_i}{\sum I_i q_i} + \frac{\Delta G_i q_i}{\sum \Delta G_i q_i} \cdot \frac{\sum \Delta G_i q_i}{\sum I_i q_i}. \tag{11}$$

Comparing equations (2) and (11), we know that

$$FH_i = \frac{I_i q_i}{\sum I_i q_i}, \frac{I_i^* q_i}{\sum I_i q_i} = PF_i, \frac{\Delta G_i q_i}{\sum \Delta G_i q_i} = GF_i,$$

$$\frac{\sum \Delta G_i q_i}{\sum I_i q_i} = \alpha_i, \text{ and } \frac{\sum I_i^* q_i}{\sum I_i q_i} = 1 - \alpha_1.$$

In order to approximate the range of in manufacturing, it would be desirable to estimate equation (6) and its variants for the subsectors in Table 7.2. However, because of the unavailability of data, in particular the capital stock, we have not been able to do so. For some variables, data are available for the period since the late 1960s, but this is not enough to conduct a meaningful time-series analysis. To obtain a sufficient number of observations, we have had to pool data by pairing subsector of manufacturing.[16]

In our empirical examination, we have estimated equation (6) for the following seven sectors for the 1969-81 period.

    Very labour-intensive   I   :   Clothing and footwear

			Miscellaneous Manufactures
Moderately labour-intensive	II	:	Textiles
			Wood Products
	III	:	Metal products
			Electrical Machinery
Very capital-intensive	IV	:	Iron and steel
			Cement
Moderately capital-intensive	V	:	Pulp and paper
			Non-ferrous metal
	VI	:	Industrial chemicals
			Rubber tyres,
	VII	:	Machinery
			Transport equipment

As for the government-controlled credit variable (FCR), we have experimented with year-to-year changes in loans extended by the KDB and the DMB and in foreign loans. We have also used the sum of KDB and foreign loans, and of all three as a proxy for FCR.

KDB loans may be classified as genuine 'policy' or 'directed' loans in that they are extended in accordance with the criteria and priorities used for allocation by the government. Foreign loans must be approved by the government and are invariably tied to specific investment projects. These characteristics suggest that KDB and foreign loans combined may qualify as a good proxy for FCR. However, the sum of the two types of loans constitutes a relatively small part of the total volume of investment funds controlled by the government, as deposit money banks supply a sizeable amount of fixed investment financing in Korea. Therefore, when the sum of KDB and foreign loans is used as FCR, it may lead to an underestimation of the actual degree of credit fungibility because the variable represents only a part of the government-controlled investment fund. The variable may be statistically insignificant in estimated equations in those sectors which have limited access to KDB or foreign loans.

As an alternative to KDB and foreign loans, we have also tested change in DMB and foreign loans as a measure of FCR. While this variable covers a broader range of government intervention in loan allocation than KDB and foreign loans, it has also several defects. Although the government actively

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[16]By pooling the data, we are implicitly assuming that the paried sector have similar lag structures in investment behaviour. Although this assumption is not realistic, it is likely that sector with comparable factor intensities have similar lag structures.

interferes with the asset management of DMB, it does not and in reality cannot control all lending activities of the banks. Some of the DMB loans are extended at the discretion of the banks themselves. More important, commercial banks theoretically specialize in supplying short-term loans for working-capital financing. It is therefore unrealistic to treat DMB loans as if they are all channelled to fixed-investment financing. To eliminate this bias, we have tried to divide DMB loans into short-term credit for working capital and long-term credit for fixed-investment financing. At the sectoral level, a lack of reliable data precludes such a division. There is, however, strong evidence that much of DMB credit has been used for long-term fixed-investment financing in Korea.[17] Although the DMBs may have some leeway in their asset management, they are supposed to follow the government's guidelines and directives for loan allocation. These considerations do suggest that DMB loans may not be as unrealistic as they appear as a proxy for FCR. Nevertheless, it is likely that the use of DMB loans in equation (6) exaggerates the degree of credit fungibility as they include short-term loans for working-capital financing. This problem is more serious when the sum of KDB, DMB, and foreign loans is used in the estimation.

Our estimation results are presented in Table 7.3 and from them we have reached the following tentative conclusions.

1 It can be seen that the investment demand model cannot be applied universally to all sectors of manufacturing. As evidenced by the poor explanatory ability of equation (6), the data do not seem to support the investment hypothesis in sectors I and V. This is true even when we take into consideration the use of pooled time-series data. The estimated equations also display considerable instability, making difficult the interpretation of some results.

