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Country Economics Department
The World Bank
March 1991
WPS 625

How Trade and Macroeconomic Policies Affect Economic Growth and Capital Accumulation in Developing Countries

Ramon Lopez

A stable exchange rate is crucial to economic growth. Export promotion generates faster growth than import liberalization. Economic instability and foreign debt are key determinants of capital growth.

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Lopez provides cross-country empirical evidence on the relationship between trade and macroeconomic policy and economic growth. He finds that:

- Countries that follow sustainable strategies perform better than those following unsustainable strategies. Indeed, unsustainable policies hurt growth. Sustainable policies (as in Korea, Taiwan, Singapore, Hong Kong, Thailand, and Malaysia) promote exports and lead to real exchange rates that are either fully aligned or even undervalued for prolonged periods of time but are relatively stable. Unsustainable policies (more common in developing countries) include policies that tax exports and overvalue exchange rates for extended periods, leading to periodic balance of payments crises and a highly unstable real exchange rate.

- Export promotion policies generate faster growth than policies that remove import restrictions.

- Economic instability and foreign debt are key determinants of capital growth.

- Contrary to conventional belief, capital accumulation appears to be stimulated by direct export restrictions and does not seem to be directly affected by economic instability.

Produced by the PRE Dissemination Center

Table of Contents

This paper has benefitted from the comments by Jim de Melo, Arvind Panagariya, Paul Romer, Dani Rodrik, Maurice Schiff, Vinod Thomas, and Jim Tybout on an earlier draft. Able research assistance was provided by Bjorn Larsen. Financial support was provided by the World Bank Research Committee, RPO #675-32.

ECONOMIC GROWTH, CAPITAL ACCUMULATION AND THE TRADE/MACRO POLICY REGIME IN LDCs

I. Introduction

The relation between trade strategy and economic growth has received increasing attention during the last decade. The neoclassical growth model suggests that under the usual constant returns to scale production function without externalities, per capita economic growth along the optimal path basically depends on the rate of (per capita) capital accumulation and technological change. In steady state growth in per capita income is entirely determined by the rate of productivity growth. Since static (efficiency) gains of removing even relatively large distortions have been shown to be modest, economists have turned to endogenous dynamic effects of outward-oriented trade policies on productivity growth and externalities (Lucas 1988, Romer 1986, and Edwards 1989).

The limited empirical evidence available to-date suggests that the trade/macro policy strategy chosen by a country plays a more important role in economic growth than what is suggested by the simplest versions of the neoclassical growth model. Perhaps the most compelling evidence supporting the hypothesis that trade policies affect economic growth comes from the few developing countries that during the last 2 decades have made significant progress to achieve the standards of living of industrialized economies. These countries (Korea, Taiwan, Singapore, Hong Kong, and more recently, Thailand and Malaysia), whether following a "liberal equivalent" trade strategy as Krueger (1978), Bhagwati (1978) and others suggest or an active government intervention strategy as suggested by Sachs (1987), have a common trade/macro policy denominator that largely distinguishes them from most other developing countries. The policy similarity has been their massive export promotion including both commercial and exchange rate policies that led to real exchange rates that have been either fully "aligned" or even undervalued for prolonged periods of time. Moreover, largely because of the trade/macro policy

regime followed the real exchange rate has shown a relatively high degree of stability. This is in contrast with the experience of the vast majority of the rest of the developing world where commercial policies have usually taxed exports and maintained their real exchange rate overvalued for periods of time, which in turn have forced periodic balance of payments crises and a high degree of instability of the real exchange rate.

The above evidence is, of course, only suggestive. It is possible that these particular policy differentials make no real difference and that the apparent correlation between policy and growth have no causal implications. Nonetheless, there exists some further evidence obtained by detailed, usually multicountry studies, which despite their many limitations still point towards some degree of a systematic relationship between trade policy orientation and growth.[1]

Several studies have been directed to either endogenize productivity growth by making it dependent on the trade regime, or to remove the assumption of constant returns to scale thus allowing for internal or external economies of scale. Two other mechanisms by which trade/macro policies can affect growth at least in the intermediate run, which have received little attention are the following: (i) the effect of economic instability (in particular exchange rate instability) on productivity growth that ex-ante unsustainable trade/macro policies may generate, and (ii) the effects of these policies on capital accumulation. Unsustainable strategies are those that follow a combination of macro and trade policies that are not consistent with external (current account) equilibrium. Ex-ante unsustainable strategies lead to economic instability characterized by periodical balance of payment crises that force major adjustments of the exchange rate and domestic expenditures. Once the crisis is over the policy mix becomes again biased by taxing exportables and importables. This, in turn, causes more external disequilibria which after a while require a new round of devaluation and expenditure adjustment. Although both sustainable and unsustainable strategies are characterized by external equilibrium on average over a long period of

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[1] See Edwards (1989) for a critical review of the empirical studies available.

time, the main distinction between the two is that a sustainable strategy, ceteris paribus, will provide a more stable real exchange rate/current account profile than an unsustainable strategy. The key issue is, therefore, the effect of economic instability on growth. If instability is detrimental for growth then trade/macro policies that are ex-ante unsustainable will retard economic growth.

The fact that the effect of trade/macro policies on growth via capital accumulation has been largely ignored at least in cross country analyses is quite surprising. This is so because empirical work has shown that, while productivity growth is the most important factor explaining growth, the role of capital expansion is far from being negligible. Moreover, it appears that capital accumulation in LDCs plays an even greater role in explaining economic growth than in developed countries.

