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# Optimal Borrowing Policies for Developing Countries: the Cases of Korea, the Philippines, and Thailand, 1965-83

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Abstract

This paper develops a theoretical framework for analyzing external debt policies of developing countries and applies it to assess the cases of three Asian countries, namely Korea, the Philippines, and Thailand. The "optimal debt policy" for a developing country is characterized in the first part of the paper. In the second, the experiences of these three countries during the period 1965-83 are compared with this theoretical benchmark. The empirical results show that, during this period, Korea was quite successful in managing its external debt, while the Philippines was less successful. The case of Thailand, in many respects, fell in between the other two, although closer to that of Korea.

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Summary

This paper uses a model of optimal borrowing as a guideline for empirical analysis. It describes the characteristics of the optimal policy for a borrowing country and compares to this paradigm the experiences of the Republic of Korea, the Philippines, and Thailand.

The empirical analysis shows that of the three countries Korea managed its external debt best. In the 1970s, Korea took advantage of favorable conditions in international capital markets by borrowing to finance investment; the resulting rates of output growth were the highest for the three countries. With the onset of the international debt crisis in the early 1980s, Korea implemented a stabilization program that resulted in a rapid improvement in its external position, a high rate of growth of output, and low domestic inflation.

During the same period, the Philippines experienced considerable difficulty in the management of its external debt. Like Korea, the Philippines borrowed in the 1970s to finance investment, but investment in the Philippines contributed less to the growth of output than it did in Korea and in Thailand. Furthermore, the tradable goods sector in the Philippines did not expand; as a consequence, the debt indicators of the Philippines increased very rapidly during 1980-83.

The case of Thailand, in many respects, falls between Korea and the Philippines, although closer to that of Korea. Thailand's debt/GNP ratio was much lower than those of the other two countries. Given the dimension of Thailand's export sector, however, the debt/export ratio and the debt service ratio were close to those of Korea. Furthermore, Thailand accumulated most of its debt in the period of rising interest rates. The reaction of Thailand to the external shocks at the end of the 1970s was not as dramatic as that of Korea; nevertheless, economic conditions improved significantly despite the difficulties encountered by Thailand's exports in 1983.

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# I. Introduction

This paper develops a theoretical framework for analyzing external debt policies of developing countries and applies it to assess developments in three Asian countries, namely Korea, the Philippines, and Thailand. Theoretically, a country's optimal borrowing policy can be derived by maximizing an intertemporal welfare function based on consumption levels. The first-order conditions of the maximization yield a set of criteria that can be used for determining the optimal borrowing strategy for the country. By pursuing this strategy, the country can minimize its forgone future consumption necessary to service its debt. In this framework, the closer a country is to the optimal policy, the more sustainable is its debt level and the lower is the debt burden. Two countries with similar debt ratios (such as debt/export or debt/GNP ratios) could be in a very different situation in terms of debt burden depending on the "optimality" of their debt policies. 1/

In this paper, the optimal borrowing policy is derived under the assumption that the debt will be fully repaid; the possibility of repudiation is not considered. 2/ Nevertheless, the further a country deviates from the optimal borrowing policy, the more costly it is to continue servicing its debt, and therefore the more likely it is that the country will find it attractive to repudiate its debt.

The paper is organized as follows: Section II sets forth a model characterizing the optimal policy for a borrowing country; Section III utilizes the theoretical model to examine and compare the debt accumulation of Korea, the Philippines, and Thailand during the period 1965-83; and finally Section IV summarizes the paper's main conclusions.

# II. A Model of "Optimal Borrowing"

In this section, a simple one-sector model of optimal borrowing is developed on the basis of which a number of general propositions are drawn. This model is then extended to incorporate additional features. First, the assumption of constant marginal cost of foreign borrowing is relaxed and this cost is assumed to be a positive function of the level of the debt. Second, the marginal return to investment is assumed to be a declining function of the level of investment. Third, the role of fiscal policy is examined. And, finally, the model is expanded to include a nontraded goods sector.

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1/ Most of the empirical literature on external debt focuses on analysis and forecasts of traditional debt ratios. Problems associated with using traditional debt indicators were pointed out by Nowzad and Williams (1981). For a critical survey see Dornbusch-Fischer (1984).

2/ Repudiation risk has been analyzed in this framework by Cohen-Sachs (1982); Sachs (1983); Cooper-Sachs (1984).

## 1. The basic model

In the basic model, a country produces only one tradable good ($Q_t$) with a given stock of capital ($K_t$) and labor force ($L_t$), according to the following production function:

$$Q_t = F(K_t, L_t) \tag{1}$$

The model could be written with population growth and all the variables expressed in per capita terms, but for simplicity it is assumed that the labor force is constant. 1/

The country takes as given a constant world real interest rate (r). The government maximizes an intertemporal social welfare function defined in terms of the level of consumption ($C_t$):

$$W = \sum_{t=o}^{\infty} (1 + \delta)^{-t} U(C_t) \qquad \delta \geq 0 \tag{2}$$

$U(C_t)$ has the usual properties, that is, $U'(C) > 0$, and $U''(C) < 0$. The rate of time preference ($\delta$) is non-negative. Two standard assumptions are also made: time separability of the utility function and an infinite time horizon. 2/ Public expenditure and taxation are not considered for the moment. Investment ($I_t$) is given by:

$$I_t = (Q_t - rD_t - C_t) + (D_{t+1} - D_t) \tag{3}$$

Investments can be financed by national savings ($Q_t - rD_t - C_t$), where $rD_t$ denotes interest payments on the existing stock of external debt, or by external borrowing ($D_{t+1} - D_t$). Equation (3) can be rewritten as the investment-savings gap, which is equivalent to the current account deficit:

$$D_{t+1} - D_t = I_t - (Q_t - rD_t - C_t) \tag{4}$$

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1/ No distinction is made between population and labor force and technology is assumed to be constant.

2/ The model can be rewritten in continuous time with no changes in the results. For a similar model in continuous time, see Blanchard (1983).

In order to obtain a meaningful budget constraint for the economy, the possibility of unlimited borrowing must be excluded. Therefore, it is assumed that lenders will not provide a country more than the discounted value of its domestic product minus domestic expenditure. This condition is formalized as follows: 1/

$$(1 + r)D_t \leq \sum_{\iota=t}^{\infty} (Q_\iota - C_\iota - I_\iota)(1 + r)^{\iota-t} \tag{5}$$

The problem can now be formulated as follows:

$$\text{Max } W = \sum_{t=o}^{\infty} (1 + \delta)^{-t} U(C_t) \tag{6}$$

Subject to:

$$Q_t = F(K_t) \tag{6a}$$

$$K_{t+1} = K_t + I_t \tag{6b}$$

$$(1 + r)D_o \leq \sum_{t=o}^{\infty} (1 + r)^{-t}(Q_t - C_t - I_t) \tag{6c}$$

where $K_o$ and $D_o$ are given exogenously.

This maximization problem has been explored extensively (see, for example, Sachs (1983)). 2/ The first-order conditions are:

$$F_{K_t} = r \tag{7}$$

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1/ Technically, to obtain (5) from the set of conditions (3), the following has to be assumed:

$$\lim_{t\to\infty} D_t(1 + r)^{-t} \leq 0$$

2/ Depreciation has been ignored here for simplicity. If depreciation were considered, (6b) would become:

$K_{t+1} = K_t (1 - d) + I_t$ where d is the coefficient of geometric depreciation.

$$U_{C_t} = \lambda \left(\frac{1 + \delta}{1 + r}\right)^{-t} \tag{8}$$

$$\sum_{t=o}^{\infty}(1 + r)^{-t}C_t = \sum_{t=o}^{\infty}(1 + r)^{-t}(Q_t - I_t) - (1 + r)D_o \tag{9}$$

A number of general propositions can be derived from this simple model.

Proposition 1: A country should invest until the marginal productivity of capital is equal to the cost of capital. 1/ This well-known principle is of general applicability; all the extensions of this model can be reduced to a different evaluation of the marginal cost of capital or of the marginal cost of borrowing. Two corollaries can also be derived. First, if a country borrows to invest and the return on the project is higher than the cost of borrowing, then the country will have higher consumption in the future even after paying interest on the debt. In this case, the debt is clearly sustainable. Second, the optimal investment path is independent of the optimal intertemporal allocation of consumption: the optimal path of investment is given by equation (7), while the optimal path for consumption can be derived from equations (8) and (9).

Proposition 2: If a country borrows to increase consumption in the current period, then future consumption will need to be reduced by the increased current consumption plus interest costs. Thus, while tomorrow's consumption can be substituted for today's consumption, the present value of total consumption is constant for a given path of capital accumulation.