2 From the perspective of our study, the results suggest a high degree of credit fungibility in Korea's manufacturing. This conclusion follows regardless of which credit variable among the three is used. When the sum of KDB and foreign loans is used as a measure of FCR, the credit term is significant in sectors II, III, IV, VII. The coefficient of FCR is highest in iron and steel, cement with 0.9, followed by 0.62 in textile and wood products, and 0.46 in metal products and electric machinery. The coefficient for machinery and transport equipment is about 0.33. While these figures indicate that KDB and foreign loans have been largely

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[17]See chapter 4 of D. C. Cole and Yung Chul Park, *Financial Development in Korea*, 1945-78, Studies in the Modernization of the Republic of Korea: 1945-75, Council on East Asian Studies, Harvard University, 1983.

channelled to the sectors designated by the government, our confidence in these results is dampened by the fact that only in iron, steel and cement has   an acceptable 't' value.

3 When $\overset{.}{K}$FL is replaced by either DFL (DMB and foreign loans) or KML (the sum of KDB, DMB, and foreign loans), the credit term becomes significant and has larger coefficients than before in sectors V and VI, while the opposite is the case in sectors III and VII. These results suggest that the credit variable that is appropriate for measurement of credit diversion is likely to differ from sector to sector.

4 On the basis of our results, one cannot establish any relationship between the degree of credit fungibility on the one hand and export performance or capital intensities on the other, in subsectors of manufacturing.

5 The degree of credit diversion is lowest in iron, steel and cement. This is true whichever credit variable is use in our estimation. One possible explanation for this is that this sector has been the major recipient of KDB and foreign loans throughout the period under discussion. More important, to our view, is the fact that much of the investment in this sector has been undertaken by a public enterprise specializing in the production of iron and steel. Given this specialization and the public nature of the firm, any efforts to divert funds to other ventures would have been easily detected and therefore unlikely to succeed. To these explanations we can add that the iron and steel industries are relatively efficient producers and exporters in Korea.

6 In contrast to the iron, steel and cement sector, the clothing and footwear, and miscellaneous manufactures (very labour-intensive sectors) are characterized by a relatively high degree of credit diversion. This appears to be the case regardless of the credit variable chosen for our estimation. The coefficient of   KFL, though high, is statistically insignificant and those of   DFL and   KML are less than 0.1. One possible explanation is that, given their low capital intensities, these sectors may not require as much long-term credit for fixed investment in comparison with the sectors with a higher capital intensity. Because of the relatively short-term nature of investment with high yields, the borrowers may not have had difficulty securing funds from sources other than the banks.

7 Industrial chemicals and rubber tyres (VI), and machinery and transport equipment (VII) account for a large share of KDB and foreign loans (Table 7.4). Unlike in iron, steel and cement the coefficient of the credit term for these sectors is either very low or statistically insignificant, suggesting a relatively high degree of credit fungibility. One possible reason for this may be that the borrowers in these sectors are usually large industrial

groups, which have diversified their investments over a wide range of manufacturing activities and have better information about alternative investment opportunities. These conglomerates have a centralized unit that both oversees credit use and often acts like a financial intermediary. It mobilizes funds from outside sources and then allocates between firms and investment projects of the groups. For these reasons, the borrowers in these sectors may find it easier to divert funds to uses other than those prescribed by the KDB and the government.

CONCLUDING REMARKS

The allocation of loans in Korea has been characterized by concentrated rationing to a small number of selected entrepreneurs. Almost all of Korea's manufactures exports have been carried out by or through these selected entrepreneurs. Therefore the financing of export expansion in Korea should imply the financing of this selected group of entrepreneurs and the export-oriented growth of Korean manufacturing should imply essentially the growth and export expansion of the same group.[18] The manufacturing firms not included in this group have had to depend almost exclusively on self-financing and kerb-market loans. Credit rationing has been concentrated particularly on large company groups and as a result there occurred a concentration of export activities in Korea.

Considering the equity and efficiency aspects of credit rationing, one can conclude that the Korean government should start to reduce the excessiveness of credit rationing by enhancing as much as possible the role of the market mechanism in resource allocation. This conclusion is reinforced by the high credit fungibility in many subsectors of manufacturing. Our empirical examination shows that the Korean government has not been as successful as it may appear in influencing sectoral investment through directed allocation of bank credit.

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[18]The non-monetary financial institution (excluding KDB and EXIMB), such as investment companies, savings institutions, life insurance companies and the Korea Long-Term Credit Bank, are almost entirely owned and controlled by this selected group of entrepreneurs.