The endogenous productivity growth version that is perhaps most relevant to LDCs emphasizes the role of the trade regime in determining how fast existing innovations are absorbed by a particular country (Lewis, 1955, Edwards, 1989). A number of authors have documented a strong and positive association between growth in exports -- a measure of greater outward-orientation -- and growth in output. Based on the experience of eleven economies during 1960-73, Balassa (1982) concluded that a high rate of export growth has positive effects on output growth. A growing number of empirical studies bring out the significance of export growth to output performance (Kavoussi, 1984 and Ram, 1985). Grounds for considering exports as an additional factor of production and as a source of growth include their technological diffusion effects, associated scale economies, and positive externalities stemming from the exposure to larger markets and greater competition.

Two limitations of the observed export-GDP linkage are particularly noteworthy. First, the standard regression results do not permit the establishment of causality from export growth to output growth, as is often asserted.[2] Second, the studies are seldom able to control for the actual trade policy bias of the countries. Thus, even where the contribution of exports and outward orientation is

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[2] Jung and Marshall (1985) found in most cases a two-way causality.

established, this by itself provides only indirect evidence in favor of export-oriented policies but says little about the most effective policies to promote exports.[3]

The purpose of this paper is to provide some further cross-country empirical evidence on the relationship between trade/macro policy strategies and economic growth. Following the growth accounting tradition, we use an extended GDP function where we consider trade/macro policy indicators in addition to the conventional factors of production. We consider two channels by which the trade/macro policy environment may affect growth, namely, its direct effects on productivity growth and its indirect effects via capital accumulation.

An important difference with previous studies is that we use a much broader taxonomy of policy strategies. Most analyses have been in the past implicitly or sometimes explicitly based on the traditional taxonomy proposed by Bhagwati that focusses on trade policies only. This taxonomy suggests a dichotomous policy alternative, namely, import substitution or export promotion. We propose here a taxonomy that allows for various combinations of trade and macro/expenditure policies. This permits us to distinguish not only between import substitution and export oriented strategies but also between ex-ante sustainable and unsustainable trade/macro policy strategies as defined above. We consider disaggregated trade policy indicators combined with measures of real exchange rate instability and alternatively current account instability, which allow us to distinguish export oriented, import substitution, ex-ante sustainable and unsustainable trade/macro policy strategies. The fact that we relate growth directly to trade policies rather than to exports or other trade flow variables has the advantage of partially mitigating the causality issue (policies are more likely to be exogenous than trade flows) so pervasive in cross-country studies that have tried to explain growth by export growth and other trade flow variables.

In contrast with recent empirical analyses we explicitly allow for the joint determination of output growth and capital growth as mutually interdependent variables. This enables us to obtain estimates of

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[3] An important exception is Balassa (1985) who does relate economic growth to various policies.

the two channels by which trade/macro policies can affect growth, namely, productivity changes and capital accumulation.

A third contribution of this paper is to provide some evidence on the factors underlying differences in capital growth across countries, using both trade regime variables, measures of price instability and national debt as explanatory variables. In various internal World Bank documents it has been suggested that a more open trade policy leads to greater capital growth. On the other hand, Rodrik (1988) argues that the trade regime is of little importance in determining investments and that the key factor required to promote domestic investments in LDCs is a reduction in uncertainty. Using trade regime proxies as well as simple measures of instability we provide some empirical verification of Rodrik's claims.

The remainder of this paper is organized as follows: In Section II we briefly review the accepted taxonomy of trade policies due to Krueger (1978) and Bhagwati (1988) arguing that a broader taxonomy explicitly accounting for non-tradables is necessary. Section III is devoted to a description of the methodology and estimation strategy. In Section IV we provide the main results, in Section V we provide a tentative interpretation of the results, and in the last section we summarize the major findings.

II. Trade Strategies: Some Further Taxonomy

Traditionally trade policies are classified into import substitution strategies where import substitutes enjoy greater incentives than exports, and export promotion strategies where the export sector receives as much incentives as import substitution industries (Bhagwati adds an "ultra export promotion" strategy where exports receive more incentives than import substitutes). This taxonomy only considers relative incentives to importables and exportables ignoring any effect of trade and macro policies on the non-tradable sector. This requires the assumption of permanent current account equilibrium, in which

case the price of non-tradables is uniquely determined by the prices of the importable and exportable goods. If because of expansive fiscal/monetary policies or other reasons the price of non-tradables is too high relative to that of tradables, a temporary current account deficit is generated that, in turn, triggers automatic expenditure reducing mechanisms correcting the imbalance and the exchange rate overvaluation. The government can ot course neutralize these effects by appropriate expenditure measures but to the cost of rapidly depleting foreign exchange reserves and/or increasing international debt. Thus the government can maintain overvaluation only to the extent permitted by the availability of foreign reserves and international creditworthiness. Beyond this the only possible outcome is to allow for the market mechanisms to operate reestablishing an equilibrium exchange rate meaning that in the long-run there is no room for a "non-tradable promotion" strategy.