The distribution of consumption over time is determined by the social rate of discount according to condition (8), the so-called smoothing principle. If the social discount rate is equal to the international real interest rate, which, given (7), is also equal to the marginal productivity of capital, then condition (8) implies that constant consumption through time is optimal. The social welfare function is therefore maximized by borrowing when output is low and by repaying the debt when output is high. This result is the country analog of the "permanent income" hypothesis according to which consumers do not consume a fixed fraction of their current disposable income, but,

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1/ Given the simplicity of the assumptions, the cost of capital is simply the world rate of interest (r). With depreciation, condition (7) would become:

$$F_{Kt} = r + d$$

rather, base their decisions on their expected earnings over their life cycle. Access to financial markets enables individuals to maintain consumption by borrowing when income is low and lending when income is high. The same principle is applied here to a country; the current consumption decisions of the country do not depend on current output alone but on the expected future stream of output.

This basic model implies two important policy prescriptions. First, the country should "adjust" to permanent shocks and "accommodate" transitory ones. In fact, if output is temporarily depressed, say as a result of drought, then it is optimal for the country to borrow to maintain stable consumption. On the other hand, in the case of a permanent shock to output, consumption should be adjusted downward in line with the expected effect of the shock on the present value of total future production. Similar considerations apply to the rate of interest on the debt. If the interest rate is temporarily raised, the country should borrow more to maintain consumption and pay the debts. But, if a rise in the interest rate is viewed to be permanent, domestic absorption has to be reduced proportionally.

The second policy prescription is that, in cases in which a country needs to generate additional resources to service its external debt, the adjustment in aggregate demand should come from reduced consumption as long as return to investment exceeds the rate of interest. However, if the marginal productivity of capital is less than the interest rate, then reductions in investment spending should precede cuts in consumption. Investment in inefficient projects that have a rate of return below the borrowing rate can be viewed as containing an element of consumption.

This basic model is useful in setting out a number of general propositions, but it cannot be used for empirical analysis because it does not fully characterize the conditions of a borrowing country. Consequently, the model needs to be extended in order to make it more directly applicable to actual cases.

## 2. Upward sloping cost of funds

So far it has been assumed that the rate of interest, r, is constant. It would be more realistic to assume that the interest rate on new loans is an increasing function of a country's outstanding debt:

$$r_t = r(D_t) \tag{10}$$

A rationale for an upward sloping supply curve of funds can be found in repudiation risk. Lenders might in fact perceive a loan to a country to become increasingly risky as the country accumulates external

debt. 1/ Rewriting the first-order conditions based on equation (10) yields: 2/

$$F_{k_t} = r(D_t) + r'(D_t)D_t \qquad (7a)$$

where $r'(D_t)$ is the derivative of $r(D_t)$.

The new rule (7a) is similar to the one derived from the basic model except the marginal cost of borrowing is now an increasing function of the level of debt. Consequently, optimal borrowing requires that investment projects must have greater rates of return as debt is accumulated. In the basic model the optimal investment path was independent of the level of outstanding debt because the cost of external borrowing was constant. In the modified model, the investment path is a function of the level of debt; the more external debt that is accumulated, the more costly it becomes to borrow abroad to finance investments. It should be noted that in this model there is a negative externality associated with foreign borrowing. The government could therefore improve efficiency with a tax on foreign borrowing or by placing quantitative limits on foreign borrowing by domestic residents. This latter approach has been extensively employed by developing countries in managing their external debt. 3/

3. Increasing investment costs

Rapid growth of the capital stock may be associated with rising costs, owing to congestion and inefficient use of resources. These congestion costs might be an increasing function of the level of investment or of the investment/capital ratio. In this context, a slower rate of growth of investment would be preferable to a faster rate, given that the latter implies higher installation costs. This smoothing principle would be applicable either to a firm or to a country. If a country has to choose between two development plans involving the same total amount of investment spending, the smoother one would be preferred because it avoids the greater negative externalities associated with higher investment expenditures. Congestion costs, together with differences in

1/ On this issue, see Eaton-Gersovitz (1981), Cohen-Sachs (1982), Sachs (1983). Repudiation risk is not fully analyzed in this paper; a more complete treatment should consider directly the behavior of the lenders.

2/ The proof is provided in the Appendix.

3/ The optimal tax on foreign borrowing is equal to $1/\varepsilon_s$ where $\varepsilon_s$ is the elasticity of the supply of funds to the borrowing country. For a simple proof see Cohen-Sachs (1982). This point is stressed also in Harberger (1984).

technology, may explain different rates of growth for countries with similar investment/output ratios.

Installment costs can be represented in the model by changing equation (3) as follows:

$$C_t = Q_t - I_t\ (1 + \psi(I_t)) + D_{t+1} - (1 + r)D_t \tag{3a}$$

Equation (3a) states that, in order to invest $I_t$, resources equivalent to $I_t(1 + \psi(I_t))$ need to be allocated to the project, where $\psi(I_t)$ represents the resources necessary for the installment process, that is, the congestion costs. $\psi(I_t)$ is an increasing function of $I_t$. 1/

The upward sloping cost of investment introduces into the model additional intertemporal links. For example, suppose that the rate of interest falls because of exogenous factors. Without upward sloping costs of investment, it would be optimal to adjust immediately the capital stock of the economy in order to satisfy equation (7) at the new interest rate. 2/ Therefore, the basic model would prescribe, quite unrealistically, "jumps" in the capital stock of the country. The model with increasing costs of investment has a more realistic implication; in this case, if the interest rate falls, the capital stock adjusts smoothly over time to the new optimal level, since the costs of installment are an increasing function of the speed of adjustment. Therefore, today's change in the interest rate affects not only today's investment spending but also investment for several periods in the future.

If investments are financed by external borrowing, then installment costs imply that a smoother path of debt accumulation is preferable to a lumpier one. A formal treatment of models with increasing costs of investment can be found in Abel (1979) and Hayashi (1982) in the context of the theory of the firm, and in Blanchard (1983) and Cooper-Sachs (1984) in the debt literature.

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1/ If the installment costs are a function of the investment/capital ratio, equation (3a) would be modified as follows:

$$C_t = Q_t - I_t\ (1 + \psi(I_t/K_t)) + D_{t+1} - (1 + r)D_t.$$

2/ Technically this adjustment should be instantaneous, that is, it should take place in one period since equation (7) implies that the capital stock of the economy always has to be at its optimal level.

## 4. Role of fiscal policy 1/

In this section, the role of the government is developed more fully. It is assumed that the government can influence private consumption directly by levying taxes. Consumers save a constant fraction of their disposable income. This simple Keynesian consumption function, although probably inadequate for more developed countries, may be suitable for countries with undeveloped financial markets in which consumer credit does not play a major role. Furthermore, it is assumed that in this model the private sector has no access to foreign capital markets and that the government undertakes all external borrowing and services the debt through tax collection. 2/

The consumption function is given by:

$$C_t = (1 - s)(1 - \tau_t)Q_t \tag{11}$$

where s is the propensity to save and $\tau$ is the tax parameter controlled by the government. Investment is given as before by: 3/

$$I_t = Q_t - C_t + D_{t+1} - (1 + r)D_t \tag{12}$$

This expression can be rewritten using (11) as:

$$I_t = s(1 - \tau_t)Q_t + \tau_t Q_t + D_{t+1} - (1 + r)D_t \tag{13}$$

Equation (13) underlines that investment is financed through private savings ($s(1 - \tau_t)Q_t$), taxes ($\tau_t Q_t$), and foreign borrowing ($D_{t+1} - (1 + r)D_t$). For simplicity, public expenditure on consumption goods is not considered. 4/

The government maximizes the intertemporal social welfare function (2), under the constraint (13), choosing the optimal path of $\tau_t$ and

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1/ This section is based on Sachs (1983).

2/ It is therefore assumed that the government does not use external borrowing for directly productive investment, but it behaves as an "intermediary" for the private sector and/or it invests in indirectly productive projects, such as infrastructure.

3/ For simplicity, installment costs are not considered.

4/ The introduction of public expenditure on consumption goods would not change qualitatively the results of this section. For a model similar to this one with public consumption, see Cooper-Sachs (1984).

$I_t$. The solution of this problem yields the same intertemporal allocation of consumption and investment as in the basic model if the government can follow an unconstrained tax policy. 1/ The government should borrow to invest until the marginal productivity of capital is equal to the cost of capital. As in the basic model, the optimal consumption allocation over time is smooth. Since a fixed fraction of disposable income is consumed, the government should adjust the tax parameter in order to achieve a smooth path of disposable income. Therefore, taxes should be kept low when output is low and raised when output increases. In particular, taxes should be low at the beginning of the development process when income per capita is low; public investment projects should initially be financed with external borrowing, but when income increases as a result of the investments undertaken, taxes should be raised in order to pay back the debt.

