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Economic Effects and Structural Determinants of Capital Controls

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Abstract

This paper studies determinants and effects of capital controls using a panel of 61 developed and developing countries. The results suggest that capital account restrictions are more likely to be in place in countries with low income, a large share of government, and where the central bank is not independent. Other determinants of controls include the exchange rate regime, current account imbalances and the degree of openness of the economy. We also find that capital controls and other foreign exchange restrictions are associated with higher inflation and lower real interest rates. We do not find any robust correlation between our measures of controls and the rate of growth, although there is evidence that countries with large black market premia grow more slowly.

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Summary

This paper examines capital controls from a long-term perspective, it analyzes theoretically and empirically their determinants and their economic effects. With regard to the determinants of capital controls, the paper investigates whether certain political and structural features of an economy make the imposition or removal of capital controls more likely. With regard to the effects of foreign exchange restrictions, it investigates whether limitations on capital mobility, together with other economic, political, and institutional features, help explain the behavior of key macroeconomic variables, such as inflation, real interest rates, and growth.

The theoretical part of the paper presents a simple and widely used overlapping generations model. Although no formal test of propositions derived from the model is performed, the theoretical framework helps to identify some of the key issues examined in the empirical analysis. The empirical part of the paper is based on a panel of 61 developing and developed countries. Dummy variables are constructed from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* as proxies for capital controls. These proxies include restrictions on payments for current and capital account transactions and multiple currency practices.

Several interesting empirical regularities are identified in the paper. Capital controls are more likely to be in place when income is low, the share of government in economic activity is large, the exchange rate is managed, and the government has a relatively free hand in monetary policy because the central bank is not very independent. As for the economic impact of capital controls, restrictions on capital account transactions tend to be associated with higher inflation, a higher share of seigniorage revenue in total revenue, and lower interest rates. This study finds no robust impact of capital controls on the rate of growth, although there is evidence that countries with large black-market premiums (themselves correlated with foreign exchange restrictions) grow more slowly.

1. Introduction

The turbulence on foreign exchange markets that led to the demise of the "hard EMS" has once again sparked a debate on the opportunity to impose restrictions on international capital flows to prevent "speculative" attacks on pegged currencies unwarranted by economic fundamentals. ^{1/} The economics literature on foreign exchange restrictions is extensive, and has analyzed important issues such as, for example, the rationale for the imposition of capital controls, their implications for monetary and fiscal policy conduct, their effectiveness in segmenting domestic and foreign financial markets, the optimal sequencing in a process of trade and financial liberalization. This paper examines capital controls from a long-term perspective, and analyzes theoretically and empirically their determinants and their economic effects. The element of novelty in the paper is the empirical investigation of the link between foreign exchange restrictions and economic, political and institutional features of an economy in a wide sample of countries. ^{2/}

With regard to the determinants of capital controls, we investigate whether certain political and structural features of an economy make the imposition or removal of capital controls more likely. Since effective capital controls can have significant macroeconomic and distributional consequences, we believe this investigation to be a logical starting point. For example, capital controls may allow a country to pursue for a certain time an independent monetary policy. The incentive of the government to impose capital controls for this reason should then depend on the degree of control the government has over monetary policy. This control is tighter the less independent is the Central Bank. As for distributional considerations, capital controls may allow the government to tax capital more easily, provided they are effective in curtailing capital flight. With regard to the effects of foreign exchange restrictions, we investigate whether limitations to the degree of capital mobility, together with other economic, political and institutional features, help explain the behavior of key macroeconomic variables, such as inflation, real interest rates, and growth. Our analysis therefore belongs to the growing body of literature on endogenous macroeconomic policy formation that links economic policy choices to various structural, institutional and political features of an economy. ^{3/}

The theoretical part of the paper presents a simple and widely-used overlapping generations model. Although we do not formally test propositions derived from the model, this theoretical framework allows us

^{1/} See for example Eichengreen and Wyplosz (1993). The original argument was formulated by Tobin (1978).

^{2/} In a previous study (Alesina, Grilli and Milesi-Ferretti (1994)) we focused only on OECD countries. See also Epstein and Schor (1992).

^{3/} For related work see for example Roubini and Sachs (1989), Grilli, Masciandaro and Tabellini (1991) and Alesina and Roubini (1992).

to identify some of the key issues we examine in the empirical analysis. The empirical part of the paper is based on a panel of 61 developing and developed countries and extends a previous study (Alesina, Grilli and Milesi-Ferretti (1994)) that focused solely on OECD countries. Although the data has many shortcomings, discussed in Section IV, we identify several interesting empirical regularities. Overall, our results are consistent with the view that capital controls are a complement to "financial repression" measures that allow the government to extract seigniorage revenue more effectively and to reduce domestic debt service through lower real interest rates. We find that capital controls are more likely to be in place when income is low, the share of government in economic activity is large, the exchange rate is managed and the government has a relatively free hand on monetary policy because the Central Bank is not very independent. As for the economic impact of capital controls, we find that restrictions on capital account transactions tend to be associated with higher inflation, a higher share of seigniorage revenue in total revenue, and lower interest rates. We do not find any significant impact of capital controls on the rate of growth, although there is evidence that countries with large black market premia (correlated with foreign exchange restrictions) grow more slowly.

The remainder of the paper is organized as follows. Section II discusses the rationale for imposing capital controls. Section III presents a simple model that identifies key "economic" effects of capital controls. Section IV describes the data, Section V presents the empirical evidence on the effects of controls and Section VI the evidence on their determinants. Section VII concludes.

II. Why Capital Controls? ^{1/}

A recent study by Mathieson and Rojas-Suarez (1993) provides a useful classification of the main motivations to impose restrictions on capital account transactions:

1. Limiting volatile short-term capital flows
(avoiding balance of payments crises etc.);
2. Retention of domestic savings;
3. Help for stabilization and structural reform programs;
4. Maintenance of the domestic tax base.

Before starting the discussion of these motivations, one should point out that their relevance depends on the ability of the government to impose effective capital controls. This ability has probably weakened over time, for two reasons. The first is the endogenous "erosion" of existing barriers, as agents find ways to circumvent official restrictions. The

^{1/} This section draws largely from Alesina, Grilli and Milesi-Ferretti (1994).

second has to do with structural change and technological progress in financial markets, that facilitate international capital movements and make them harder to monitor. The nature of our data makes it impossible to account for these factors; they should be taken into account, however, when weighing the arguments in favor or against financial liberalization. Indeed, empirical work suggests that the effective degree of capital mobility in developing countries may be quite high. ^{1/}

1. Limiting volatile short-term capital flows
(stability of foreign exchange markets)

Foreign exchange markets are very liquid and react very quickly to shocks. Because of factors such as price and wage rigidities and investment irreversibility the real economy has a slower speed of adjustment. Authors such as Tobin (1978) and Dornbusch (1986) argue that this differential speed of adjustment, together with exogenous "excess volatility" in financial markets, may induce excess exchange rate volatility (overshooting; bubbles etc.), with negative effects on real economic activity. Tobin proposed to "throw sand in the wheels" of short-run capital flows through a uniform tax on all foreign exchange transactions, thereby discouraging very short-term capital flows, but with negligible effects on long-run ones. ^{2/} Dornbusch (1986) suggests the adoption of measures such a dual exchange rate systems, that are able to shield, at least partially, the real economy from the vagaries of short-term financial markets behavior. Tornell (1990) presents a model in which "Tobin taxes" can help increase "real" investment by reducing the volatility of returns on financial investment--the latter discourages real investment because of an irreversibility constraint.

With pegged exchange rates, unrestricted short-term capital flows may cause large variations in foreign exchange reserves, the collapse of the peg or high interest rate variability. The recent turbulence experienced in the European Monetary System, in countries that unilaterally pegged their rate to the ECU or the D-Mark and more recently in Mexico proves this point very effectively. According to their proponents, effective capital controls can at least mitigate these undesirable effects in the short run. Obviously crises can occur because fundamentals are out of line, as is the case when two macroeconomic policy objectives (say, domestic credit expansion and fixed exchange rates) are mutually inconsistent, as shown in the literature on speculative attacks and balance of payments crises. ^{3/} In the absence of capital controls, sustainability of an adjustable-peg mechanism requires large interest rate changes before realignments, to compensate asset holders

^{1/} See for example Ul Haque and Montiel (1990).

^{2/} To be effective, this type of measure would need to be adopted by all countries, in order to avoid capital flows to "tax haven" countries. Of course, this raises serious coordination problems.