Although the above argument clearly indicates that the limits for exchange rate overvaluation are quite narrow, what is not so clear is that the argument is completely symmetric. Undervaluation of the real exchange rate seems much more sustainable than overvaluation. A government can use fiscal/monetary instruments to neutralize the effect of the current account surpluses caused by exchange rate undervaluation for much longer periods of time. The consequence of this would be a continuous and persistent accumulation of foreign reserves and foreign assets. It appears that the only limit to this lies in the effectiveness of the neutralization mechanisms used by the government which may tend to decline as foreign assets continue to accumulate. The fact that a policy of systematic undervaluation may not be optimal does not mean that it should not be considered as a feasible strategy at least for the intermediate run. The experiences of Japan and specially Taiwan provide "real world" examples of persistent and increasing current account surpluses that have gone unchecked for decades. The key issue is that macro/trade policy biases against non-tradables can be sustained for sufficiently long periods of time to cause dramatic changes in the pattern of development.

Once we allow for the price of non-tradables to be part of the trade/macro policy strategy we need to distinguish those that are a priori sustainable from those that are not. Sustainable strategies are those policy combinations that ex-ante imply either a balanced or surplus current account.[4] These strategies are sustainable in the sense that they can be maintained for a long period of time without going through major instability in relative prices, particularly the real exchange rate. Ex-ante unsustainable strategies generate periodic deficits in the current account that require major (temporary) corrections in the real exchange rate once a balance of payments crisis becomes serious. After the crisis is over the policy mix is again biased toward external deficits which after a while require drastic expenditure/devaluation corrections and so on. The main characteristic of unsustainable strategies is to cause chronic economic instability, particularly reflected in large fluctuations of the real exchange rate.

Table 1 proposes a taxonomy of six trade/macro policy strategies consistent with the previous discussion. Direct export promotion policies include export subsidies, drawbacks, preferential credit and other measures that favor the export sector directly. Direct import protection essentially covers quantitative restrictions, import tariffs and any other restrictions to imports that lend domestic production of import substitutes more profitable. Implicit in Table 1 are the indirect or general equilibrium effects of trade/macro policies which act through the price of non-tradables (or, equivalently, through wages). In the anti-non-tradable strategy the non-tradable sector is not compensated for the direct export promotion and import restriction measures. That is, the real exchange rate is undervalued or the wage rate is too low causing a current account surplus. Since this is quite sustainable there is no need of frequent adjustments and thus the system is inherently stable. This is translated in a low rate of variability of the real exchange rate. Strategies 2 and 3 concentrate the direct incentives on either the

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[4] Of course the current account needs to be in equilibrium over the very long-run. The question is whether this equilibration process is achieved in a stable framework or require periodic major adjustments. The former occurs when the policy mix is ex-ante consistent with current account equilibrium or surplus.

import substitution or export sector and may or may not compensate the non-tradable sector. The important thing is that the net a-priori effect of these strategies is either to penalize or have a neutral effect on the non-tradable sector. As a consequence, the current account will be either in surplus or in equilibrium and thus the strategy does not require large periodic adjustments of the real exchange rate.

The last 3 strategies generate ex-ante current account deficits which implies the necessity of constant real exchange rate corrections with the government persisting in its unsuccessful efforts to maintain the real price of non-tradables and wages too high. The net or average long-run effect of this is not of course a permanent overvaluation of the real exchange rate but rather a large degree of variability of the real exchange rate. Also, the current account is characterized by a high degree of instability with periods of deficits followed by surpluses (this is reflected in the (-/+) sign under the current account column for rows 4 to 6).

It appears that the most common strategies adopted by LDCs fall among the first four categories in Table 1. The fast growing South East Asian countries have implemented strategies that can be probably best characterized by 3 or perhaps 1 while most Latin American economic policies are better described by 4.

The taxonomy proposed above has three important implications: (i) the trade policy orientation cannot be judged separately from macroeconomic policies, particularly those affecting the determination of the real exchange rate; (ii) the degree of instability of the current account balances and real exchange rate provide an important indicator to distinguish between ex-ante sustainable and unsustainable strategies; (iii) trade/exchange rate policies can determine real export incentives and import substitution incentives more or less independently at least in the intermediate run. That is, in contrast with the conventional presumption, there is no reason why the effects of increasing direct export incentives on GDP should be identical to reducing import substitution incentives. The Lerner symmetry condition does not hold except

in the very long-run.[5] This has important implications for the empirical analysis of this paper. In particular, this is a justification to use direct export incentives and import substitution incentives as independent explanatory variables in the GDP growth and capital growth equations. Moreover, if the ex-ante trade/macro strategies chosen by countries are important for growth, the above taxonomy suggest that, in addition to the conventional variables (capital growth, employment growth, etc.), either real exchange rate or current account instability, should also be used as a factor determining growth.

This framework permits us to provide some evidence on the effectiveness of export incentives vis-à-vis import substitution incentives in promoting growth and capital accumulation to answer the following important question: Is reducing import barriers equally effective as export promotion in generating economic growth? Within the conventional framework the answer would be affirmative since both imply the same thing, namely a reduction in the anti export bias. If the taxonomy suggested here is at all relevant, the answer to the above question would be negative. Reducing import barriers will imply resource flows towards the non-tradable sector as well as to the export sector from the import substitution sector while increasing export promotion will cause resources to flow from both the import substitution and non-tradables towards the export sector. If exports are (gross) substitutes in production with both non-tradables and import substitutes, it can be shown that the effect on the export sector of an increase in direct export promotion will be greater than that of a similar reduction in import barriers.

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[5] Even without non-tradables, and assuming sustainable external equilibrium Razin and Svensson (1983) have shown that the Lerner symmetry condition does not hold in multiperiod models except in the steady state. In general, the very fact that exchange rate devaluation (an equal incentive to both importables and exportables) has real effects suggests that the Lerner symmetry condition does not hold.