The solution changes if the government faces a binding constraint on the amount of taxes it can collect. This constraint may derive from political considerations or from inefficiencies in the fiscal system that restrict the government's ability to levy taxes. 2/ The problem can be formalized as follows:

$$\text{Max } W = \sum_{t=o}^{\infty} (1 + \delta)^{-t} U(C_t) \tag{14}$$

$$\text{s.t. } C_t = (1 - s)(1 - \tau_t) Q_t \tag{14a}$$

$$\tau_t = \leq \bar{\tau}$$

$$Q_t = F(K_t) \tag{14b}$$

$$K_{t+1} = K_t + I_t \tag{14c}$$

$$\sum_{t=o}^{\infty} C_t (1 + r)^{-t} \leq \sum_{t=o}^{\infty} (Q_t - I_t)(1 + r)^{-t} - (1 + r) D_o \tag{14d}$$

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1/ A formal proof is presented in the Appendix. The same result is proved in a different way in Sachs (1983).

2/ This consideration has been suggested in several papers (Kharas (1981), Sachs (1983), Cooper-Sachs (1984)).

$K_o$, $D_o$ given.

When the fiscal constraint is binding, the government sets taxes at $\bar{\tau}$ even if the unconstrained solution would prescribe higher taxes.

The first-order conditions of this problem yield:

$$F_{K_t} = \frac{r}{\Gamma_t} \tag{15}$$

where $\Gamma_t < 1$ if the fiscal constraint is binding. If the constraint is not binding, $\Gamma_t = 1$ and the solution is the same as in the basic model. An explicit expression for $\Gamma_t$ is derived and discussed in the Appendix where it is also shown that the lower is $\bar{\tau}$, the lower is $\Gamma_t$. Therefore, the more constrained the government in generating tax revenue, the higher the marginal productivity of capital has to be to satisfy the optimal foreign borrowing condition. In this model, the shadow cost of borrowing is the international rate of interest plus the cost of raising taxes. Therefore, equation (15) implies that externally financed investment should be lower in the case in which the government is constrained in its ability to raise revenue than in the unconstrained case.

It should be noted that the borrowing country would be better off without the fiscal constraint. While the solution of the model with the constraint produces a "second best" outcome, a "first best" solution could be reached by enhancing the government's capacity to raise tax revenues. In this context, the fiscal constraint could be regarded as unwillingness on the part of the borrowing government to tax in order to transfer resources to the creditors. Repudiation risk and fiscal constraints could then be analyzed jointly since in this model external debt is repaid only with tax revenues. The simple case presented could also be extended by considering different sources of revenue for the government, such as the inflation tax.

## 5. Tradable and nontradable goods sectors

So far the entire output of the economy has been assumed to be tradable and thus available for servicing external debt. This assumption is relaxed by incorporating into the model a nontradable goods sector, the output of which can fulfill only domestic demand. In this framework, the share of the tradable goods in the economy becomes an important factor in evaluating the sustainability of external debt.

Nontradable goods (N) can be easily added to the tradable framework (T) by assuming that (a) capital is sector specific; (b) investment in the nontraded goods sector requires only traded goods; and (c) all

nontradables are consumed. The equilibrium condition in the nontradable goods sector is: 1/

$$C_t^N = Q_t^N \tag{16}$$

Using (16) and (4), the budget constraint for this economy is derived as:

$$\sum_{t=o}^{\infty} (Q_t^T - C_t^T - I_t^T - I_t^N)\ (1 + r)^{-t} \geq (1 + r)D_o \tag{17}$$

This expression states that only tradable goods can be used directly to service external debt. The following optimization problem can then be solved: 2/

$$\text{Max} \sum_{t=o}^{\infty} (1 + \delta)^{-t} U(C_t^T,\ C_t^N) \tag{18}$$

$$\text{s.t.}\ Q_t^N = F^N(K_t^N) \tag{18a}$$

$$Q_t^T = F^T(K_t^T) \tag{18b}$$

$$K_{t+1}^T = K_t^T + I_t^T \tag{18c}$$

$$K_{t+1}^N = K_t^N + I_t^N \tag{18d}$$

$$C_t^N = Q_t^N \tag{18e}$$

1/ Throughout this section, the superscripts N and T will be used to denote the nontradable and tradable goods sectors, respectively.

2/ This specification is adapted from Cooper-Sachs (1984). Increasing costs of investment are disregarded.

$$\sum_{t=o}^{\infty} (Q_t^T - C_t^T - I_t^T - I_t^N)\ (1 + r)^{-t} \geq (1 + r)D_o \tag{18f}$$

The first-order conditions imply (see Appendix):

$$\frac{U_{C_t^N}}{U_{C_t^T}} = P_{N_t} \tag{19}$$

$$F_{k_t}^T = r \tag{20}$$

$$F_{k_t}^N = \frac{1}{P_N} r \tag{21}$$

The key feature of these conditions is the role played by $P_N$, the relative price of nontradables in terms of tradable goods. If $P_N$ rises, domestic demand is shifted toward tradable goods (equation 19), while domestic supply is shifted toward nontradable goods (equation 21). Consequently, the exportable surplus falls, reducing the resources available for servicing external debt. In this model, the relation between the real exchange rate and the debt-servicing capacity is clear. In a small open economy, which takes as given the international prices of its exportables, a real devaluation increases the relative prices of tradables with respect to nontradables. Therefore a country can increase the exportable surplus available for servicing the external debt by adopting demand management and exchange rate policies that switch domestic demand toward nontradables.

## III. External Debt in Korea, the Philippines, and Thailand

In this section, the accumulation of external debt in three non-oil developing countries, namely, Korea, the Philippines, and Thailand, is analyzed using some of the insights gained from the model of optimal borrowing. The analysis is not meant to be a "test" of the theoretical model, but rather an application of the basic criteria derived from the general framework. Korea, the Philippines, and Thailand were selected because they are the three largest debtors in the non-oil group of developing countries in East Asia. In addition, experiences of the three countries have been quite different, making a comparison of their debt policies particularly useful.

1. An overview

The decade preceding the second oil crisis in 1978-79 has been described as a "debtor paradise" 1/ because of the low real interest rates and the sustained growth of industrial countries that increased demand for exports of developing countries. External borrowing by developing countries during this period did not generally pose a problem, as the ratios of outstanding debt and the associated service payments to exports rose only moderately. The economic performance of Korea, the Philippines, and Thailand was stronger than that of most developing countries during this period.

At the end of the 1970s, several major shocks affected non-oil debtor countries: the increase in the price of oil; the increase in international interest rates; a prolonged recession in the industrial countries; deteriorating terms of trade; and, in several cases, loss of external competitiveness with adverse effects on export performance. The magnitude and the perceived permanence of these shocks required a reaction in the economic policies of debtor countries. The option of "accommodating" the current account imbalances by increasing external borrowing was particularly costly given the rising interest rates and the world recession.

The responses of Korea, the Philippines, and Thailand to these difficult economic problems contrasted sharply. Korea responded to these adverse developments by implementing a Fund-supported stabilization program in early 1980. 2/ The adjustment involved reductions in domestic absorption and shifts in expenditure policies, including a real devaluation of the exchange rate. As a result, Korea's external position improved drastically in the subsequent years, and its economy continued to grow rapidly. In contrast, the Philippines experienced a sharp deterioration in its external position and in economic growth. The economic performance of Thailand lay between that of Korea and the Philippines. Thailand reacted to the shocks at the end of the 1970s less promptly than Korea, but still avoided external debt problems, partly because of its relatively low level of debt at the turn of the decade.

2. Savings, investment, and the current account

Current account deficits and accumulation of external debt can result from high investment spending or from low domestic savings, that is, "overconsumption." A crucial element in evaluating the external debt situation of a country is the determination of whether increased domestic investment or consumption is responsible for a rise in foreign

1/ Dornbusch-Fischer (1984).

2/ For a comprehensive and detailed analysis of this adjustment policy, see Kincaid (1983).

borrowing. Sachs (1981) claims that the increased current account deficits of developing countries in the 1970s were due to a shift in investment opportunities from developed to developing countries. He points out that both investment and savings of developing countries rose during the 1970s but that investment increased faster than savings. He thus concludes that foreign borrowings of developing countries were used mainly to finance investment projects. Zaidi (1984) addressed the same question and reached similar conclusions. 1/ In contrast to the experience of the 1970s, the higher current account deficits in the 1980s were mainly associated with a lower domestic savings rate. This pattern was particularly pronounced in the case of Korea, the Philippines, and Thailand. In fact, the investment ratio fell in the three countries during the 1980s, but their current account deficits were large because of an even sharper decline in the savings rates.

a. Korea

Korea experienced an impressive growth of investment in the late 1960s and early 1970s as a result of the ambitious five-year development plans. In the period 1965-73, the ratio of investment/GNP rose from 15 percent to almost 26 percent (Table 1); in the same period, the savings/GNP ratio rose from 9 percent to 22 percent. Therefore, the current account gap narrowed despite a rising investment rate. 2/ The subsequent rise in the current account deficits during 1974-75 was clearly explained by the first oil shock, which led to a decline in the savings ratio; furthermore, the data show an abnormally high accumulation of inventories that might hide a greater fall in savings. 3/

In the second half of the 1970s, investment and savings were still growing but the former more rapidly than the latter. Between 1973 and 1979, the investment/GNP ratio rose by approximately 10 percentage points while the savings ratio rose by about 7 percentage points. In

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1/ Feldstein and Horioka (1980) and Feldstein (1983) reach different conclusions about the shift in investment toward developing countries. Penati and Dooley (1984) also criticize Sachs' results and conclude that "no systematic relationship between current account imbalances and investment rates is apparent." These papers, however, focus on developed countries and do not address directly the question of the role of investment and savings in developing countries.