^{3/} See for example Krugman (1979), Flood and Garber (1984), Grilli (1986) and Obstfeld (1986).

from capital losses. This interest rate variability is particularly damaging in countries where the government has a large short-term public debt, or when longer-term debt instruments are indexed to short-term interest rates, as is the case in Italy. ^{1/} In order to justify the imposition of controls, one would need to motivate explicitly the adoption of policy measures that are inconsistent with the exchange rate peg in the long run. However, the possibility of self-fulfilling speculative attacks against a fixed exchange rate, not motivated by market fundamentals, would provide an additional justification for the imposition of capital controls: the exchange-rate peg can collapse even when current fundamentals are consistent with the peg (Obstfeld 1986, 1988). This line of argument has been adopted recently by Eichengreen and Wyplosz (1993). Overall, the analysis would suggest that governments with stronger "credibility problems" would be more likely targets of speculative attacks and may therefore be more likely to impose capital controls. ^{2/}

2. Retention of domestic savings

If the private return from holding domestic instruments is below the social return, for example because of the existence of positive externalities from domestically invested capital, there is a rationale for limiting capital outflows and/or encourage capital inflows. As observed by Mathieson and Rojas-Suarez (1993), however, restricting domestic residents' ownership of foreign assets implies reduced portfolio diversification and more vulnerability to domestic macroeconomic shocks.

A related argument is that a government may be willing to adopt measures that stimulate savings if the latter are prevented from flowing abroad by low capital mobility or by capital controls. For example, a panel study of OECD countries by Jappelli and Pagano (1994) finds that savings

^{1/} Giavazzi and Giovannini (1989) underline the asymmetry between strong- and weak-currency countries: as long as the burden of adjustment falls on the weak-currency countries, the other countries are "isolated" from the effects of interest-rate variability. Giavazzi and Pagano (1990) relate the likelihood of a "confidence crisis" to public debt management.

^{2/} However, it is necessary to take into account the impact of imposing capital controls on the credibility of the policy itself. Suppose for example that the imposition of capital controls allows the government to pursue "inconsistent" policies for a while. Then private agents, if they do not fully know the government's intentions, may raise the probability that the government will indeed behave inconsistently, implying a worsening of credibility rather than an improvement. Lane and Rojas-Suarez (1992) analyze the impact of capital controls on the credibility of a commitment to keep the exchange rate within pre-specified bands. Dellas and Stockman (1993) show that self-fulfilling speculative attacks can occur under a fixed exchange rate regime because agents expect that capital controls will be imposed in the future.

are higher in countries with restrictions on household borrowing. To be effective in raising domestic savings, these restrictions require in addition the presence of capital controls (Pagano, 1994).

Finally, capital inflows may be discouraged by countries that wish to limit foreign ownership of domestic factors of production, for political or ideological reasons. These limitations, however, would prevent a country from using external finance to allow domestic investment to diverge from domestic savings and from benefitting from technological transfers through foreign direct investment.

3. Help for stabilization and structural reform programs

Free capital flows can be destabilizing when a country implements a stabilization or a structural reform plan. There is an extensive literature on the optimal sequencing of external sector liberalization. Authors such as Frenkel (1982), Edwards (1984, 1989) and Van Wijnbergen (1990) have stressed the effects of liberalizing the capital account on the real exchange rate. In the context of an inflation stabilization plan accompanied by trade liberalization, an early opening of the capital account can cause a real appreciation, because of the high interest rates typically associated with a stabilization plan, and more real exchange rate volatility. Both these effects would make trade liberalization more problematic.

The credibility of the stabilization plan plays a key role in determining the consequences of free capital mobility. Lack of credibility of the stabilization plan may cause capital flight and a balance of payments crisis, making the plan failure more likely. If the plan is credible, the high real interest rates typically associated with a stabilization program may cause temporary large capital inflows. If these inflows are sterilized, domestic interest rates remain high, thereby encouraging further inflows, and the central bank incurs a quasi-fiscal cost, because the return on foreign exchange reserves is below the return on assets denominated in domestic currency. 1/ If no sterilization occurs, the increase in the money supply can jeopardize the control of inflation. Finally, letting the nominal exchange rate appreciate may hamper a trade reform aiming at lower barriers to imports. 2/

The appropriate response to a surge in capital inflows cannot be determined without a close examination of the causes of the inflow, and may

1/ For an illustration of the "perils of sterilization", see Calvo (1991).

2/ For an analysis of policy response to capital inflows following stabilization, see for example Calvo, Leiderman and Reinhart (1993). Among the policy responses being discussed, one can mention fiscal restraint, the removal of restrictions on capital outflows, and the imposition of "Tobin taxes" on short-run capital inflows.

differ depending on what is the composition of inflows. Clearly, portfolio investment is more "reversible" than foreign direct investment. Indeed, proponents of foreign exchange restrictions (see previous sub-section) tend to propose measures that hamper short-term flows, rather than long-term ones. From a political economy point of view, one should consider the relation between political stability, government preferences and credibility. Again, governments with lower initial credibility may be those with stronger incentives to introduce capital controls (see 2.1 above). Overall, this motivation for the introduction of capital controls may have larger relevance for developing countries.

4. Maintenance of the domestic tax base and distributional issues

In the presence of restrictions on foreign currency holdings, the ability of domestic agents to avoid the inflation tax is reduced. In the presence of controls, the government can impose measures such as high reserve requirements that raise the demand for money and therefore the inflation tax base. As stressed by Drazen (1989), these measures can have negative long-run effects, because they may discourage capital accumulation by raising the interest rates that banks charge on loans. ^{1/} In order to maintain seigniorage revenue following the dismantling of barriers to trade and capital flows, Brock (1984) argues that the central bank can impose a reserve requirement on foreign capital inflows and a prior import deposit.

More generally, foreign exchange restrictions are often accompanied by various types of financial market restrictions, such as controls on interest rates, constraints on banks' portfolios, credit controls etc. These measures can be used by the government to reduce the cost of domestic borrowing. Giovannini and de Melo (1993) compare the domestic and foreign cost of borrowing for a sample of developing countries, and show that this source of revenue can be substantial. Even in the absence of financial repression, effective controls on capital outflows may allow the government to reduce the cost of financing its debt by lowering real interest rates. Aizenman and Guidotti (1994) present a second-best argument in favor of this policy choice when tax distortions are high and domestic debt is large. ^{2/}

The links between financial development and economic performance, highlighted in the work of Goldsmith (1969) and McKinnon (1973), among others, have been recently re-examined by Roubini and Sala-i-Martin (1992a, b) and King and Levine (1993). These authors underline that an

^{1/} On the relation between reserve requirements and the inflation tax, see also Brock (1989).

^{2/} Using an overlapping-generations framework, Sussman (1991) also suggests that capital controls (in the form of a tax on interest-bearing foreign assets, accompanied by a tax on domestic assets) reduce debt service and increase the demand for money.

underdeveloped and repressed financial system allows the government to finance public expenditure more easily when the tax system is inefficient, but it may constitute an obstacle to growth.

Giovannini (1988) and Razin and Sadka (1991) argue that taxation of domestic capital can induce capital flight when it is difficult to tax foreign-source income, thus making a case for controls on capital outflows. According to Giovannini, the distortions introduced by capital controls may be smaller than those implied by the impossibility to tax foreign-source income. Razin and Sadka show that when taxing foreign-source income is impossible, it may be optimal to impose a restriction on capital exports in order to generate "overinvestment" domestically. These issues are discussed more formally in the next section.

Alesina and Tabellini (1989) examine the distributional aspects of tax policy and capital controls when economic agents are heterogeneous. The authors view capital controls as a form of limiting holdings of foreign assets that are non taxable. Individuals would accumulate foreign assets to avoid the risk of future domestic taxation. In their model there are two social groups, "workers" and "capitalists", and two parties, each representing a social group. The workers' source of income is labor (they cannot own domestic capital), while the capitalists' income comes from capital holdings. Under reasonable assumptions about initial endowments and distribution it is shown that fear of a future workers' government may induce capitalists to export capital. Among other things, the paper shows that once homogeneity between private agents is removed, distributional reasons become an important consideration in the evaluation of foreign exchange restrictions. ^{1/} Epstein and Schor (1992) use a Keynesian framework to argue that capital controls enhance monetary policy autonomy, and that an expansionary monetary policy in the presence of controls can raise employment and capacity utilization by reducing interest rates, thus favoring workers and damaging financial sector interests.

We turn now to a more analytical discussion of some of the public finance aspects of capital controls, that seeks to formalize some of the arguments developed in this section.

III. A Model of Capital Controls

The model is a variant of Diamond's (1965) overlapping generations model. Related models are presented in Persson (1985), Giovannini (1988) and Sussman (1991). We focus on a small open economy, in which capital controls take the form of a tax on foreign assets' holdings. An alternative formulation, analytically more cumbersome, is to express capital controls as a quantity restriction (as, for example, in Razin and Sadka, 1991). Adams

^{1/} Capital flight may be induced by expectations of future capital controls and capital levies.

and Greenwood (1985) demonstrate the equivalence of a tax and a quota on foreign assets when the quota is "auctioned" by the government.