III. Methodology and Estimation

We consi r the rates of growth of output and capital as simultaneously determined. First we specify the GDP growth equation and next we consider the capital growth equation. Define a GDP function in the standard manner,

(1) $$Y = F(K, L, Z; A) - qZ ,$$

where Y is GDP level, K is the stock of physical capital, L is labor, Z is the level of imported intermediate inputs, A is an index of productivity, and q is the real price of imported intermediate inputs.

Since we are interested in cross country analysis we can assume that q is approximately similar across countries and thus define the GDP function exclusively in terms of the factors of production

(2) $$Y = G(K, L, Z; A) ,$$

where the effect of Z on GDP is zero if GDP is measured in domestic rather than in world prices as is the case with conventional statistics. Therefore, one can write a per capita GDP growth equation as

(3) $$\hat{y} = \alpha_k \hat{k} + \alpha_L \hat{L} + \alpha_A \hat{A}$$

where $\hat{y}$ is per capita GDP growth, $\hat{k}$ is the rate of growth of the capital stock per capita, $\hat{A}$ is rate of productivity growth, and α_k, α_L, and α_A are fixed coefficients. Note that $\alpha_L = 0$ implies constant returns to scale. We postulate that the rate of growth of productivity depends on the trade/macro policy regime. The more open the trade regime is the more rapid the adoption of new technologies is likely to be and, hence, export and import restrictions are likely to reduce growth.

As discussed in the previous section, sustainable ex-ante trade/macro policy regimes are likely to generate a more stable economic environment than unsustainable regimes. This can affect growth

through various mechanisms. The more stable an economy is the greater will be the allocation of capital to research activities vis-à-vis physical capital and the fastest can technological change be developed and/or adapted to the specific country conditions. That is, stability affects the composition of capital accumulation between physical capital and research and development. It is assumed that investments in research and development require a much longer maturity period than physical capital and are also riskier than non-research investments. This implies that an adequate level of investment in research and development requires greater stability.

Thus, the growth in productivity can be represented by,

$$(4) \qquad \hat{A} = \beta_0 + \beta_{DX} DX + \beta_{DM} DM + \beta_\sigma \sigma ,$$

where DX is a measure of direct export restrictions, DM is a measure of direct import restrictions, and σ is a variable reflecting economic instability. According to the previous discussion the expected signs of the coefficients are $\beta_{DX} \leq 0$, $\beta_{DM} \leq 0$ and $\beta_\sigma < 0$. The coefficient $\beta_{DM} \leq 0$ if import restrictions imply also difficulties in absorbing external technical change that is embodied in imported goods and $\beta_{DX} \leq 0$ if expanding exports provide, for example, additional incentives for the adoption of modern techniques that usually require large plant capacity (and, hence, international markets) to be profitable.

Substituting (4) in (3) we obtain the estimating growth equation,

$$(5) \qquad \hat{y} = \alpha_0 + \alpha_k \hat{k} + \alpha_L \hat{L} + \alpha_{DX} DX + \alpha_{DM} DM + \alpha_\sigma \sigma ,$$

where $\alpha_0 = \beta_0 \alpha_A$; $\alpha_{DX} = \beta_{DX} \alpha_A$; $\alpha_{DM} = \beta_{DM} \alpha_A$; $\alpha_\sigma = \beta_0 \alpha_A$

Most empirical studies do not use capital growth as an explanatory variable mainly due to problems in measuring the stock of capital required to calculate the rate of growth. They instead use investment/GDP (see, for example, Edwards, 1989). When the investment/GDP ratio is used the interpretation of the coefficient is not the share of capital but is rather the marginal physical product of

capital. Since in a cross-country analysis this coefficient is assumed constant across countries it can be easily shown that this is equivalent (under constant returns to scale) to assume that the capital/labor ratios are constant across countries which is certainly more unrealistic than assuming that the shares are constant.[6]

An alternative approach actually followed in this study is to consider a unique (average) rate of growth of capital throughout the period (and country) that would replicate the actual growth of capital as closely as possible. Assume, for example, that the path of capital can be approximated by

$$(6) \qquad K_t = K_0 (1 + \hat{k}_1)^t$$

where K_0 is the stock of capital at the beginning of the period under consideration and $\hat{k}_1$ is the average (equivalent) growth rate of capital for the period. Differentiating (6) with respect to time and using $I_t = \delta K_t + \dot{K}_t$ we obtain,

$$(7) \qquad I_t = [\delta + \ln (1 + \hat{k}_1)] \; K_0 (1 + \hat{k}_1)^t$$

and taking log of both sides,

$$(8) \qquad \ln I_t = \gamma_0 + \gamma_1 t$$

where $\gamma_0 = [\delta + \ln (1 + \hat{k}_1)] \; K_0$

$\gamma_1 = \ln (1 + \hat{k}_1)$

Thus by estimating (8), which only requires data on gross investments, it is possible to obtain an estimate of the average growth rate of capital without necessitating information on the stock of capital, $\hat{k}_1 = \text{antiln } \gamma_1 - 1$. Equation (8) is estimated for each country using time series for the period under consideration, and the average growth rate of capital is derived from the estimated coefficient γ, using its definition. To obtain the capital growth per capita, $\hat{k}$, as required by (5) we simply use $\hat{k} = \hat{k}_1 - \hat{L}$.