2/ The current account balance in Table 1 is defined net of private and official unrequited transfers. Official transfers were quite substantial in the late 1960s. The current account in 1965/66 would be virtually in balance if the transfers were included.

3/ Inventory accumulation was abnormally high for several years in the three countries (in particular in the Philippines). This phenomenon could be related to some problems in the national accounts data, which need further research and better explanation.

Table 1. Korea, 1965-83

| | Fixed Investment / GNP | Total Investment / GNP | Saving / GNP 1/ | Budget Balance / GNP | Current Account / GNP 2/ | Debt / GNP 3/ |
|---|---|---|---|---|---|---|
| 1965 | 14.8 | 15.0 | 8.5 | -0.1 | -6.5 | 5.9 |
| 1966 | 20.2 | 21.6 | 13.2 | -0.5 | -8.4 | 9.6 |
| 1967 | 21.4 | 21.9 | 13.1 | -0.6 | -8.8 | 15.1 |
| 1968 | 25.0 | 25.8 | 14.7 | 0.3 | -11.1 | 22.9 |
| 1969 | 25.8 | 28.8 | 18.2 | -0.2 | -10.6 | 27.2 |
| 1970 | 22.9 | 25.3 | 16.3 | -1.9 | -9.0 | 28.7 |
| 1971 | 21.5 | 25.1 | 14.7 | -1.8 | -10.4 | 31.2 |
| 1972 | 20.0 | 22.2 | 17.2 | -5.4 | -5.0 | 34.0 |
| 1973 | 23.3 | 25.6 | 22.0 | -0.6 | -3.6 | 31.6 |
| 1974 | 25.3 | 31.6 | 19.7 | -1.7 | -11.9 | 32.0 |
| 1975 | 25.5 | 30.0 | 20.9 | -2.2 | -9.1 | 40.6 |
| 1976 | 24.1 | 25.6 | 24.4 | -1.4 | -1.2 | 36.7 |
| 1977 | 26.7 | 27.7 | 28.4 | -2.0 | 0.7 | 33.8 |
| 1978 | 30.8 | 31.1 | 29.1 | -1.5 | -2.0 | 28.6 |
| 1979 | 32.8 | 35.6 | 29.3 | -1.7 | -6.3 | 31.6 |
| 1980 | 31.9 | 31.2 | 22.7 | -2.3 | -8.5 | 44.6 |
| 1981 | 28.9 | 29.1 | 22.3 | -3.5 | -6.8 | 48.3 |
| 1982 | 30.3 | 27.0 | 23.5 | -3.2 | -3.5 | 52.4 |
| 1983 | 31.8 | 27.6 | 25.5 | -1.1 | -2.2 | 53.7 |

Sources: IMF, International Financial Statistics (IFS); and Economic Planning Board of Korea.

1/ The saving/GNP ratio has been computed as a residual from the identity S = CA - I (column 5 - column 2).
2/ This current account balance excludes unrequited private and official transfers but it includes workers' remittances.
3/ In this ratio, debt is defined as total external debt inclusive of short-term liabilities of commercial banks.

this period, national savings were supplemented by external borrowing to finance investments. The planners relied heavily on foreign savings to achieve a target rate of growth. 1/

In the aftermath of the second oil crisis, the current account deficit/GNP ratio rose to more than 8 percent as the domestic savings ratio dropped by almost 7 percentage points. In 1980, the Korean Government perceived this imbalance to be unsustainable and initiated a strong adjustment program. Credit and fiscal policies were tightened in order to control the pressure of aggregate demand; government current expenditures were cut; and investment projects were postponed. The public deficit was significantly reduced in 1982/83. As a result, the domestic savings ratio increased during 1982-83 and the current account deficit declined rapidly to a sustainable level. By 1983, the current account deficit/GNP ratio had declined to about 2 percent.

b. The Philippines

The Philippines also experienced an investment boom during the 1970s (Table 2). The investment/GNP ratio rose dramatically, peaking at 31 percent in 1979; one should note, however, the very high accumulation of inventories (about 5-6 percent of GNP) over the entire period. 2/ The savings ratio increased rapidly in the early 1970s, from 19 percent in 1970 to almost 24 percent of GNP in 1973, and remained virtually stable in the second half of the 1970s. As a consequence, the current account deficit rose from about 2 percent of GNP in the early 1970s to about 6 percent in the late 1970s.

After the second oil shock, the savings ratio fell from about 25 percent in 1979 to about 19 percent in 1983, while investment did not decline until 1982. The budget deficit increased sharply to 5 percent of GNP in 1980/81 and remained high as a percentage of GNP through 1981/82. 3/ The pressure of domestic demand led to increased current account deficits and rapid accumulation of external debt. The current account deficit rose to over 8 percent of GNP in 1982.

c. Thailand

Thailand accumulated most of its external debt starting in the second half of the 1970s. During 1974-79, the external debt/GNP ratio doubled to 21 percent, as the current account deficit rose to a peak of

1/ See Park (1984).

2/ See footnote 3 on page 14.

3/ In 1983, the central government drastically reduced the subsidies to several public corporations, whose deficits increased by about the same amount. The result was simply a decline in the deficit of the central government with a virtually stable deficit of the public sector defined more broadly.

Table 2. Philippines, 1965-83 1/

| | Fixed Investment / GNP | Total Investment / GNP | Savings / GNP | Budget Balance / GNP | Current Account / GNP | Debt / GNP |
|---|---|---|---|---|---|---|
| 1965 | 17.7 | 20.8 | 20.8 | -1.2 | 0.0 | ... |
| 1966 | 16.5 | 19.7 | 19.7 | -0.6 | 0.0 | ... |
| 1967 | 18.3 | 21.1 | 18.1 | -0.8 | -3.0 | ... |
| 1968 | 17.4 | 21.3 | 16.4 | -0.8 | -4.9 | ... |
| 1969 | 16.4 | 20.6 | 16.1 | -2.8 | -4.5 | ... |
| 1970 | 16.0 | 21.5 | 19.2 | 0.0 | -2.3 | 32.5 |
| 1971 | 16.4 | 21.0 | 19.2 | -0.3 | -1.8 | 30.7 |
| 1972 | 15.9 | 20.8 | 18.7 | -1.8 | -2.1 | 32.0 |
| 1973 | 15.4 | 21.6 | 23.8 | 2.9 | 2.3 | 26.8 |
| 1974 | 18.6 | 26.8 | 23.9 | 2.4 | -3.2 | 24.0 |
| 1975 | 24.3 | 31.2 | 23.4 | -0.8 | -7.8 | 27.9 |
| 1976 | 24.7 | 30.9 | 23.2 | -1.6 | -7.7 | 35.5 |
| 1977 | 24.3 | 29.3 | 24.1 | -1.7 | -5.2 | 39.0 |
| 1978 | 24.1 | 29.3 | 23.2 | -1.6 | -6.1 | 44.0 |
| 1979 | 26.0 | 31.1 | 25.4 | -0.2 | -5.7 | 44.0 |
| 1980 | 25.7 | 30.6 | 24.2 | -1.5 | -6.4 | 48.5 |
| 1981 | 26.1 | 30.7 | 24.4 | -4.0 | -6.3 | 52.8 |
| 1982 | 25.8 | 28.9 | 20.2 | -4.3 | -8.7 | 60.5 |
| 1983 | 25.1 | 27.5 | 18.7 | -1.6 | -8.8 | 73.4 |

Source: IMF, IFS.

1/ All the variables are defined as in Table 1.

nearly 9 percent of GNP in 1979; the investment/GNP ratio rose from 22 percent to almost 27 percent, while the savings/GNP ratio remained virtually stable (Table 3). 1/ The trend in the domestic savings ratio for Thailand is consistent with the trends in those ratios for Korea and the Philippines; from the late 1960s to 1979, the total savings rate was stable and the investment/GNP ratio was growing. Therefore, it can perhaps be argued that the rapid increase in foreign liabilities was used for investment rather than for consumption. Following the second oil crisis, the savings ratio in Thailand dropped (from 21 percent in 1979 to 16 percent in 1983), owing mainly to the decline in public sector savings; nevertheless, the ratio of the current account deficits to GNP averaged about 6 percent of GNP, as the investment ratio also declined during 1979-83.