1. Consumers

Individuals live for two periods; they work in the first, and then retire and consume their savings in the second. Real money balances yield utility, for example because they provide transaction services. They are held by individuals in the first period of their life, and used in the second to purchase goods. Lifetime utility for an individual born at time t is given by:

$$U = u(c_{1t}) + \beta u(c_{2t+1}) + v(m_t) \quad (1)$$

where c_{ij} is real consumption in period j of an individual of age i (1 = young, 2 = old) and m_t are real money balances. 1/ Disposable income in the first period of life is given by y_t , which is equal to labor income minus distortionary income taxes τ :

$$y_t = w_t(1 - \tau_t - h(\tau_t)) \quad (2)$$

The function $h(\tau)$ captures the distortionary costs of taxation, for example on labor supply. The individual budget constraint in the first period, expressed in real terms, is given by:

$$y_t - c_{1t} = b_{t+1} + m_t \quad (3)$$

where b_{t+1} are purchases of "bonds" representing the sum of physical capital k , indexed domestic government debt d and foreign bonds f that mature in period $t+1$. In the second period the individual consumes all his wealth:

$$c_{2t+1} = \frac{m_t}{1 + \pi_{t+1}} + (k_{t+1} + d_{t+1})[1 + r_{t+1}(1 - \delta_{t+1})] + f_{t+1}[1 + r^*(1 - \theta_{t+1})] \quad (4)$$

r^* is the foreign real interest rate (assumed to be fixed for simplicity), π_{t+1} is the inflation rate between periods t and $t + 1$ and δ_{t+1} and θ_{t+1} are

1/ Alternatively the utility derived from real balances could be expressed as $v(m_{t+1})$

the tax rates on domestic capital income and on foreign asset holdings respectively. The latter tax represents capital controls. Equation (4) implicitly assumes that the tax on capital income is levied on real returns; we later discuss the case in which the tax is levied on nominal returns. In the absence of risk, arbitrage requires the equality between the post-tax rates of return on capital, domestic and foreign bonds:

$$r_{t+1}(1-\delta_{t+1}) = r^*(1-\theta_{t+1}) \quad (5)$$

Let i_{t+1} be the post-tax nominal interest rate, equal to:

$$[1+r_{t+1}(1-\delta_{t+1})](1+\pi_{t+1}) - 1.$$

The consumer's intertemporal budget constraint is therefore given by:

$$c_{1t} + \frac{c_{2t+1}}{1+r_{t+1}} = y_t - \frac{\hat{i}_{t+1}}{1+i_{t+1}} m_t \quad (6)$$

where $\hat{r}_{t+1} = r_{t+1}(1-\delta_{t+1})$ is the post-tax real return on assets. The last term on the RHS is seigniorage.

The first-order conditions for consumer utility maximization yield:

$$u_1(c_{1t}, c_{2t+1}) = (1+\hat{r}_{t+1})u_2(c_t, c_{2t+1}) \quad (7)$$

$$v'(m_t) = \frac{\hat{i}_{t+1}}{1+i_{t+1}} u_1(c_{1t}, c_{2t+1}) \quad (8)$$

where u_i denotes the derivative of u with respect to its i -th argument. Together with the intertemporal budget constraint (6), these two equations determine the path of consumption and money holdings as a function of disposable income y_t , the post-tax real interest rate \hat{r}_{t+1} and the rate of inflation π_{t+1} .

2. Firms

Firms produce output using capital and labor, with a constant returns to scale Cobb-Douglas technology. The labor force is constant, and we express output and capital in per worker terms:

$$q_t = f(k_t) \quad (9)$$

The marginal product of capital has to be equal to its rental rate (gross of tax):

$$1 + r_t = f'(k_t) \quad (10)$$

and the wage rate is given by:

$$w_t = f(k_t) - r_t k_t \quad (11)$$

3. The Government

The government undertakes public spending, levies taxes and issues government debt. Its budget constraint takes the form:

$$d_{t+1} = (1 + \hat{r}_t) d_t + g_t - \tau_t w_t - \delta_t k_t - \theta_t f_t - \frac{i_t}{1 + i_t} m_{t-1} \quad (12)$$

where g is government expenditure in real terms. Note that if controls are imposed in the form of a quota on foreign asset holdings the revenue from taxation of foreign assets ($\theta_t f_t$) may not accrue to the government if the quota rights are not auctioned.

In order to determine the dynamic behavior of the model, we need to specify government policy. Suppose, for example, that the tax rates δ , θ and τ and the rate of inflation π are fixed over time. Then equation (5) determines the pre-tax return on capital and via (9) and (10) the optimal capital stock. The path of private consumption and money holdings is then determined as a function of inflation, the post-tax real interest rate and disposable income. Finally, the path of domestic public debt and net foreign assets are determined as a function of the tax vector, the inflation rate and the path of government spending.

4. The effects of taxation of assets

a. Effects on capital accumulation and growth

We consider three possible "regimes", based on different configurations of the tax rates on domestic and foreign assets.

$$(1) \quad \delta_{t+1} > 0, \theta_{t+1} = 0$$

This is the "capital flight" case (Giovannini 1988). Domestic capital is taxed at the rate δ , but the lack of appropriate control and enforcement mechanisms on foreign asset holdings imply that the latter are untaxed. Consequently, the *net of tax* domestic interest rate has to equal the foreign interest rate, as shown by equation (5) (otherwise nobody would hold domestic capital). As a result, the level of the capital stock is lower than in the absence of capital taxation, as long as the marginal product of capital is declining in the level of the capital stock. 1/ More generally, every time the tax rate on domestic capital is higher than the one on foreign assets the level of the domestic capital stock will be lower than in the absence of controls. Of course, one can argue that if the government finds it impossible to tax foreign source income, capital controls may not be sufficient to do it: this case may therefore correspond to "porous" capital controls as well. If the country is trying to stem capital inflows, a quota on the holdings of domestic assets by foreigners raises domestic rates of return above foreign ones and reduce capital accumulation with respect to the case when controls are absent.

$$(2) \quad \delta_{t+1} = 0, \theta_{t+1} > 0$$

This is the "pure" capital controls case. Domestic interest rates will equal *net of tax* foreign interest rates, and therefore the domestic capital stock is higher than it would be in the absence of the tax (equations (5) and (9)). This is true in general every time δ_t is smaller than θ_t . This case illustrates the rationale for the idea that capital controls "stimulate domestic investment". Note that a binding quota on foreign asset holdings would also drive a wedge between domestic and foreign rates of return on capital, and therefore increase domestic investment, as shown by Razin and Sadka (1991). Dellas and Galor (1992) show that this policy, coupled with foreign borrowing, may increase growth (temporarily) and income (permanently) in the presence of multiple equilibria.

$$(3) \quad \delta_{t+1} = \theta_{t+1} > 0$$

This is the case of uniform taxation of domestic and foreign assets. In this case the level of the aggregate capital stock is unaffected by controls, but the intertemporal terms of trade are. More specifically, since individuals' savings decisions depend on the *net of tax* real interest rate, capital controls affect the consumption-savings decision. If savings are a positive function of the interest rate, capital controls will be associated

1/ Analogous results are obtained by Khan and Haque (1985) in a model in which domestic investment entails an expropriation risk. In endogenous growth models of the "Ak" type the marginal product of capital is unaffected by the level of the capital stock, as there are non-diminishing returns to capital, so that an increase in interest rates does not reduce capital accumulation.

with lower savings. If the country is initially "poor" so that consumption is close to its subsistence level, the elasticity of intertemporal substitution may be low, implying a modest impact of interest rates on savings. ^{1/}

b. Effects on government debt

$$(1) \quad \delta_{t+1} > 0, \theta_{t+1} = 0$$

In this case the effective cost of borrowing for the government is equal to the foreign interest rate, irrespectively of whether government bonds are taxed or not. This happens because individuals will not hold domestic debt instruments if the net rate of return is lower than the one they can obtain by holding foreign assets.

$$(2-3) \quad \delta_{t+1} \geq 0, \theta_{t+1} > 0$$

The imposition of a tax on foreign assets lowers the real interest rate the government pays on domestic debt. This is true irrespectively of whether the government actually taxes interest on its debt (that is, whether δ_t is greater than or equal to zero). Equation (12) points out that the reduction in interest payments associated with the imposition of a tax on foreign asset holdings will--ceteris paribus--tend to reduce public debt accumulation. In order to study the general equilibrium effects, one would need to include the impact on seigniorage revenue.

c. Effect on money demand and inflation

$$(1) \quad \delta_{t+1} > 0, \theta_{t+1} = 0$$

The relevant interest rate in the determination of money demand is unchanged by the imposition of a tax on domestic capital only. However, the consequent increase in domestic pre-tax interest rates would lower the capital stock, output and therefore money demand.

$$(2-3) \quad \delta_{t+1} \geq 0, \theta_{t+1} > 0$$

The tax on foreign assets reduce the post-tax return on interest-bearing assets (equation 5) and increases the demand for domestic money (equation 6). Its effects on seigniorage revenue are more ambiguous. For a given rate of inflation, the tax rate on money balances is lowered by a decrease in real interest rates (i_{t+1} falls). If capital controls reduce the stock of capital, income would decline, thereby reducing the demand for money.