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[6] On the other hand, the use of this procedure in time series analysis requires that the system be in steady state at all times!

The (per capita) growth of physical capital is assumed to be determined by the (per capita) GDP growth rate, the degree of economic stability prevailing in each country considered during the period of analysis, the level of external debt of the country and by features of the trade regime. Naturally we expect that the effect of the GDP growth rate on capital growth to be positive as suggested by the various versions of the theory of the accelerator. Consistent with the idea that there exist important entry and exit costs associated with investments one would expect that even if decision makers are risk neutral increased uncertainty will decrease the level of investment (Rodrik, 1988). Therefore, greater instability and, hence, greater uncertainty is likely to have a negative effect on investments and consequently on capital growth.

The effect of external debt on capital growth is also expected to be negative at least for two reasons. One is the debtor hangover story in which the existence of a heavy debt burden reduces the incentives to invest due to the fact that debt payments are tied to economic performance. Another reason is that heavily indebted countries are forced to reduce their external imbalances which, in turn, calls for large reductions of fiscal expenditures. It is usually the public investment component of fiscal expenditures that suffers the largest reduction in this situation. Since public investment is an important component of total investment, its reduction usually implies a significant deceleration of the rate of growth of total capital. The degree of export and import restrictions, may have an ambiguous effect on capital accumulation. If domestic production of importables is more capital intensive than that of exportables and non-tradables, it is possible that greater import restrictions have a positive effect on capital accumulation.

Thus, the specification of the cross-country analysis of capital accumulation is the following:

$$(9) \qquad \hat{k} = \epsilon_0 + \epsilon_y \hat{y} + \epsilon_\sigma \sigma + \epsilon_D \left[\frac{D}{y}\right] + \epsilon_{DX} DX + \epsilon_{DM} DM ,$$

where D is the stock of debt. Consistent with the previous discussion the following sign pattern is expected for the coefficients: $\epsilon_y > 0$, $\epsilon_\sigma < 0$, $\epsilon_D < 0$, ϵ_{DX} , $\epsilon_{DM} \gtrless 0$.

IV. Data and Results

The per capita GDP growth equation (5) and the per capita capital growth equation (9) were estimated using cross-country data for a set of 35 developing countries using a Two Stage Least square method.[7] The period under analysis is 1975-85. The data on the trade regime is based on the assessment of various components of trade policies prepared in a cross-country study by Halevi (1989). The trade regime data collected by Halevi corresponds mostly to the period 1979-83. Since some countries in the sample have in part altered their trade regimes throughout the 1975-85 period, we also estimate the model for the period 1979-83 to check the robustness of the estimates.

The indicator of instability (variable σ) chosen was the real exchange rate variability defined as the coefficient of variability (standard deviation/mean) of the real exchange rate during the period under analysis.[8] The variable representing export restrictions (DX) is a dummy variable that equals to one for countries that, according to Halevi's analysis, have imposed a high degree of direct export restrictions. Similarly, import restrictions are represented by a dummy variable (DM) that equals to one for countries that exhibit a high degree of direct import protection. We note that, consistent with the taxonomy of trade regimes proposed in Section II, we are considering here only direct restrictions. That is, for example, a country is judged to have high export restrictions based only on direct disincentives to exports without considering indirect incentives such as the degree of protection to the import substitution sector.

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[7] See appendix for the lists of countries considered.

[8] We measure the deviations from the fitted trend values of the real exchange rate.

Tables 2 and 3 present the two stage Least square estimates of the model using samples that cover two periods, namely, 1975-85 and 1979-83. The reason for estimating the 1979-83 period was that the trade regime data covers this period and thus we were interested in checking the stability of the parameters estimated using the longer time period. The estimates in Tables 2 and 3 were obtained after excluding 3 and 2 observations, respectively that turned out significant at 5% level of significance when performing the D exclusion text for influential observations (Besley, Kuh and Welsh, 1980).[9]

In general, the goodness-of-fit of the two set of estimates is very good with adjusted R^2 in the 0.42-0.62 range and high level of significance of most variables considered. The sign pattern of the coefficients is generally consistent with a priori expectations with the only exception of the sign of the coefficient of the export dummy in the capital growth equation. Moreover, as shown by the equations presented in Tables 2 and 3 as well as several other estimates not reported in them, the coefficients are quite robust to changes in data and specification. The lack of significance of the coefficient associated with the labor force variable in the per capita GDP growth equations suggests that the hypothesis of constant returns to scale cannot be rejected.

We use a Chow test to analyze the stability of the coefficients through time. In particular we tested whether they remained constant in the period 1981-85 compared with the 1975-80 period. The hypothesis of stability of the coefficients could not be rejected at 5% level of significance. Similarly, the hypothesis that the coefficients were constant in the period 1979-83 could not be rejected at 5%. Thus, we will henceforth refer mostly to the estimates in Table 2 that cover a larger time period.

The most striking result of Table 2 is the high significance and negative sign of the export restriction dummy (DX) in the output growth equation and its positive effect on the capital growth equation. The import restriction dummy (DM) does not appear to have a significant effect on output

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[9] It is important to note that the signs of the statistically significant coefficients were not affected by the exclusion of the observations.

growth or capital accumulation. The coefficient of DM was never significant including in specifications (not reported in Table 2) where the variable σ was excluded. That is, countries that have high direct restrictions on exports have experienced a slower growth in total factor productivity but a faster rate of expansion of physical capital than countries that have not imposed important restrictions to exports. At the same time whether a country restricts imports or not does not seem to cause any significant effect either on total factor productivity or capital accumulation.[10]

Another important result is the highly significant negative effect of the variability of the real exchange rate on productivity growth. Surprisingly, the variability of the real exchange rate does not exert any direct significant effect on capital accumulation. However, given that capital growth is also affected by output growth, there is an indirect negative effect of exchange rate variability on capital accumulation as well.[11] A fourth important result from Table 2 is that, not surprisingly, the stock of debt exerts a significantly negative effect on capital growth.