### 3. Rate of return on investments and the cost of borrowing

This section analyzes the productivity of investment based on the theoretical proposition that for any given interest rate, a country with a higher productivity of capital can borrow more in absolute terms. World interest rates in real terms (relative to actual inflation rates) were quite low, often negative, for most of the 1970s. However, at the end of the 1970s, real international interest rates started to rise, reaching levels of 7-10 percent by the early 1980s. In addition, given the increasing share of debt subject to variable interest rates, the cost of servicing the existing debt automatically rose. Given the very low level of real interest rates in the early 1970s, at least part of the increase in real interest rates experienced during 1979-83 should be considered as permanent. Furthermore, both short- and long-term real interest rates increased, signaling that this shift was not expected to be transitory. Consequently, the appropriate response of the borrowing countries should have been to reduce the rate of growth of their external debt. However, the three countries continued to borrow considerably even at increasing interest rates. 2/

The return on investment differs across the three countries because of differences in their cost of installment, efficiency in the use of resources, and in technology. The rate of return on investment can be evaluated from a macroeconomic point of view by relating the rate of

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1/ National accounts data show a sharp rise in the savings/GNP ratio during 1973-74 and an abnormally high accumulation of inventories (about 7 percent of GNP). However, these two years also show a high statistical discrepancy (about 3 percent of GNP); thus, both the inventory and savings figures may be overestimated.

2/ In particular, Thailand, which had very low debt ratios until the mid-1970s, borrowed almost entirely in the period of high interest rates. Kharas (1983) notes that the Thai Government "did not pay enough attention" to the increasing cost of external borrowing.

Table 3. Thailand, 1965-83 1/

| | Fixed Investment / GNP | Total Investment / GNP | Saving / GNP | Public Budget Balance / GNP | Current Account / GNP | Debt / GNP |
|---|---|---|---|---|---|---|
| 1965 | 18.9 | 20.1 | 18.8 | -0.1 | -1.3 | ... |
| 1966 | 20.1 | 23.5 | 23.5 | -1.3 | -- | ... |
| 1967 | 23.0 | 23.6 | 21.6 | -0.2 | -2.0 | ... |
| 1968 | 23.5 | 25.1 | 21.3 | -2.0 | -3.8 | ... |
| 1969 | 23.9 | 26.3 | 22.2 | -0.2 | -3.8 | ... |
| 1970 | 24.0 | 26.0 | 21.4 | -3.9 | -4.6 | ... |
| 1971 | 22.7 | 22.9 | 19.8 | -4.9 | -3.1 | ... |
| 1972 | 21.1 | 23.4 | 22.0 | -4.4 | -1.4 | ... |
| 1973 | 20.5 | 28.1 | 26.3 | -2.4 | -1.8 | 10.8 |
| 1974 | 21.7 | 27.8 | 25.3 | 0.7 | -2.5 | 11.1 |
| 1975 | 22.1 | 27.8 | 23.0 | -2.4 | -4.8 | 12.2 |
| 1976 | 21.8 | 24.5 | 21.6 | -4.7 | -2.9 | 13.0 |
| 1977 | 25.2 | 26.7 | 20.6 | -3.1 | -6.1 | 14.7 |
| 1978 | 25.1 | 27.3 | 21.6 | -2.8 | -5.7 | 18.7 |
| 1979 | 26.4 | 29.3 | 20.7 | -2.4 | -8.6 | 21.3 |
| 1980 | 26.3 | 27.6 | 20.6 | -4.6 | -7.0 | 22.3 |
| 1981 | 24.7 | 25.4 | 17.7 | -3.2 | -7.7 | 25.7 |
| 1982 | 21.9 | 21.7 | 18.4 | -5.9 | -3.3 | 31.5 |
| 1983 | 22.5 | 23.5 | 15.8 | -2.7 | -7.7 | 34.3 |

Source: IMF, IFS.

1/ All the variables are defined as in Table 1.

growth of output to the investment/GNP ratio. For the entire period examined, the rate of growth of GNP was highest in Korea, followed by Thailand and then the Philippines (Table 4). During the 1970s, Korea grew at an average rate of about 10 percent per year, Thailand at about 7 percent, and the Philippines at slightly less than 6 percent. Korea had a severe recession in 1980 following the second oil crisis. Real GNP declined for the first time, but economic growth was resumed subsequently; growth of real GNP averaged 7 percent during 1981-83. In contrast, GNP growth in the Philippines fell persistently from 7.5 percent in 1979 to slightly over 1 percent in 1983. Thailand's rate of growth was relatively stable at about 5 percent per year during 1979-83.

Table 4. Rate of Growth of GNP, 1965-83

(In percent)

| | Korea | Philippines | Thailand |
|---|---|---|---|
| Annual average | | | |
| 1965-69 | 10.4 | 4.7 | 8.3 |
| 1970-73 | 10.4 | 5.7 | 6.1 |
| 1974-79 | 9.6 | 6.5 | 7.2 |
| 1980-83 | 4.0 | 3.0 | 5.3 |
| 1974 | 7.8 | 6.3 | 5.8 |
| 1975 | 6.9 | 5.8 | 7.2 |
| 1976 | 14.2 | 6.1 | 8.9 |
| 1977 | 12.7 | 6.9 | 7.1 |
| 1978 | 9.7 | 6.2 | 9.1 |
| 1979 | 6.5 | 7.5 | 5.0 |
| 1980 | -5.2 | 4.4 | 5.4 |
| 1981 | 6.2 | 3.7 | 6.3 |
| 1982 | 5.6 | 2.7 | 4.1 |
| 1983 | 9.3 | 1.3 | 5.4 |

Sources: Bank of Korea, National Income Accounts, 1984; IMF, IFS; and Bank of Thailand, Quarterly Bulletin.

A simple, although imperfect, method of evaluating the quality of investments is to employ the incremental capital output ratio (ICOR) as a proxy for the marginal productivity of capital. For a simple linear production function, the ICOR is inversely related to the marginal

productivity of capital. 1/ Table 5 displays the ICORs obtained using total investment inclusive of increases in stocks. Korea had the lowest ICORs for the entire period, 2/ implying the highest productivity of investment, while the Philippines had generally the highest ICOR implying the lowest productivity of investment. Thailand's ICOR tended to lie in between, although closer to Korea's ICOR.

Table 5. Incremental Capital Output Ratio (Including Variations of Stocks), 1965-83

| | Korea | Philippines | Thailand |
|---|---|---|---|
| Average | | | |
| 1965-69 | 2.2 | 4.4 | 2.9 |
| 1970-73 | 2.4 | 3.7 | 4.1 |
| 1974-79 | 3.1 | 4.6 | 3.8 |
| 1980-83 | 4.0 1/ | 9.8 | 4.6 |

Source: Computations based on Tables 1-4.
1/ For the period 1981-83.

The ICORs of the three countries started to increase toward the end of the 1970s. This can probably be explained by imperfect sectoral allocations of investments. The increase in Korea's ICOR derived from the sharp increase in the share of investments directed toward the heavy manufactures and chemical sectors, at the expense of the light and labor-intensive manufactures, the traditional leading industrial sector

1/ If the production function is linear, then Q = ak. Therefore:

$$\frac{dQ}{dK} = a \text{ ; but } \dot{Q} = a\dot{k} \text{ and } \frac{\dot{Q}}{Q} = a\frac{\dot{k}}{Q}$$

$$\text{ICOR} = \frac{I/Q}{\dot{Q}/Q} = \frac{I}{Q} = \frac{1}{a}$$

In a more general framework the relation between the ICOR and the marginal productivity of capital is affected by several other factors including the rate of growth of employment, the rate of technological progress, and the marginal productivity of labor.

2/ The year 1980, the year of the recession in Korea, was excluded from the computations.

of this country. 1/ In the Philippines and Thailand, the increases in ICORs were probably due to the rising share of investments directed toward infrastructure. Table 5 shows, however, that Philippine ICOR increased much more in the late 1970s and early 1980s than those of the other two countries. Despite its increase, Korea's ICOR was still the lowest of the three countries even in the 1980s, although closer to that of Thailand. Therefore, starting in the late 1970s, the return on investments was falling, the cost of borrowing was rising, and debt accumulation was accelerating. These variables were moving in a direction opposite to that of the optimal. Note that since the costs of borrowing were roughly identical for these three countries, the divergence of cost of external borrowing and productivity of capital was wider in the Philippines than in Korea and Thailand because the productivity of capital declined more in the former country.

## 4. Fiscal policies

The appropriate long-run strategy for a government that is borrowing abroad is to impose lower taxes at the early stage of development and higher taxes later when the debt has to be repaid. If the government were not able to increase tax revenues above a certain level to repay the debt, then the optimal amount of public borrowing would be lower than in the unconstrained case.