^{1/} See the discussion in Rebelo (1992). The effect of a higher real interest rate on savings depend on the relative intensity of the income and the substitution effect. For some empirical evidence on the relation between savings and real interest rates in developing countries, see Giovannini (1985).

It should be noted, however, that capital controls allow the imposition of financial repression measures, such as high reserve requirements for banks, that artificially raise the demand for money and the seigniorage revenue the government can extract with a given rate of inflation.

More generally, in order to study the effects on inflation and seigniorage, one would need to study how the government sets monetary policy. The often contrasting statements in the literature on the impact of capital controls and financial repression/liberalization on the inflation rate are due to the alternative ways in which inflation is viewed. According to the optimal taxation literature, inflation is a tax that is chosen optimally together with other tax instruments: tax rates are set at values that equalize the marginal distortions of the different tax instruments, weighed by the size of the respective tax bases. With a larger tax base, the optimal rate of inflation may rise or fall, while seigniorage revenue would unambiguously rise (for given distortions). ^{1/} In other work inflation is viewed as a "residual" form of taxation, given other taxes and bond financing. In the latter view, financial liberalization may reduce the tax base for the inflation tax, implying that the same "financing gap" would have to be covered by a higher rate of inflation, for given bond financing. This effect would be enhanced by the necessity to raise revenue to finance the higher interest payments on government debt. ^{2/}

Note finally that if the taxes on capital income are levied on nominal returns, the post-tax interest rate parity condition becomes:

$$r(1-\delta) - \delta \frac{\pi}{1+\pi} = r^*(1-\theta) - \theta \frac{\pi}{1+\pi} \quad (13)$$

implying that the after-tax real return is lower the higher the rate of inflation. In this case the effects of monetary policy are more pervasive, because changes in the rate of inflation will also affect capital accumulation. If controls take the form of a quota on foreign asset holdings, then a higher rate of inflation, other things being equal, will require *more stringent* controls (a reduction of the quota) because by reducing the domestic real rate of return it makes foreign assets more attractive.

d. Effect on borrowing

If firms had to borrow in order to finance capital accumulation, as would be the case if today's output is produced with last period's capital

^{1/} See for example Roubini and Sala-i-Martin (1992) for a model in which the optimal inflation rate rises with financial repression.

^{2/} See for example Giovannini (1988).

stock (as in Sussman (1991)) the tax on foreign credit would be given by $(\delta_t - \theta_t)$. In the context of our model, case 2 would imply a subsidy to foreign borrowing. Of course, the model could be re-formulated so as to included a ban on foreign borrowing altogether; alternatively, it could be re-written by specifying a limit on the net foreign asset position, without the imposition of an explicit tax.

IV. The Data on Capital Controls

The data on restrictions to international capital flows adopted in this study come from the International Monetary Fund's annual report "Exchange Arrangements and Exchange Restrictions". The report has been issued since 1950, and provides a description of the exchange rate system and of exchange rate restrictions for individual country members. Since the 1967 issue (covering 1966) the Report also includes a summary Table specifying whether given forms of exchange arrangements and restrictions are adopted by member countries. The data presented in this Table was used to construct dummy variables taking the value of one when a restriction was in place for a given year in a given country, and zero otherwise. This study focuses on three forms of exchange restrictions. The first is "Restrictions on Payments for Capital Transactions". This restriction refers exclusively to resident-owned funds. The second restriction is "Separate exchange rate(s) for some or all capital transactions and/or some or all invisibles". This restriction reflects mainly multiple currency practices, as well as the use of a unitary rate for transactions with a certain group of countries and another different unitary rate for transactions with other countries. Both these restrictions can broadly be interpreted as a form of control on capital flows.

The third restriction ("Restriction on payments for current transactions") refers to limitations on current account transactions. It has been included in the study because current account transactions can be used to (partially) evade restrictions on capital transactions through practices such as leads and lags in export billing, overinvoicing of imports and underinvoicing of exports etc.

The problem with the use of these dummy variables to measure restrictions on international capital flows is that they provide no measure of the intensity of controls. Although there have been attempts to construct indices of the degree of capital controls, it is difficult to find a measure which is comparable across countries and that is available for a sufficiently long period of time. To some degree, the current account restrictions dummy variable can proxy for the intensity of controls, as pointed out above.

Alternative measures of the degree of intensity of capital controls have been adopted in previous studies. Among these, one can cite onshore-offshore interest differentials (see, for example, Giavazzi and Pagano (1988)), the size of the black market premium, and deviations from covered

interest rate parity (Dooley and Isard (1980), Ito (1983)). These measures are more suited to empirical analysis that uses higher frequency data. A comparison of findings using different measures of controls is a topic for future research.

Examination of the dummy variables for the sample of countries under examination reveals several interesting regularities, summarized in Table 1. 1/ The most common form of restriction among the countries in our sample is the first (capital controls). Of the 61 countries in our sample, 34 had capital controls in place throughout the period, while 5 never had controls. Also, while the number of industrial countries with capital account restrictions decreases, the number of developing countries with them increases.

Current account restrictions are in place throughout the period in 19 countries, while they are never in place in 15 countries. Interestingly, current account restrictions are in place in countries that have restrictions on capital account transactions as well (compare line (2) with the line (1) & (2)). Once again, the number of countries with this type of restrictions is falling among industrial countries and rising among developing countries.

Multiple currency practices are the least common form of restriction. Only 4 countries had them in place throughout the period, while they were never in place in 27 countries. 2/ Also, most countries using separate exchange rates for capital transactions have restrictions on capital and current account transactions as well (line (1), (2) & (3)).

Before turning to the empirical evidence, it is important to point out its limitations. Given the nature of our measures of foreign exchange restrictions, our analysis focuses on medium- and long-run aspects, and is not suitable to the study of the interaction between foreign exchange market instability, speculative attacks and capital controls. 3/ The second limitation is that the imposition and removal of capital account restrictions is typically undertaken together with other macroeconomic and structural reform measures. For example, capital controls may be a complement to measures of financial repression designed to facilitate the financing of government spending when the tax system is relatively inefficient. This makes it more difficult to evaluate the consequences of measures such as capital account liberalization per se.

1/ A similar table for a larger sample of countries but not including current account restrictions is presented in Mathieson and Rojas-Suarez (1993).

2/ The only industrial country with separate exchange rates in 1989 is Belgium. Several industrial countries, among them Belgium and Italy, dismantled remaining foreign exchange restrictions the following year.

3/ On this topic, see Eichengreen, Rose and Wyplosz (1994).

Table 1. Foreign Exchange Restrictions

Type of Restrictions	1969	1979	1989
Number of Countries	58	61	61
(1) Restrictions on Cap. Acct. Trans.	44	43	45
Industrial	17	14	11
Developing	27	29	34
(2) Restrictions on Curr. Acct. Trans.	32	27	30
Industrial	9	4	2
Developing	23	23	28
(3) Multiple Currency Practices	11	15	14
Industrial	4	3	1
Developing	7	12	13
(1) & (2) Total	32	27	30
Industrial	9	4	2
Developing	23	23	28
(1) & (3) Total	18	11	13
Industrial	3	2	0
Developing	5	9	13
(1), (2) & (3) Total	7	10	11
Industrial	2	2	0
Developing	5	8	11

V. Empirical Evidence on the Effects of Exchange Controls

This Section examines the effects of capital controls and current account restrictions on inflation, real interest rates, and economic growth. In addition to the data on capital controls described in the previous section, we use data on macroeconomic, political and institutional variables. These are taken from various sources: the economic variables from International Finance Statistics, Summers and Heston (1991) and Barro and Lee (1994); the political and institutional variables from Banks, Cukierman (1992) and Taylor and Jodice (1983). The Appendix describes the sources more in detail.

1. Capital controls and inflation

The discussion in Section II.4 and our theoretical model of section III provide ambiguous predictions regarding the impact of capital controls on the rate of inflation, but suggest that countries with capital controls in place can raise more revenue through seigniorage because capital controls facilitate the imposition of financial repression measures. In this paper we presents results of regressions in which the dependent variable is the rate of inflation. The results are qualitatively similar to those that obtain when the share of seigniorage over total GDP or over total tax revenue is used (results are available from the authors). In order to proxy, albeit roughly, for the intensity of capital controls, we included restrictions to current account transactions among the regressors, with the idea is that current account restrictions may make it more difficult to evade capital controls through "leads and lags" in import and export billing.

We also included among the regressors two measures of central bank independence, taken from Cukierman (1992) and Cukierman et al. (1992). The first variable (LEGAL) measures the legal independence of the Central Bank (CB). Four groups of legal provisions are used in constructing this index: provisions related to the appointment, dismissal and terms in office of the governor; provisions for the resolution of conflicts between the executive branch and the CB, as well as the degree of participation of the CB in formulating monetary policy; the objectives of the CB, stated in its charter; and limitations on the ability of the government to borrow from the Central Bank. Higher numbers imply a more independent Central Bank. According to Cukierman (1992) this is a good measure of actual central bank independence for industrial countries.