Table 4 shows the net effects of the various exogenous variables on GDP growth and capital growth obtained by solving the simultaneous system comprised of equations (5) and (9). For example, the effect of debt on capital growth considers its direct effect as well as the indirect effect due to the fact that capital growth affects GDP growth which, in turn, has a second round impact on capital growth. These net effects are calculated using the estimated coefficients reported in Table 2. Since the coefficients of DM were completely insignificant in both equations we consider the net effect of import restrictions as zero.

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[10] In fact, the coefficient of DM reported in Table 1 as well as in several other estimates have never been significant.

[11] The lack of significance of the coefficient of the exchange rate variability in the 1979-83 sample period (Table 2) is due to the insufficient number of observations available to calculate the coefficient of variability of the exchange rate when it is measured using annual data. When we used quarterly data to calculate REVAR for 1979-83, the coefficient became again negative and significant in the GDP growth equation while still insignificant in the capital growth equation.

To judge the quantitative importance of the export restrictions effect one should note that the per capita GDP growth is expressed in coefficient form (i.e., 3% is 0.03). Hence, high export restrictions have caused a net reduction in growth of about 0.4 percentage point per annum to countries that have imposed them. This is certainly an important loss that has occurred despite the fact that, according to the statistical analysis, the rate of capital growth has been accelerated by 3 percentage points in these countries. The positive effect of export restrictions on capital growth is somehow surprising. A possible explanation is that production of exportables in LDCs tends to be less capital intensive than other sectors and, hence, that a relative acceleration of growth in the production of exportables vis-à-vis non-tradables and importables decreases investments in physical capital.

The net effect of exchange rate variability is also negative for both GDP growth and capital accumulation. According to the estimates, a 10% increase in the degree of exchange rate instability would cause approximately a 0.7% deceleration in output growth and a 0.2% reduction in the rate of capital accumulation. This result may be considered to be consistent with models that acknowledge exit/entry costs in investment determination (Dixit, 1987 and Rodrik, 1988). In these models uncertainty is a key factor explaining investments. However, the empirical analysis shows that the mechanism by which capital accumulation is negatively affected is the deceleration on output growth caused by instability rather than by direct effects. Economic instability decreases productivity growth which, in turn, causes a fall in output growth and thus on capital accumulation.

The net effect of foreign debt is particularly detrimental for capital accumulation while the effect on output growth is substantially less negative. A 10% increase in the stock of debt causes a deceleration in capital growth of almost 1.5% and a reduction in output growth of the order of 0.4%. In order to shed some light on the mechanisms by which foreign debt affects capital accumulation we disaggregated capital growth into growth of private and public capital for a subset of countries for which these data were available (23 countries). We estimated private capital growth as a function of the same variables

that we used to explain aggregate capital growth plus the rate of growth of public capital. Public capital growth, in turn, was explained by GDP growth and Debt/GDP. We used an instrumental variables technique to account for the endogeneity of GDP growth. Table 5 shows the estimated coefficients for the two capital growth equations.

The major findings in Table 5 are three: (i) Private capital accumulation is much more affected by GDP growth than public capital growth. This, of course, is not surprising but confirms that private investment is much more procyclical than public investment although both suffer in periods of slow growth; (ii) private capital growth tends to be negatively affected by public capital growth indicating a degree of crowding-out; (iii) Real exchange rate instability exerts no direct effect on private capital growth as well. As in the case of aggregate capital accumulation, the negative effect of exchange rate stability on private capital accumulation takes place entirely through the output effect; (iv) The detrimental effect of foreign debt on capital accumulation appears to be mostly concentrated on the growth of public capital and not so much on private capital accumulation. That is the debtors' hangover effect does not appear to apply to private investment and its negative effect on public capital accumulation is probably related to the necessity of devoting a greater proportion of public revenues to servicing the debt with the corresponding reduction of public investments.[12]

V. A Suggested Interpretation of the Results

In this section we present some possible hypotheses that would help to interpret the results. Here we try to explain the direction of the partial effects in Table 2 rather than the net effects presented in Table 4.

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[12] An important proportion of the foreign debt in LDCs is public sector debt.

The fact that the effects of direct export restrictions and import restrictions are qualitatively different is consistent with the hypothesis that the Lerner's symmetry condition does not hold except in the very long-run. As long as there exist persistent current account imbalances, as has been the case with most countries in our sample, there is no reason to expect that output and capital accumulation will be equally affected by export and import restrictions. The results are consistent with the idea that there exist positive externalities associated with exports and that direct export promotion measures tend to be more effective in generating export growth than the removal of import restrictions.

Why is it that decreasing import restrictions does not cause the same effects as decreasing export restrictions? A possible explanation could be that (if the Lerner's symmetry condition does not hold) lowering import restrictions has a more indirect effect on exports mostly because lower import restrictions cause an expansion of the non-tradable sector which, in turn, can compete with the exportable sector for resources. Also the existence of unemployment can greatly reduce the effectiveness of reducing import restriction on exports vis-a-vis export promotion measures. A vital general equilibrium linkage, the wage effect, between the import substitution and the export sector can be considerably weakened when the existence of unemployment make that the two sectors do not actually compete in the labor market.