Therefore, one should observe a rising trend in the tax/GNP ratio of developing countries that are accumulating external debt. Table 6 displays the tax/GNP ratios of the three countries for the last 20 years. The tax ratio of Korea was the lowest of the three countries in the mid-1960s, while in the early 1980s it was the highest. In particular, starting in the mid-1970s, in the period of more rapid accumulation of external debt, the tax ratio of Korea increased from about 13 percent to almost 20 percent in 1983, a level that is high by historical standards. In contrast, the tax ratio of the Philippines in the early 1980s was about the same as in the late 1960s. This ratio shows a relatively high variability; it was fairly high in the mid-1970s peaking at more than 18 percent in 1975, but after 1976 it declined almost continuously until 1982/83, when it was about 12 percent of GNP, the same level as 1967/68. From the point of view of tax effort, then, the Philippines experienced a deterioration in its ability to collect revenues. This observation might imply that since the Philippine Government was "more constrained" in collecting tax revenues, the country's sustainable public external debt decreased.

The tax ratio of Thailand showed much less variability than that of the Philippines. It was fairly stable at about 13-15 percent of GNP in the entire period under consideration. The stable tax ratio suggests that the sustainable level of external debt/GNP remained unchanged.

1/ On this point, see Park (1984).

Table 6. Fiscal Revenue/GNP, 1965-83

(*In percent*)

| | Korea | Philippines | Thailand |
|---|---|---|---|
| 1965 | 7.6 | 10.8 | 14.6 |
| 1966 | 12.8 | 11.8 | 12.8 |
| 1967 | 14.7 | 12.4 | 14.9 |
| 1968 | 17.0 | 12.7 | 14.6 |
| 1969 | 17.8 | 12.8 | 14.3 |
| 1970 | 15.3 | 11.6 | 14.2 |
| 1971 | 15.2 | 11.8 | 13.8 |
| 1972 | 13.4 | 10.7 | 13.1 |
| 1973 | 12.6 | 14.4 | 12.6 |
| 1974 | 13.7 | 17.7 | 14.0 |
| 1975 | 15.3 | 18.7 | 13.1 |
| 1976 | 16.7 | 15.8 | 12.9 |
| 1977 | 16.3 | 16.2 | 13.8 |
| 1978 | 17.0 | 16.9 | 14.0 |
| 1979 | 17.4 | 15.9 | 14.4 |
| 1980 | 18.3 | 13.8 | 14.1 |
| 1981 | 18.8 | 11.6 | 14.6 |
| 1982 | 19.3 | 11.2 | 14.1 |
| 1983 | 19.8 | 12.1 | 15.9 |

Source: IMF, *IFS*.

In summary, the tax effort in Korea was increasing in the period of more rapid accumulation of external debt. By contrast, in the Philippines, external debt accumulation and tax effort moved in a direction opposite to optimal. The fiscal policy of Thailand did not show a reaction to the rapid accumulation of external debt of the last seven or eight years, but unlike the case of the Philippines, the tax effort did not decrease.

## 5. Tradable and nontradable goods sectors

The three countries have been thus far been considered as one-sector economies, but only the tradable goods sector of the economy produces resources that can be used directly to service external debt. Nontradable goods production is, by definition, absorbed by domestic demand. No direct information is available on the relative sizes of these two sectors; it is very difficult, for example, to measure the extent to which goods that are currently not exported are, in fact, exportable. Therefore, imperfect proxies such as the export/GNP ratio for the exportable/GNP ratio and the unit value of export/CPI for the relative price of exportables will be used (Tables 7, 8, and 9).

Table 7. Proxies for the Tradable Goods Sector 1/

| | Korea | Philippines | Thailand |
|---|---|---|---|
| Average 1970/75 | | | |
| Exp/GNP | 22.3 | 19.4 | 19.0 |
| (Exp + Imp)/GNP | 52.3 | 41.0 | 41.2 |
| Average 1976/80 | | | |
| Exp/GNP | 30.7 | 18.7 | 21.4 |
| (Exp + Imp)/GNP | 66.2 | 42.8 | 49.8 |
| Average 1981/83 | | | |
| Exp/GNP | 36.7 | 19.2 | 24.8 |
| (Exp + Imp)/GNP | 77.0 | 43.0 | 52.3 |

Source: IMF, IFS.

1/ The variable Exp is the export of goods and services. The variable Imp is the import of goods and services.

Table 8. Relative Price of Exportable Goods,
Unit Value of Exports/CPI, 1975-83

(1980 = 100)

| | Korea | Philippines | Thailand |
|---|---|---|---|
| 1975 | 105.8 | 129.9 | 110.4 |
| 1976 | 101.4 | 110.3 | 97.6 |
| 1977 | 99.5 | 103.9 | 94.3 |
| 1978 | 97.5 | 107.2 | 93.1 |
| 1979 | 98.0 | 111.8 | 101.3 |
| 1980 | 100.0 | 100.0 | 100.0 |
| 1981 | 95.4 | 91.0 | 91.3 |
| 1982 | 92.2 | 73.8 | 80.7 |
| 1983 | 91.1 | 92.0 | 79.0 |

Source: IMF, IFS.

Table 9. Real Effective Exchange Rate, 1975-83

(Base 1980 = 100)

| | Korea | Philippines | Thailand |
|---|---|---|---|
| 1975 | 92.5 | 97.7 | ... |
| 1976 | 100.6 | 95.8 | ... |
| 1977 | 100.8 | 93.8 | ... |
| 1978 | 94.5 | 87.2 | 93.3 |
| 1979 | 108.0 | 95.2 | 92.3 |
| 1980 | 100.0 | 100.0 | 100.0 |
| 1981 | 104.3 | 101.7 | 104.6 |
| 1982 | 106.1 | 105.1 | 106.7 |
| 1983 | 102.0 | 89.1 | 110.2 |

Source: IMF, IFS.

The export/GNP ratio for Korea was the highest and increased faster than those of the other two countries (Table 7). This ratio also rose in Thailand, albeit at a lower rate than in Korea. The ratio for the Philippines was the lowest of the three countries and remained virtually stable. The export sectors of the three economies show some signs of deterioration in the late 1970s and/or early 1980s. Besides the second oil shock, this was due to exchange rate behavior, movements of the international prices of some major exports of these countries, and to a lesser extent, to some imbalances in the sectoral allocation of investment.

Korea represents the best example of export-led growth. In the period 1963-73, the volume of Korean exports was rising at the rate of 30 percent a year, especially in the labor-intensive, light manufacturing sector. The export/GNP ratio was therefore rising rapidly. In the late 1970s, some adverse phenomena affected Korean exports, and the real exchange rate appreciated by about 8 percent between 1977 and the end of 1979 (Table 9). The unit value of the export/CPI index also showed a tendency to decline after 1977/78; in 1983, this index was about 10 percent lower than in 1977 (Table 8). As a result of these relative price and exchange rate movements, for the first time in recent Korean history, the volume of exports declined (by about 1 percent) in 1979. In response, the Korean Government implemented a flexible exchange rate policy that restored the real effective exchange rate to the level of 1972. Partly as a result, Korean exports resumed relatively rapid growth during 1981-83.

The share of the tradable goods sector in the Philippines remained virtually stable in the period under consideration and by 1983 it was about half of the share of the tradable goods sector of Korea (Table 7). Owing to the behavior of the real exchange rate and the relative price of exportables, the performance of the export sector was very weak in the early 1980s. The Philippine peso appreciated in real terms by approximately 20 percent between 1978 and 1982 (Table 9). It was not until 1983 that the peso was depreciated in order to restore the real exchange rate to a level that approximated the rate in 1978. The relative price of exports fell by about 30 percent between 1978/79 and 1982/83, almost four times as much as the same index for Korea. As a result, Philippine exports fell in real terms in 1981/82 and, together with the increase in imports, deficits in the trade and current accounts increased significantly. The weak performance of Philippine exports was also the result of the increased share of investment directed toward public infrastructure that, especially in the short run, did not directly expand the tradable goods sector.

Thailand's export sector performed well during the 1970s as it grew at an average annual rate of about 13 percent. As a consequence, the share of the tradable goods sector rose. Also, given the high share of agricultural products in Thailand's exports, the performance of Thailand's exports is influenced strongly by the behavior of the

international prices of a few commodities, particularly rice. Starting at the end of the 1970s, Thailand faced deteriorating relative prices for its exports. In this period, the real exchange rate appreciated by about 20 percent. This phenomena helps to explain the difficulties experienced by Thailand's exports which led to a marked increase in the current account deficit in 1983.

Given the relative dimensions of the export sectors in Korea, the Philippines, and Thailand, the debt/export and debt service ratios describe the level of debt of the three economies quite differently than the debt/GNP ratio. Table 10 shows that from the mid-1970s to the early 1980s, the Philippines and Korea had similar debt/GNP ratios but the former country had much higher debt/export and debt service ratios. In the 1980s, the debt/export ratio of the Philippines was more than twice that of Korea, and, additionally, the Philippines' debt/GNP ratio increased more rapidly than that in Korea; as a result, in 1983 the debt/GNP ratio of this country was 20 percentage points higher than the same ratio in Korea. It should be emphasized that Korea represents one of the few examples of a major borrowing country with a sharply declining debt/export ratio in the 1970s.