In some cases, however, the degree of legal independence of the CB may be a poor proxy for actual independence. Following Cukierman (1992) we therefore consider a second variable (TURNOVER), based on the actual term in office of the CB governor. This measure equals the average turnover rate of CB governors; at least above some threshold, it should be negatively correlated with the degree of independence of the Central Bank. Cukierman (1992) argues that this is a good measure of central bank independence for

developing countries. Both measures change every ten years for most countries, and are constant across time for the rest. We expect inflation to be lower in countries with a more independent central bank, because an independent central bank can better withstand government pressures to increase inflation for cyclical or electoral purposes, and may assign a higher weight to the objective of price stability.

We introduce three time-varying political variables. The first variable, LEFT, captures the political orientation of the government: it takes the value of one when a democratic left-wing government is in power, and zero otherwise. "Partisan" models of monetary policy (Alesina (1987)) predict that inflation should be higher under left-wing governments, who are more concerned about output and employment performance than about inflation. The second variable, COAL, takes the value of one when a coalition government is in power and zero otherwise. Coalition government may find it more difficult to reach agreement on tax increases and may therefore rely more heavily on seigniorage. The third political dummy (NODEM) takes the value of one when the country is not a democracy, and zero otherwise. There is no *a priori* presumption about its effect on inflation.

We also introduce two political variables that are country specific, but time invariant. The first, TCHANGE, measures the total number of government changes in the period 1950-82. ^{1/} The second variable, COUP, gives the total number of successful coups between 1950 and 1982. Both variables are proxies for the degree of political instability. As several studies have shown, inflation and political instability are strongly correlated, although the issue of causality is not firmly resolved (see Cukierman et al, 1992; Roubini and Ozler, 1994).

Finally, we include among the regressors three macroeconomic variables. The first is the (log of) initial level of income (GDP66). The expected sign on this variable is *a priori* ambiguous: on the one hand, countries with lower income have a less efficient tax system and may therefore rely more heavily on the inflation tax; on the other hand, the degree of "monetization" of the economy is lower in poorer countries. The second variable is the lagged share of the budget balance to GDP (negative numbers indicate a deficit). The third variable is the degree of openness of the economy (OPEN), measured as the ratio of exports plus imports to GDP. According to Romer (1993), countries that are more open to international trade have lower incentives to use unexpected inflation to stimulate economic activity, because of the harms of real depreciation. ^{2/} We therefore expect to find a negative correlation between inflation and

^{1/} This is the time period covered in the Taylor and Jodice (1983) study. The use of an average value over a long time period can be interpreted as a measure of the average probability of the event occurring in a given year.

^{2/} Cukierman, Edwards and Tabellini (1992) and Romer (1993) present cross-sectional evidence of a negative relation between inflation and openness.

openness. The last explanatory variable is a dummy variable identifying the type of exchange rate regime (EXR). It takes the value of one when the exchange rate is fixed or managed, and zero when it is floating.

The inflation equations were estimated using three different specifications. The regressions were first run on the pooled cross-section time series data, using ordinary least squares (OLS) (column (1)) in Tables 2-4. The residuals from this regression were then used to calculate appropriate weights, and the subsequent regressions were run using weighted least squares (WLS). This procedure was used given the difference in the variance of inflation across the countries in our sample. The second column in Tables 2-4 reports results from the WLS regressions using a dummy variable for each year in the sample. Time dummies help control for the effects of omitted variables that are time-varying, but have the same effect across countries. Finally, the third column reports results from WLS regressions that include country-specific dummies, in addition to time dummies. These country dummies are introduced in order to control for omitted variables that are country-specific, but constant through time. It should be noted that introducing country-specific fixed effects implies that it is impossible to identify the coefficient on variables that are country-specific and time invariant, such as the initial level of income and the TCHANGE and COUP variables. ^{1/}

In order to avoid capturing the effects of outliers, the observations on the dependent variable were restricted to inflation rates below 80 percent. ^{2/} Results for the whole sample are presented in Table 2. They show that capital controls, current account restrictions and multiple exchange rate practices are associated with higher rates of inflation. Regressions (1) and (2) also suggest that inflation is higher in countries with a high turnover of central bankers and with a lower degree of legal independence. The coefficients on the central bank independence variables are not significant in the regressions including fixed country effects (column (3)). The reason is that the estimate captures only the effects of the time-series variation in the degree of independence, which is very small in the data (for all countries, the index of independence changes only three times or less in the sample). The political variables LEFT and NODEM have a positive sign and are significant in regressions (1) and (2), but not in the one with country-specific effects. The coefficient on the initial level of income is positive and significant, so monetization outweighs a less

^{1/} We also tried instrumental variable estimation, in order to control for the possible endogeneity of capital controls. The instruments for the capital control variables are their own lagged value and the share of government consumption to GDP, which has is highly correlated with capital controls but not with inflation rates. Results, not reported, are in line with those presented in the text.

^{2/} The only countries in the sample with sustained high inflation episodes (more than 3-4 years) are Argentina and Brazil.

Table 2. Determinants of Inflation, 1966-89
Whole Sample*

	(1)	(2)	(3)
CAPCON	2.51 (3.21)	2.89 (8.96)	2.02 (4.12)
CURRCON	1.64 (1.39)	2.14 (4.28)	1.17 (2.41)
MULTER	5.38 (4.55)	3.22 (6.77)	3.04 (5.02)
LEGAL	-8.83 (-4.11)	-3.66 (-4.06)	-8.13 (-1.03)
TURNOVER	13.63 (4.84)	10.20 (6.47)	3.88 (1.82)
LEFT	2.82 (3.18)	0.93 (2.84)	0.42 (1.35)
NODEM	6.95 (5.72)	3.72 (5.38)	0.67 (0.73)
COAL	-0.01 (-0.02)	1.09 (2.85)	0.18 (0.35)
TCHANGE	0.05 (1.17)	0.01 (0.23)	
TCOUP	0.91 (3.44)	-0.04 (-0.39)	
GDP 1966	2.56 (3.86)	0.81 (2.52)	
DEFY (1)	-0.25 (-2.79)	0.02 (0.67)	-0.05 (-1.24)
OPEN	-0.01 (-1.44)	-0.02 (-3.34)	-0.04 (-2.38)
EXR	-7.45 (-7.81)	-3.42 (-7.42)	-2.92 (-6.01)
\bar{R}^2	0.28	0.36	0.56
N Observ.	1,061	1,061	1,061

- * t-statistics in parentheses
 (1) Ordinary least squares
 (2) Weighted least squares, time dummies
 (3) Weighted least squares, time + country dummies

Table 3. Determinants of Inflation Rates, 1966-89
Industrial Countries*

	(1)	(2)	(3)
CAPCON	3.67 (7.37)	2.56 (8.19)	1.94 (3.92)
CURRCON	2.52 (3.21)	2.16 (3.98)	1.19 (2.19)
MULTER	-0.03 (-0.04)	0.57 (1.18)	0.88 (1.37)
LEGAL	-1.61 (-1.16)	-4.11 (-4.77)	-6.65 (-1.10)
LEFT	1.30 (3.15)	0.70 (2.56)	0.59 (2.20)
COAL	0.71 (1.22)	1.22 (3.46)	0.99 (2.10)
TCHANGE	0.03 (0.89)	0.03 (1.13)	
GDP 1966	-1.57 (-1.39)	-0.80 (-1.08)	
DEFY (1)	-0.17 (-2.36)	-0.08 (-1.43)	-0.01 (-0.12)
OPEN	0.02 (1.74)	-0.01 (-1.69)	-0.02 (-0.90)
EXRAR	-4.65 (-7.09)	-3.13 (-6.98)	-1.87 (-4.09)
\bar{R}^2	0.36	0.50	0.62
N Observ.	468	468	468

* t-statistics in parentheses

(1) Ordinary least squares

(2) Weighted least squares, time dummies

(3) Weighted least squares, time + country dummies

Table 4. Determinants of Inflation, 1966-89
Developing Countries*

	(1)	(2)	(3)
CAPCON	1.49 (0.83)	0.90 (0.53)	3.06 (3.19)
CURRCON	0.53 (0.28)	1.58 (0.85)	-1.40 (-1.26)
MULTER	6.98 (3.73)	5.35 (2.94)	4.49 (4.02)
TURNOVER	6.42 (2.19)	7.38 (2.54)	2.33 (1.00)
LEFT	3.27 (1.62)	1.88 (0.93)	-0.14 (0.11)
NODEM	7.52 (5.18)	6.47 (4.73)	1.73 (1.32)
COAL	-4.86 (-3.01)	-4.58 (-2.96)	-2.46 (-2.16)
TCHANGE	0.11 (0.88)	0.15 (1.22)	
TCOUP	0.51 (1.78)	0.47 (1.69)	
GDP 1966	4.29 (4.30)	4.91 (4.98)	
DEFY (1)	-0.23 (-1.74)	-0.10 (-0.73)	-0.07 (-1.26)
OPEN	-0.02 (-2.43)	-0.04 (-4.33)	-0.05 (-2.08)
EXRAR	-10.30 (-6.71)	-6.91 (-3.93)	-4.13 (-4.45)
\bar{R}^2	0.25	0.29	0.59
N Observ.	607	607	607

- * t-statistics in parentheses
 (1) Ordinary least squares
 (2) Weighted least squares, time dummies
 (3) Weighted least squares, time + country dummies

efficient tax system; the coefficient on the lagged budget deficit is significant with the expected sign only in the OLS regression. With regard to external sector variables, the results show that inflation is significantly lower in countries that are more open and that manage their exchange rate.