The positive effect of export promotion on productivity growth may be associated with export externalities. To maintain a steady export expansion it is necessary to allocate a greater volume of resources to research and development to create and especially adopt new technologies.[13] This, in turn, causes a faster growth in total factor productivity. Production of exportables in LDCs is more intensive in research and development and less intensive in physical capital than the import substitution and non-tradable sectors. Thus, countries that have high export restrictions tend to reallocate capital away from

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[13] Although LDCs do not create in a considerable manner "new" technologies, the rapid adaptation and dissemination of foreign technologies to the indigenous conditions is an essential condition for fast productivity growth. Investments in research and development are possibly the most important factor explaining this process.

research and development activities toward physical capital accumulation. This explains the negative effect on total factor productivity growth and the positive (partial) direct effect on capital accumulation of export restrictions. However, the total effect on physical capital accumulation of export restrictions is still negative because the deceleration of output growth that they cause has a sufficiently large detrimental effect on physical capital accumulation to offset the partial positive effect.

The negative effect of macroeconomic instability on productivity growth is also likely to be caused by a reallocation of resources away from research and development possibly associated with an increase of the share of physical capital investments in total investment and a reduction in total investments. Investments in research and development are inherently more long-run and risky in nature than investments in physical capital. Therefore, economic instability is likely to cause a much greater reduction in research and development than in physical capital expansion. This would explain why the direct effect of real exchange rate instability is negative and significant on GDP growth equation but not significant in the physical capital growth equation.

VI. Summary and Conclusions

This paper has provided further evidence on the role of trade/macro policy regimes on economic growth and, to the best of our knowledge, for the first time has econometrically analyzed the relationship between trade regime and capital accumulation. The econometric analysis of economic growth has considered a number of important aspects mostly ignored by previous studies. In the first place, the role of the trade regime has been analyzed using disaggregated components of trade policies rather than a single indicator of "trade liberalization." The disaggregation between export incentives and import protection has been shown to be theoretically consistent if one recognizes that trade policies (combined

with suitable macroeconomic policies) can independently affect the real incentives of importables/exportables and non-tradables.

In the second place, we have shown that the distinction between ex-ante sustainable and unsustainable strategies has important implications for the analysis of the role of trade/macro policy strategies for economic development. In particular, by explicitly considering indicators of real exchange rate instability in conjunction with direct export incentives and direct protection for import substitution we have been able to obtain an idea of the importance of unsustainable trade/macro policies as a factor retarding growth.

In the third place, the empirical analysis has allowed for the simultaneous determination of output growth and capital accumulation. This is in contrast with most previous studies on growth that have typically assumed a one way causality from capital accumulation to output growth. The joint analysis of output growth and capital accumulation has allowed us to consider the effects of various policy-related variables considering both direct mechanisms (productivity growth) and indirect mechanisms via changes in capital growth.

The empirical results permit us to obtain some important implications: (i) Export promotion policies and not import liberalization have generated faster growth; (ii) Unsustainable ex-ante trade/macro regimes have had a significant detrimental effect on economic growth; (iii) Economic instability and foreign debt are key determinant of capital growth; (iv) Contrary to the conventional belief, capital accumulation appears to be stimulated by direct export restrictions and does not seem to be affected by economic instability.

REFERENCES

Balassa, B. (1982), "Development Strategies and Economic Performance," in Development Strategies in Semiindustrialized Economies, B. Balassa (ed.), London: Oxford University Press.

_____, B. (1985), "Exports, Policy Choices and Economic Growth in Developing Countries," Journal of Development Economics,

Belsley, D., Kuh and Welsch (1980), Diagnostic Test in Regression Analysis.

Bhagwati, J. (1988), Export-Promoting Trade Strategy: Issues and Evidence, The World Bank Research Observer, 3: 27-58.

_____ (1978), Anatomy and Consequences of Exchange Control Regimes, Cambridge, MA: Ballinger Publisher Co. (NBER).

Dixit, A. (1987), "Intersectoral Capital Reallocation Under Price Uncertainty," Princeton University.

Edwards, S. (1989), Openness, Outward Orientation, Trade Liberalization and Economic Performance in Developing Countries," Unpublished mimeo, The World Bank.

Halevi, N. (1989), "Trade Liberalization in Adjustment Lending," background paper for Strengthening Trade Policy Reform, The World Bank, Washington D.C.

Jung, W. and P. Marshall (1985), Exports, Growth and Causality in Developing Countries," Journal of Development Economics, 18: 1-12.

Kavoussi, R. (1984), "Export Expansion and Economic Growth: Further Empirical Evidence," Journal of Development Economics, 14: 241-50.

Krueger, A. (1978). Foreign Trade Regimes and Economic Development: Liberalization Attempts and Consequences, Cambridge, MA: Ballinger Publishing Co. (NBER).

Lewis, A. (1955), The Theory of Economic Growth, London: Allen and Umwin.

Lucas, R. (1988), "On the Mechanics of Economic Development," Journal of Monetary Economics, 22:3-42.

Ram, R. (1985), "Exports and Economic Growth: Some Additional Evidence," Economic Development and Cultural Change, 33: 415-25.