The external debt/GNP ratio of Thailand in the 1980s was less than two thirds of Korea's external debt/GNP ratio but given the smaller share of Thailand's export sector, the debt/export and debt service ratios of the two economies were about the same. In fact, in 1982-83, the debt service ratios were very close, and the debt/export ratio in 1983 was higher in Thailand than in Korea. The rate of growth of debt has been higher in the former than in the latter in recent years.

Given this significant difference in the relative magnitudes of these debt ratios, it is important to identify which one is the most reliable indicator of debt burden. The analysis presented in this study suggests that neither the debt/export nor the debt/GNP ratio is, by itself, a totally accurate indicator of debt burden. If a ratio has to be used, the correct one would be the ratio of debt to tradable goods, if it were observable. The debt/GNP ratio is a good proxy for the debt/tradable ratio if resources can easily be reallocated toward the tradable goods sector, that is, if there is a high level of substitutability between sectors. The debt/export ratio is a better proxy if the opposite is true. The time dimension is therefore relevant in evaluating these ratios. In the short run, resources cannot be reallocated easily between sectors so the debt/export ratio is a better indicator of short-run debt sustainability. Since, in the longer run, the relative size of the export sector is variable, the debt/GNP ratio is a better indicator of the debt burden.

Table 10. Total Debt/Export, Debt Service, and Debt/GNP Ratios, 1970-83 1/

| | Korea | | | Philippines | | | Thailand | | |
|---|---|---|---|---|---|---|---|---|---|
| | Debt/Export | Debt Service Ratio | Debt/GNP | Debt/Export | Debt Service Ratio | Debt/GNP | Debt/Export | Debt Service Ratio | Debt/GNP |
| 1970 | 2.05 | 18.5 | 28.7 | 1.67 | 29.2 | 32.5 | 1.10 | 16.3 | 11.1 |
| 1971 | 2.03 | 21.0 | 31.2 | 1.64 | 25.3 | 30.7 | 0.99 | 17.7 | 11.5 |
| 1972 | 1.72 | 18.7 | 34.0 | 1.80 | 26.1 | 32.0 | 0.87 | 14.5 | 11.6 |
| 1973 | 1.60 | 14.8 | 31.6 | 1.20 | 19.7 | 26.8 | 0.59 | 13.2 | 10.8 |
| 1974 | 1.16 | 14.4 | 32.0 | 1.08 | 14.5 | 24.0 | 0.46 | 9.4 | 11.1 |
| 1975 | 1.50 | 14.4 | 40.6 | 1.50 | 18.1 | 27.9 | 0.63 | 13.5 | 12.2 |
| 1976 | 1.18 | 12.1 | 36.7 | 2.01 | 17.2 | 35.5 | 0.61 | 11.4 | 13.0 |
| 1977 | 1.08 | 11.1 | 33.8 | 2.03 | 15.3 | 39.0 | 0.70 | 11.5 | 14.7 |
| 1978 | 1.08 | 13.2 | 28.6 | 2.48 | 20.0 | 44.0 | 0.86 | 18.1 | 18.7 |
| 1979 | 1.05 | 16.9 | 31.6 | 2.34 | 20.1 | 44.0 | 0.88 | 16.5 | 21.3 |
| 1980 | 1.21 | 19.7 | 44.6 | 2.37 | 20.9 | 48.5 | 0.89 | 16.7 | 22.3 |
| 1981 | 1.19 | 21.5 | 48.3 | 2.77 | 25.1 | 52.8 | 1.01 | 18.4 | 25.7 |
| 1982 | 1.31 | 23.1 | 52.4 | 3.61 | 38.1 | 60.5 | 1.22 | 20.2 | 31.5 |
| 1983 | 1.34 | 21.6 | 53.7 | 3.70 | 35.7 | 73.4 | 1.49 | 20.5 | 34.3 |

Sources: IMF, IFS; and Economic Planning Board of Korea.

1/ Debt is defined as in Table 1, inclusive of liabilities of commercial banks. Only the debt service ratio of the Philippines in the period 1970-76 does not include liabilities of commercial banks.

## IV. Conclusions

In this paper, a model of optimal borrowing has been used as a guideline for empirical analysis. The optimal policy for a borrowing country has been characterized, and the experiences of Korea, the Philippines, and Thailand have been compared to this paradigm.

The empirical analysis shows that Korea's external debt was the best managed of the three countries. In the 1970s, Korea took advantage of the favorable conditions of the international capital markets; it borrowed to finance investment, and the resulting rates of output growth were the highest for the three countries. The cost of borrowing was clearly lower than the rate of growth of GNP and presumably lower than the marginal productivity of capital. Furthermore, given the remarkable growth of the tradable goods sector, Korea's debt/export ratio was falling throughout the period 1970-79. At the end of the 1970s, most debtor countries faced serious economic problems necessitating prompt adjustment. Korea was the quickest and the most effective of the three countries in implementing a stabilization program. As a result, after the difficult years of 1979 and 1980, Korea's external position improved rapidly with sustained growth and low rates of domestic inflation.

The Philippines experienced considerable difficulty in the management of its external debt. Like Korea, the Philippines borrowed in the 1970s to finance investment. However, investment in the Philippines contributed less to GNP growth than in Korea and in Thailand. Furthermore, the tradable goods sector in the Philippines was not expanding; as a consequence, the debt/export ratio increased sharply. In the early 1980s, the Philippines did not respond in a timely fashion to the deteriorating economic situation. As a result, most policy indicators worsened during 1979-83; the real exchange rate appreciated, the tax effort decreased, and budget deficits rose. Consequently, current account deficits widened, GNP growth dropped, and inflation soared. As a result of these adverse developments, the debt indicators of the Philippines increased very rapidly during 1980-83 reaching the highest level of the three countries.

In many respects, the case of Thailand falls between Korea and the Philippines, although closer to that of Korea. Thailand's debt/GNP ratio was much lower than those of the other two countries. However, given the dimension of Thailand's export sector, the debt/export ratio and the debt service ratio are close to those of Korea. Furthermore, Thailand accumulated most of its debt in the period of rising interest rates. The reaction of Thailand to the external shocks at the end of the 1970s was not as dramatic as Korea's reaction; nevertheless, economic conditions improved significantly despite the difficulties encountered by Thailand's exports in 1983.

In this Appendix the rate of geometric depreciation (d) is explicitly considered.

1. Upward sloping cost of funds

Problem:

$$\max_{C_t, I_t} \sum_{t=o}^{\infty} (1 + \delta)^{-t} U(C_t) \tag{1}$$

$$\text{s.t. } I_t = Q_t - C_t + D_{t+1} - (1 + r(D_t))D_t \tag{1a}$$

$$K_{t+1} = K_t(1-d) + I_t \tag{1b}$$

$$Q_t = F(K_t) \tag{1c}$$

$$\lim_{t \to \infty} \{D_t[1 + r(D_t)]^{-t}\} \leq 0 \tag{1d}$$

$D_o$, $K_o$ given.

Lagrangean:

$$L = \sum_{t=o}^{\infty} (1+\delta)^{-t} U(C_t) + \lambda_t \{F(K_t) - C_t - I_t + D_{t+1} - [1+r(D_t)]\}D_t$$

$$+ \mu_t (K_t(1-d) + I_t - K_{t+1}) \tag{2}$$

$\lambda_t$ and $\mu_t$ Lagrange multipliers.

First-order conditions:

$$\frac{\partial L}{\partial C_t} = 0 : \quad (1 + \delta)\, U_{C_t} = \lambda_t \tag{3}$$

$$\frac{\partial L}{\partial K_t} = 0 : \quad \lambda_t F_{K_t} + \mu_t (1 - d) - \mu_{t-1} = 0 \tag{4}$$

$$\frac{\partial L}{\partial D_t} = 0 : \quad \lambda_{t-1} - (1 + r)\lambda_t - \lambda_t r'(D_t)D_t = 0 \tag{5}$$

$$\frac{\partial L}{\partial I_t} = 0 : \quad \lambda_t = \mu_t \tag{6}$$

Rearranging the first-order conditions:

$$F_{K_t} = r(D_t) + d + r'(D_t)D_t \tag{7}$$

This is the expression discussed in the text, where it was assumed $d = 0$.

2. One-sector model with fiscal constraint

Problem:

$$\underset{\tau_t\ I_t}{\text{Max}} \sum_{t=o}^{\infty} (1 + \delta)^{-t} U(C_t) \tag{8}$$

$$\text{s.t.} \quad C_t = (1 - s)(1 - \tau_t)Q_t \tag{8a}$$

$$Q_t = F(K_t) \tag{8b}$$

$$K_{t+1} = K_t(1 - d) + I_t \tag{8c}$$

$$\tau_t \leq \bar{\tau} \tag{8d}$$

$$\sum_{t=0}^{\infty}(Q_t - C_t - I_t)(1 + r)^{-t} \geq (1 + r)D_o \tag{8e}$$

$D_o$, $K_o$, given.