We subsequently divided the sample into industrialized and developing countries (see list of countries in the Appendix). For industrialized countries we again find evidence that inflation is higher in countries with capital controls and current account restrictions, while the coefficient on multiple currency practices is not statistically significant (Table 3). As predicted, inflation tends to be higher under left-wing and coalition governments, as well as when the central bank is less independent. Inflation is lower in countries that manage the exchange rate, but there is no evidence here that openness is associated with lower inflation.

Results for developing countries are presented in Table 4. Not surprisingly, the overall fit of the regressions is worse than for industrial countries. We find that the coefficient on the MULTER dummy variable is positive and significant in all the panel regressions. Also, the capital controls variable is statistically significant in the regressions with country effects. Countries with more turnover of central bankers and with capital controls in place have experienced higher inflation; furthermore, inflation tends to be higher in non-democratic regimes. Our measures of political instability (COUP, TCHANGE and COAL) do not provide evidence in favor of a positive link with inflation. Interestingly, developing countries with higher initial income per capita in 1966 have experienced higher inflation (after controlling for the effects of the other explanatory variables). A possible explanation is that poorer developing countries are not fully "monetized", and that this effect dominates the "seigniorage effect" that works through the impact of a less developed tax system on the choice of revenue instruments. The coefficient on external sector variables are significant and with the expected sign in all regressions: countries that are more open and that manage the exchange rate tend to have lower inflation rates.

A similar set of regressions was run using non-overlapping five-year averages, instead than annual values, for all variables. This procedure reduces the serial correlation problems. The results, not presented for reasons of space, are consistent with those presented in Tables 2-4.

2. Capital controls and real interest rates

In the theoretical model capital controls drive a wedge between domestic and world interest rates. In principle, capital controls may be used either in a country that wants to maintain interest rates that are lower those prevailing on world markets without experiencing capital outflows or by a country that seeks to maintain higher interest rates without experiencing capital inflows. We therefore first considered whether real interest rates differ systematically between countries that impose

capital controls and countries that do not. Our sample includes three interest rate measures: interest rate on government bonds, loan rates and deposit rates, all taken from International Financial Statistics of the IMF. For reasons of space, we report only the results of regressions that use government bond yields as the dependent variable. Real (ex-post) rates are calculated by subtracting the rate of inflation from the nominal interest rate. Since data on interest rates are not available in a consistent and uniform fashion for the developing countries in our sample we focus exclusively on industrialized countries.

Among the explanatory variables we include the three measures of controls--CAPCON, CURRCON and MULTER. The degree of central bank independence, measured by the variable LEGAL, and the political variables LEFT, COAL and TCHANGE are also included. The first set of regressions comprises data from 1960 to 1989, and therefore excludes MULTER (data available only from 1966). These regressions include the lagged budget balance as an explanatory variable. Ideally, one would want to include the stock of public debt; however, data on public debt for the sixties are not available in a consistent fashion for the countries in our sample.

The results, presented in Table 5, show that countries with capital account and current account restrictions have lower real interest rates. One interpretation of the latter finding is that other forms of restrictions on foreign exchange transactions proxy for the intensity of capital controls, and more intensive controls are associated with lower real interest rates. Another possibly complementary explanation is that exchange restrictions are capturing the degree of government-imposed distortions, such as financial repression. The coefficient on the degree of central bank independence is positive and significant--countries with a more independent central bank have higher real interest rates. The evidence on political variables is less strong, but there is some evidence that real interest rates tend to be higher under left-wing governments.

The second set of regressions in Table 5 refers to the time period 1970 to 1989, and includes the (lagged) ratio of domestic government debt to GDP (DEBTGY(1)) as an explanatory variable. Results are similar to those for the period 1960-89--capital controls, current account restrictions and multiple currency practices are associated with lower real interest rates. The debt variable is significant and with the expected positive sign in regressions (1) and (2), but is insignificant and with the wrong sign once we control for country-specific effects. Results are qualitatively similar if we use different real interest rate measures, such as real loan or deposit rates. Overall, the results are in line with those obtained by Cukierman et al. (1993) who regress average real interest rates on the degree of central bank independence for a sample of industrial and developing countries. For both samples they find that real rates are significantly higher when the central bank is more independent.

Table 5. Determinants of Real Interest Rates, 1960-89
Industrial Countries*

	(1)	(2)	(3)
<u>1960-89</u>			
CAPCON	-1.87 (-5.90)	-1.07 (-5.12)	-1.11 (-2.89)
CURRCON	-1.48 (-3.02)	-1.13 (-3.50)	-0.71 (-2.01)
LEGAL	2.18 (2.33)	1.93 (3.51)	8.68 (2.13)
LEFT	0.17 (0.53)	0.60 (3.07)	0.80 (4.11)
COAL	0.05 (-0.15)	-0.36 (-1.52)	-0.75 (-2.16)
TCHANGE	0.02 (1.00)	-0.00 (-0.17)	
GDP 1960	1.27 (2.05)	0.31 (5.56)	
DEFY (1)	-0.05 (-1.10)	0.02 (0.75)	0.01 (0.14)
EXR	1.28 (2.85)	1.49 (5.01)	0.48 (1.39)
\bar{R}^2	0.16	0.67	0.72
N Observ.	541	541	541
<u>1970-89</u>			
CAPCON	-1.74 (-4.19)	-0.76 (-3.08)	-0.75 (-2.02)
CURRCON	-4.35 (-4.69)	-3.56 (-7.63)	-1.64 (-3.05)
MULTER	-1.67 (-3.03)	-0.71 (-1.81)	-1.49 (-2.95)
LEGAL	4.03 (3.16)	2.38 (2.98)	2.08 (2.85)
LEFT	0.89 (2.18)	0.99 (3.83)	1.10 (4.60)
COAL	0.54 (1.07)	0.36 (1.27)	-0.20 (-0.59)
GDP 1970	-0.07 (-0.08)	0.20 (2.90)	
DEBTGY (1)	5.95 (5.61)	2.32 (2.84)	-1.39 (-1.29)
EXR	1.09 (2.16)	0.83 (2.64)	0.30 (0.63)
\bar{R}^2	0.30	0.74	0.81
N Observ.	356	356	356

* t-statistics in parentheses

(1) Ordinary least squares

(2) Weighted least squares, time dummies

(3) Weighted least squares, time + country dummies

These results do not have implications about the effectiveness of capital controls. Financial repression measures are widespread in countries with capital controls, so that the interest rates we are measuring are not the relevant ones in determining the effective degree of arbitrage between domestic and foreign financial markets.

3. Capital controls and growth

Once again, theory does not provide unambiguous predictions for the effects of capital controls on growth. On the one side, capital controls may stimulate capital accumulation and (temporarily) raise the growth rate by lowering real interest rates. On the other side, in an endogenous growth framework lower real interest rates imply a lower rate of growth. The empirical literature on economic growth is immense. ^{1/} A number of empirical studies have examined the relation between growth in real income per capita and political and financial repression variables. For example, Alesina and Perotti (1993) document the relationship between growth and political instability, democracy and income distribution. Roubini and Sala-i-Martin (1992) find that countries with a more distorted trade and financial system tend to grow more slowly. Cukierman et al. (1993) study the impact of central bank independence on growth and find that central bank independence is positively correlated with growth rates in developing countries.

The empirical growth literature uses mainly cross-sectional estimates or panel estimates that use five- or ten-year averages. Here we present the results of panel regressions that use five-year non-overlapping averages of all variables. In addition to our data, we use the Barro and Lee (1994) data set, which contains data on schooling and educational attainment that are shown to be correlated with economic growth.

The dependent variable is the rate of growth of real income per capita, taken from Summers and Heston (1991). The independent variables are the three exchange restrictions dummies (CAPCON and CURRCON and MULTER), the two measures of central Bank independence (LEGAL and TURNOVER), the political dummy NODEM, the average size of the black market premium on foreign exchange (BMP), and the degree of openness of the economy (OPEN). In line with the empirical growth literature, we also include (the log of) initial income (GDP) and the initial level of education (SYRM) among the regressors. The latter is measured using years of secondary schooling of the male population, which is found to be systematically correlated with growth in Barro and Lee (1994). The convergence hypothesis implies that countries with a lower initial level of income should--ceteris paribus--grow faster than richer countries. Finally, we use two measures of government

^{1/} For recent papers see Barro and Lee (1994) and the December 1993 issue of the *Journal of Monetary Economics*. Barro and Sala-i-Martin (1994) summarize the theoretical and empirical growth literature.

consumption, GCONS and GOVSH. The first one measures the share over real GDP of real government consumption net of spending on defense and education, but is not available for 1985-89. This is the measure used in Barro and Lee (1994), which is found to be negatively correlated with growth. The second measures the share of real government consumption over real GDP, and is available for the whole sample.