Razin, A. and L. Svensson (1983), "An Asymmetry Between Import and Export Taxes," Economics Letters, (13): 33-57.

Rodrik, D. (1988), "Liberalization, Sustainability, and the Design of Structural Adjustment Programs," Unpublished mimeo, World Bank.

Romer, P. (1986), "Increasing Returns and Long-Run Growth," Journal of Political Economy, 94: 1002-1037.

Sachs, J. (1987), "Trade and Exchange Rate Policies in Growth-Oriented Adjustment Programs," in V. Corbo, M. Goldstein and M. Khan (eds.) Growth-Oriented Adjustment Programs, Washington, DC: International Monetary Fund and the World Bank.

Table 1: TRADE/MACRO POLICY STRATEGIES

	Direct export promotion	Direct import restrictions	Current Account	Real exchange rate Variability
1. Anti-non-tradables/sustainable	(+)	(+)	(+)	low
2. Import substitution/sustainable	(-) (0)	(+)	0 (+)	low
3. Export promotion/sustainable	(+)	(-) (0)	0 (+)	low
4. Import substitution/unsustainable	(-)	(+)	(-/+)	high
5. Export promotion/unsustainable	(+)	(-)	(-/+)	high
6. Anti-tradables/unsustainable	(-)	(-)	(-/+)	high

Table 2: TWO STAGE LEAST SQUARE (2SLS) ESTIMATION OF THE GDP GROWTH AND CAPITAL GROWTH EQUATIONS (1975-85)

Dependent Variable	Constant	CAPG ($\dot{k}$)	GDPG ($\dot{y}$)	LABG ($\dot{L}$)	Debt/ GDP	REVAR (σ)	DX	DM	$\bar{R}^2$
Per capita GDP growth (GDPG)	0.027	0.275	-	0.232	-	-0.061	-0.014	-0.005	0.57
	(2.56)	(4.92)		(0.68)		(-2.54)	(-3.01)	(-0.74)	
Per capita Capital stock growth (CAPG)	-0.015	-	1.462	-	-0.099	0.076	0.044	0.0005	0.62
	(0.31)		(1.73)		(-2.08)	(0.89)	(3.24)	(0.03)	

Note: t-statistics are in bracket

Table 2A: DEFINITIONS OF THE VARIABLES

(1)	REVAR	:	real exchange rate variability as measured by the coefficient of variability (standard deviation/mean of the annual average values of the real exchange rate)
(2)	GDPG	:	average rate of per capita GDP growth
(3)	DM	:	a dummy variable equals to one if direct import protection (tariffs/quota) is high and zero otherwise
(4)	DX	:	a dummy variable that equals to one if direct export restrictions are high and zero otherwise.
(5)	CAPG	:	average rate of growth of physical capital per capita
(6)	LABG	:	average rate of growth of the labor force
(7)	Debt / GDP	:	average level of total foreign debt relative to GDP

Table 3: TWO STAGE LEAST SQUARE ESTIMATION OF THE MODEL FOR THE PERIOD 1979-83

Dependent Variable	Constant	CAPG ($\dot{k}$)	GDPG ($\dot{y}$)	LABG ($\dot{L}$)	Debt/ GDP	REVAR (σ)	DX	DM	$\bar{R}^2$
Per capita GDP growth (GDPG)	0.005	0.232	--	0.703	--	0.009	-0.016	-0.015	0.59
	(0.39)	(3.64)		(1.42)		(0.24)	(-2.62)	(-1.47)	
Per capita capital stock growth (CAPG)	0.047	--	0.058	--	-0.245	-0.146	0.034	0.057	0.42
	(0.72)		(0.73)		(-2.54)	(-1.01)	(1.13)	(1.83)	

Note: t-statistics are in bracket

Table 4: NET EFFECTS OF THE VARIOUS EXOGENOUS VARIABLES ON GDP GROWTH AND CAPITAL ACCUMULATION (1975-85 SAMPLE)

	DX	DM	σ	D/GDP
GDP Growth Rate	-0.004	0.00	-0.067	-0.041
Capital Accumulation Rate	0.032	0.00	-0.022	-0.148

Table 5: DETERMINANTS OF THE GROWTH RATE OF PRIVATE AND PUBLIC CAPITAL STOCKS: INSTRUMENTAL VARIABLE ESTIMATES USING POOLED DATA FROM PERIODS 1975-80 AND 1981-85

Dependent Variable	Constant	PBCAPG	GDPG ($\dot{y}$)	Debt/ GDP	REVAR (σ)	DX	DM	$\bar{R}^2$
Per Capita Growth of Private Capital (PVCAPG)	-0.09 (-1.25)	-0.84 (-1.85)	6.51 (3.12)	-0.16 (-1.12)	0.25 (0.81)	0.04 (0.90)	0.03 (0.45)	0.30
Per Capita Growth of Public Capital (PBCAPG)	0.09 (1.80)	--	2.50 (2.48)	-0.23 (-2.52)	--	--	--	0.32

Note: t-statistics are in bracket

APPENDIX

List of Countries Considered in the Analysis

Argentina
Burundi
Brazil
Central African Republic
Chile
Cote d'Ivoire
Colombia
Costa Rica
Ghana
Guyana
Indonesia
Jamaica
Kenya
Korea
Morocco
Madagascar
Mexico
Mauritania
Mauritius
Malawi
Niger
Nigeria
Pakistan
Panama
Philippines
Senegal
Tanzania
Togo
Thailand
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