Substituting (8a) and (8b) into (8) the following Lagrangean results:

$$L = \sum_{t=0}^{\infty} (1+\delta)U((1-s)(1-\tau_t) F(K_t)) + \mu_t(K_t(1-d) + I_t - K_{t+1}) + \gamma(\sum_{t=0}^{\infty}\{F(K_t)[1 - (1-s)(1-\tau_t)] - I_t\}(1+r)^{-t} - (1+r)D_o) + \lambda (\bar{\tau} - \tau_t) \tag{9}$$

$\mu$, $\gamma$, $\lambda$ are the Lagrange multipliers of this problem:

First-order conditions:

$$\frac{\partial L}{\partial I_t} = 0 \quad : \quad \mu_t - \gamma(1+r)^{-t} = 0 \tag{10}$$

$$\frac{\partial L}{\partial K_t} = 0 \quad : \quad (1 - \delta)^{-t}U_{C_t}(1-s)(1-\tau_t)F_{K_t} + \gamma(1+r)^{-t}[1-(1-s)(1-\tau_t)]F_{K_t} + \mu_t(1-d) - \mu_{t-1} = 0 \tag{11}$$

$$\frac{\partial L}{\partial \tau_t} = 0 \quad : \quad -(1+\delta)^{-t}U_{C_t}(1-s)F(K_t) + \gamma(1+r)^{-t}F(K_t)(1-s)-\lambda = 0 \tag{12}$$

The multipliers $\mu_t$ and $\gamma$ are positive since the correspondent constraints are always binding; $\lambda$ can be positive or zero depending on whether the constraint (8d) is binding or not. After substitution from (10) and (11):

$$F_{K_t} \{(1-s)(1-\tau_t)[\frac{(1+\delta)^{-t}}{\gamma(1+r)^{-t}} U_{C_t} - 1] + 1\} = r + d \qquad (13)$$

Consider the first-order condition (12): If the constraint is not binding, by Kuhn-Tucker theorem $\lambda = 0$. Therefore $\tau > \tau_t$. From (12) it follows:

$$\gamma(1 + r)^{-t} = (1 + \delta)^{-t} U_{C_t}$$

Substituting into (13):

$$F_{K_t} = r + d \qquad (14)$$

If the constraint is not binding, the solution of this problem is like the solution of the basic model.

Suppose now that the constraint is binding: by Kuhn-Tucker theorem

$$\lambda > 0 \text{ and } \tau_t = \bar{\tau}$$

In this case from (12) it follows:

$$U_{C_t}(1 + \delta)^{-t} \leq \gamma(1 + r)^{-t} \qquad (15)$$

Therefore

$$0 < \frac{(1 + \delta)^{-t}}{\gamma(1+r)^{-t}} U_{C_t} \leq 1$$

Let

$$\Gamma_t = (1+s)(1-\tau)\left[\frac{(1+\delta)^{-t}}{\gamma(1+r)^{-t}} U_{C_t} - 1\right] + 1$$

From (15) it follows:

$$0 < \Gamma_t \leq 1 \text{ if } \bar{\tau} = \tau_t$$

So that if the fiscal constraint is binding:

$$F_{K_t} = \frac{1}{\Gamma_t}(r + d) \qquad (16)$$

and, therefore:

$$F_{K_t} \geq r + d$$

This is the expression discussed in the text. Note that if the constraint is binding:

$$\frac{d\Gamma_t}{d\bar{\tau}} > 0 \text{ .}$$

3. Two-sector model

Problem:

$$\underset{C^T, C^N, I^T, I^N}{\text{Max}} \sum_{t=0}^{\infty} (1 + \delta)^{-t} U(C_t^T, C_t^N) \qquad (17)$$

s.t.

$$Q_t^N = F^N(K_t^N) \tag{17a}$$

$$Q_t^T = F^T(K_t^T) \tag{17b}$$

$$C_t^N = Q_t^N \tag{17c}$$

$$\sum_{t=o}^{\infty} (Q_t^T - C_t^T - I_t^T - I_t^N)(1 + r)^{-t} \geq (1 + r)D_o \tag{17d}$$

$$K_{t+1}^T = K_t^T (1 - d) + I_t^T \tag{17e}$$

$$K_{t+1}^N = K_t^N (1 - d) + I_t^N \tag{17f}$$

$D_o$, $K_o^N$, $K_o^T$ given

**Lagrangean:**

$$L = \sum_{t=o}^{\infty}(1+\delta)^{-t}U(C_t^T, C_t^N) + \lambda\Big[\sum_{t=o}^{\infty}(F^T(K_t^T) - C_t^T - I_t^N - I_t^T)(1+r)^{-t}$$

$$- (1+r)D_o\Big] + \mu_t\big[K_t^T(1-d) + I_t^T - K_{t+1}^T\big] + \gamma_t\big[K_t^N(1-d) + I_t^N - K_{t+1}^N\big] +$$

$$+ \psi_t(F^N(K_t^N) - C_t^N)$$

$\lambda$, $\mu_t$, $\gamma_t$, $\psi_t$, are the Lagrange multipliers of this problem.

First-order conditions

$$(1 + \delta)^{-t} U_{C_t^T} = \lambda(1 + r)^{-t} \tag{18}$$

$$(1 + \delta)^{-t} U_{C_t^N} = \psi_t \tag{19}$$

From (18) and (19):

$$\frac{U_{C_t^N}}{U_{C_t^T}} = P_{N_t} = \frac{\psi_t (1+r)^{-t}}{\lambda} \tag{20}$$

Condition (20) implies that in each period the marginal rate of substitution between traded and nontraded goods is equal to the relative price of the two types of goods.

$$(1 + r)^{-t} \lambda \, F_{K_t}^T + \mu_t (1 - d) - \mu_{t-1} = 0 \tag{21}$$

$$\mu_t - \lambda(1 + r)^{-t} = 0 \tag{22}$$

$$\gamma_t (1 - d) - \gamma_{t-1} + \psi_t \, F_{K_t}^N = 0 \tag{23}$$

$$\gamma_t - \lambda(1 + r)^{-t} = 0 \tag{24}$$

Using (21) and (22)

$$\lambda(1 + r)^{-t} F_{K_t}^T + \lambda(1 + r)^{-t}(1 - d) - \lambda(1 + r)^{-t+1} = 0$$

Therefore:

$$F_{K_t} = r + d \tag{25}$$

Using (23) and (24)

$$\psi F^N_{K_t} = \lambda(1 + r)^{-t}(d - 1) + \lambda(1 + r)^{-t+1} \tag{26}$$

Rearranging:

$$\frac{\psi}{\lambda(1+r)^{-t}} F^N_{K_t} = r + d \tag{27}$$

Using (20):

$$F^N_{K_t} = \frac{1}{P_{N_t}}(r + d) \tag{28}$$

Conditions (20), (25), and (28) are discussed in the text.

4. Two-sector model with taxes

Under the assumptions described in the text:

$$C_t = (1 - s)(1 - \tau_t)(Q^T_t + P_{N_t} Q^N_t) \tag{29}$$

$$C^T_t = \alpha(P_N)C_t = \alpha(P_N)(1 - s)(1 - \tau_t)(Q^T_t + P_{N_t} Q^N_t) \tag{30}$$

$$C^N_t = \frac{1-\alpha(P_N)}{P_N} C_t = \frac{1}{P_{N_t}}(1-\alpha(P_{N_t}))(1-s)(1-\tau_t)(Q^T_t + P_{N_t} Q^N_t) \tag{31}$$

The equilibrium condition in the nontradable goods sector, under the assumption described in the text, is

$$C_t^N = Q_t^N \tag{32}$$

Using this condition and substituting into (30) and (31):

$$C_t^T = \frac{(1 - \alpha(P_N))(1 - s)(1 - \tau_t)}{P_{N_t}[\tau_t + s(1 - \tau_t) + \alpha(P_N)(1-s)(1-\tau_t)]} Q_t^T \tag{33}$$

$$C_t^T = \frac{(1 - s)(1 - \tau_t)}{\tau_t + s(1 - \tau_t) + \alpha(P_N)(1 - s)(1 - \tau_t)} Q_t^T \tag{34}$$

The budget constraint for this economy is:

$$\sum_{t=o}^{\infty}(Q_t^T - C_t^T - I_t^N - I_t^T)(1 + r)^{-t} \geq (1 + r)D_o \tag{35}$$

Substituting (33) and (34) into the budget constraint:

$$\sum_{t=o}^{\infty}(Q_t^T \frac{\tau_t + s(1 - \tau_t)}{\tau_t + s(1 -\tau_t) + \alpha(P_N)(1 - s)(1 - \tau_t)} - I_t^T - I_t^N)(1 + r)^{-t} \tag{36}$$

$$\geq (1 + r)D_o$$

This is the expression discussed in the text.

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