The growth regressions were run using instrumental variable estimation. We use own lagged values as instruments for OPEN and GCONS (GOVSH), while the other variables are their own instruments. Time dummies were also included. Results for the whole sample are presented in Table 6. Regressions (1) and (3) ((2) and (4)) present results without (with) regional dummies. Regressions (3) and (4) also exclude the two measures of central bank independence, TURNOVER and LEGAL. The initial level of income enters significantly in the regression, lending support to the "conditional convergence hypothesis". The coefficient on the black market premium is also significant and negative--countries with a more distorted foreign exchange system tend to grow more slowly. The evidence on other determinants of growth in our sample is weaker. For example, the openness variable is significant and with the expected positive sign only in regressions (3) and (4). The coefficient on the capital controls variable is positive in all regressions, but its significance declines once we introduce continental dummies. The coefficient on current account restrictions is negative and significant in regressions (3) and (4), but is insignificant in the others. It should be noted, however, that the black market premium (BMP) is positively correlated with our foreign exchange restrictions dummies, and in particular with CURRCON. Omitting BMP tends to raise the significance of the current account dummy. In future research we plan to widen our sample so as to include a wider sample of developing countries.

VI. Determinants of Capital Controls 1/

So far we have treated capital controls as exogenous variables. However, the discussion of the theoretical literature in Section II and the determination of an optimal policy in the model presented in Section III broadly suggest several potential determinants for capital controls:

(1) Tax system and size of government: In a country with an under-developed tax system and a narrow tax base for income taxation, capital controls may facilitate the taxation of domestic capital, as well as the collection of revenue through the inflation tax. Taxing domestic assets only would lead to capital flight and a reduction in the domestic capital stock. A related argument is that the incentive to impose controls for fiscal reasons is likely to be larger, the larger the share of government.

1/ Milesi-Ferretti (1995) contains a more comprehensive analysis of the determinants of other restrictions to capital mobility.

Table 6. Determinants of Growth, 1966-89
Whole Sample, Five-Year Averages*

	(1)	(2)	(3)	(4)
SYRM	0.002 (1.14)	0.001 (0.90)	0.002 (1.33)	0.001 (0.36)
LRGDP	-0.012 (-3.56)	-0.012 (-2.64)	-0.008 (-3.07)	-0.012 (-3.40)
NODEM	0.005 (0.83)	0.006 (1.10)	0.003 (0.55)	0.005 (1.00)
LOGBMP	-0.032 (-4.37)	-0.029 (-3.84)	-0.026 (-2.47)	-0.021 (-2.09)
GCONS			-0.075 (-1.88)	-0.050 (-1.36)
GOVSH	-0.144 (-2.56)	-0.084 (-1.13)		
OPEN	0.004 (1.18)	0.005 (1.25)	0.010 (2.81)	0.011 (2.70)
TURNOVER	-0.017 (-1.82)	-0.009 (-0.89)		
LEGAL	0.009 (1.14)	-0.001 (-0.08)		
CAPCON	0.006 (1.73)	0.003 (0.67)	0.010 (3.02)	0.006 (1.75)
CURRCON	-0.007 (-1.45)	-0.006 (-1.10)	-0.010 (-2.32)	-0.010 (-2.09)
MULTER	0.003 (0.85)	0.004 (1.23)	-0.004 (-0.92)	-0.000 (-0.01)
AFRICA		-0.017 (-1.44)		-0.021 (-3.01)
INDUST		0.003 (0.42)		0.005 (0.91)
WESHEM		-0.01 (-1.48)		-0.013 (-2.40)
\bar{R}^2	0.35	0.38	0.28	0.32
N Observ.	181	181	238	238

* t-statistics in parentheses

(2) Distributional considerations: Governments attempting to redistribute resources from "capital" to labor may want to impose capital controls in order to avoid capital flight. It should also be noted that the distributive implications of controls may differ in the short and in the long run: higher taxes on capital will discourage capital accumulation and may therefore reduce productive capacity and wages in the long run.

(3) Independence of monetary policy: When monetary policy is not a "choice variable" for the government because of the independence of the central bank, the incentive to increase seigniorage revenue by raising money demand is reduced, because monetary policy is decided autonomously. ^{1/} Furthermore, an independent central bank may reduce the credibility problems that make the imposition of controls more likely.

(4) External sector and exchange rate management: Capital controls can make it easier--ceteris paribus--to manage the exchange rate, and may be imposed in order to limit the loss of foreign currency when the current account is in deficit.

With regard to general public finance motivations, countries with an inefficient tax system may be more likely to impose capital controls and current account restrictions in order to facilitate the taxation of imports and exports, tax capital and extract revenue through financial repression (see Section III). The sophistication of the tax system is positively correlated with the level of development: we therefore introduce the level of income per capita (GDP) as an explanatory variable for the presence of capital controls. ^{2/} The need to raise revenue is enhanced when the size of the government is "large": we therefore include among the regressors the share of government consumption over GDP (GCONS).

The power that the government acquires over monetary policy by imposing controls depend, among other things, on the degree of independence of the Central Bank. We therefore included among our regressors the two variables measuring the independence of the Central Bank, TURNOVER and LEGAL, taken from Cukierman, Webb and Neyapti (1992). As mentioned above, a more independent central bank can imply more credibility of the government's monetary policy stance and therefore make speculative attacks less likely. This would lessen the need for capital controls.

^{1/} Epstein and Schor (1992) argue that central bank independence reflects "the power of financial sector interests", who are against limitations to capital mobility.

^{2/} There is of course an endogeneity problem in using real income as an explanatory variable. Furthermore, this variable can capture other factors, such as the degree of development of the financial system. However, we lacked measures of the development of the tax system that were available for most countries during our sample period.

With regard to distributional motivations, the model of Section III highlights that capital controls may facilitate the taxation of domestic capital by preventing capital flight. Alesina and Tabellini (1989) argue that in the presence of distributional conflict between "labor" and "capital", capital controls are likely to be imposed by left-wing governments, traditionally closer to labor. In order to capture the impact of the political leaning of the government on the decision whether to introduce or remove capital controls, we use two dummy variables, LEFT and NODEM. We expect the coefficient on the former variable to be positive, while there is no *a priori* presumption on the coefficient of the second. We also introduce two measures of political stability: the dummy variable MAJ and the country-specific variable TCHANGE, that equals the number of government changes during the sample period. These measures would also be linked to overall policy credibility.

Finally, three external sector variables are included among the determinants of controls. The first is a dummy variable (EXR) taking the value of one when the exchange rate is fixed or managed, and zero during periods of free floating exchange rates. The second variable is the (lagged) value of the ratio of the current account balance to GDP (CAY). We expect countries that experienced current account difficulties to be more likely to impose controls. The third variable is the degree of openness of the economy (OPEN). The sign on this variable is *a priori* ambiguous. On the one side, monitoring capital flows is more difficult in a very open economy, suggesting that the expected sign should be negative. On the other side, the effects of external shocks on the domestic economy are larger, the more open is the economy, so that the incentive to insulate it from foreign shocks through foreign exchange restrictions or a flexible exchange rate regime is stronger. All three external sector variables raise the issue of the direction of causality: it can be argued that the size of current account imbalances and the degree of openness of the economy are themselves affected by foreign exchange restrictions. We therefore use lagged values of both CAY and OPEN.

In Table 7 we present results of a logit model for the whole sample of industrial and developing countries. It is based on annual data, and relates the capital controls dummy to the set of explanatory variables discussed earlier. We also used a probit model specification, with analogous results. ^{1/} The first column refers to the whole sample, with pooled cross-section/time series data. The regression also includes a time trend, in order to control for the possibility that the income variable may

^{1/} The whole sample covers the years 1966-1989, because the data on restrictions to capital account transactions for developing countries are available only after that date.

Table 7. Determinants of Capital Controls, 1966-89
Whole Sample, Annual Data, Estimation by Logit*

	1966-89 No time dum.		1966-89 Time dummies		1970-79 Time dummies		1980-89 Time dummies	
Constant	5.687	(2.93)	5.767	(2.80)	-1.137	(-0.37)	23.807	(5.05)
TCOUP	0.059	(0.91)	0.063	(0.96)	0.146	(1.26)	-0.113	(-0.95)
TCHANGE	0.043	(3.43)	0.040	(3.14)	0.069	(2.98)	-0.011	(-0.63)
LEGAL	-3.172	(-5.01)	-3.296	(-5.14)	-4.649	(-4.33)	-3.170	(-2.82)
TURNOVER	2.430	(4.10)	2.547	(4.21)	3.613	(3.96)	8.701	(3.69)
MAJ	0.160	(0.71)	0.115	(0.50)	0.708	(1.99)	-0.814	(-1.64)
LEFT	0.733	(3.63)	0.697	(3.39)	0.694	(1.93)	1.539	(4.27)
NODEM	0.417	(1.32)	0.313	(0.97)	0.963	(1.94)	-1.209	(-1.66)
EXR	0.684	(3.12)	0.732	(3.22)	0.274	(0.78)	1.539	(3.55)
LRGDP	-0.764	(-3.19)	-0.814	(-3.31)	0.146	(0.40)	-2.949	(-5.53)
CAY(1)	-0.082	(-3.99)	-0.084	(-3.85)	-0.077	(-2.32)	-0.059	(-1.75)
GCONS(1)	0.086	(3.73)	0.086	(3.71)	0.071	(2.14)	0.157	(3.28)
OPEN(1)	-0.015	(-5.05)	-0.015	(-5.16)	-0.009	(-2.50)	-0.032	(-5.21)
AFRICA	2.637	(3.41)	2.645	(3.41)	1.888	(2.18)		
WESHEM	-1.793	(-5.59)	1.824	(-5.59)	-2.829	(-4.97)	-1.799	(-3.15)
IND	1.214	(2.79)	1.310	(2.96)	0.399	(0.60)	4.011	(4.01)
Usable Obs	1171		1171		509		481	
Deg. of Fr.	1154		1131		469		442	
Cases Corr	938		941		410		396	
Average Lik	0.659		0.662		0.679		0.701	

* t-statistics in parentheses.

simply capture a trend towards removal of controls. 1/ The second column describes results obtained by adding time dummies to the regressors. The third and fourth columns show results for the sub-periods 1970-79 and 1980-89.

The results suggest that capital controls are less likely to be in place in countries where the central bank enjoys a higher degree of legal independence and where the turnover of central bankers is low. 2/ We also find that controls are more likely to be in place in countries with lower income per capita and a higher ratio of government consumption to GDP, consistently with "fiscal" motivations for the imposition of controls. There is also evidence of partisan political effects on the likelihood of the imposition of controls: these are more frequent under left-wing governments, consistently with theories of income distribution that emphasize how capital controls facilitate the taxation of domestic capital, and more generally of wealth. We find, however, no clear evidence of a link between controls and political stability--the coefficients on the majority (MAJ) and coup (TCOUP) dummies are not statistically significant, although there is some evidence that countries with frequent government changes are more likely to impose controls. The absence of a statistically significant correlation between controls and political stability may also be due to the binary nature of our controls measure, that does not capture changes in the intensity of controls.

Results also show that countries with a flexible exchange rate and without current account imbalances are less likely to have capital controls in place. The sign of the coefficient on the openness variable (OPEN), uncertain a priori, is negative and significant; more generally, the coefficients on all three external sector variables are statistically significant at the 5 percent confidence level. As can be seen from columns 3 and 4, results are generally robust across sub-periods. In particular, results for the 1980s are consistent with theory.

It is interesting to examine whether there are systematic differences in the determinants of controls between industrial and developing countries. For this purpose, Table 8 presents results for industrial and developing

1/ We also introduce the initial level of income (coefficient not reported) in order to control for the fact that the coefficient on the income variable reflects both a cross-section and a time-series component, while the trend captures only the latter.

2/ Note that a high turnover of central bankers indicates less independence. One needs to take into account the possibility that the inverse correlation between the capital control dummy and the degree of central bank independence captures reverse causality (when capital controls are in place, the government is less likely to want an independent central bank). Given the fact that central bank statutes are changed very infrequently, we tend to favor the first interpretation.

Table 8. Determinants of Capital Controls, 1966-89
Industrial and Developing Countries, Annual Data, Estimation by Logit*

	Indust. 1955-89 Time dummies		Indust. 1966-89 Time dummies		Devel. 1966-89 Time dummies	
Constant	130.032	(8.66)	124.229	(7.17)	-0.996	(-0.45)
TCOUP					0.346	(3.75)
TCHANGE	-0.091	(-3.72)	-0.079	(-2.91)	-0.077	(-2.65)
LEGAL	-9.199	(-7.11)	-9.300	(-6.13)		
TURNOVER					2.254	(3.89)
MAJ	-0.966	(-2.14)	-0.381	(-0.76)	-0.130	(-0.32)
LEFT	0.361	(1.08)	-0.014	(-0.04)	0.472	(1.28)
NODEM					-0.149	(-0.34)
EXR	4.721	(7.38)	4.932	(6.84)	0.023	(0.07)
LRGDP	-13.869	(-8.94)	-13.171	(-7.40)	0.327	(1.16)
CAY(1)	-0.548	(-6.25)	-0.506	(-5.54)	-0.039	(-1.59)
GCONS(1)	0.439	(5.57)	0.341	(4.35)	0.069	(2.77)
OPEN(1)	-0.074	(-7.60)	-0.072	(-6.54)	-0.019	(-5.05)
AFRICA					3.173	(4.05)
WESHEM					-2.639	(-6.41)
Usable Obs	630		463		733	
Deg. of Fr.	586		430		696	
Cases Corr	550		403		610	
Average Lik.	0.7753		0.7692		0.7136	

* t-statistics in parentheses.

countries separately. For industrial countries, macroeconomic variables and the degree of legal independence of the central bank seem the most robust determinants of controls, while the evidence on political variables is less clear-cut. Not surprisingly, the model performs better (in terms of average likelihood) than the whole sample, given the greater homogeneity among countries. For developing countries, the coefficients on the level of output and the exchange rate regime dummy are statistically insignificant, while the other determinants are analogous to those for industrial countries. Regional dummies are statistically significant: after controlling for the other explanatory variables, we find that controls were less likely to be in place in Latin America and more likely to be in place in Africa.

As discussed in Section IV, our measure of controls has high persistence. In order to reduce serial correlation problems and smooth out the effects of temporary shocks, we calculated five-year non-overlapping averages of each variable, and studied the determinants of controls using simple regression analysis. For reasons of space, we report only the results for the determinants of capital controls, that are the most frequent form of restriction in our sample; further evidence on the determinants of current account restrictions and multiple exchange rate practices is presented in Milesi-Ferretti (1995). Among the explanatory variables, the only variable which is not an average is the (log of) the level of income (GDP), which is the level of income at the beginning of each five-year period (1965 to 1985). The results of these regressions are presented in Table 9 for the whole sample only, for the periods 1965-89 and 1970-89. ^{1/} For each period, the first regressions control for fixed time effects, while the second control for both time and country effects. The low (or zero) time variability of the central bank independence data implies that the coefficients on LEGAL and TURNOVER are less likely to be statistically significant in regressions including fixed country effects.

The results show that the share of government, the degree of openness and the level of income per capita are the most significant determinants of controls. Furthermore, the TURNOVER variable is statistically significant and with the expected sign, while the legal independence variable becomes insignificant in the regressions including country effects. The large increase in explanatory power with the inclusion of fixed country effects is not surprising, given the nature of our dependent variable.

The analysis in this section has treated capital controls and other foreign exchange restrictions as endogenous variables. This suggests that

^{1/} For the foreign exchange restrictions variables, data for 1965 is unavailable. For the five-year period 1965-69 we therefore use the average value for the period 1966-89. The results for the period 1970-89 are presented because for 4 developing countries the observations on capital controls start only between 1968 and 1971.

Table 9. Determinants of Capital Controls, 1966-89
Five-Year Averages, OLS*

	1966-89 Time dummies		1966-89 Fixed effects		1970-89 Time dummies		1970-89 Fixed effects	
Constant	1.766	(3.82)			1.742	(3.51)		
LEGAL	-0.718	(-3.15)	0.842	(1.30)	-0.687	(-2.75)	1.308	(1.71)
TURNOVER	0.488	(2.77)	0.379	(2.13)	0.664	(3.18)	0.519	(2.02)
LEFT	0.126	(1.50)	0.010	(0.15)	0.206	(2.25)	0.032	(0.40)
MAJ	-0.003	(-0.04)	-0.004	(-0.06)	-0.060	(-0.69)	0.101	(-1.20)
NODEM	0.020	(0.21)	-0.086	(-1.00)	-0.046	(-0.44)	-0.189	(-1.97)
LRGDP	-0.134	(-2.44)	-0.340	(-2.22)	-0.129	(-2.15)	-0.255	(-1.65)
GCONS	0.597	(1.35)	2.389	(4.19)	0.501	(1.09)	2.261	(4.11)
CAY(1)	-0.015	(-2.31)	-0.005	(-0.87)	-0.014	(-2.07)	0.001	(0.20)
EXR	0.179	(2.28)	0.066	(1.03)	0.150	(1.91)	0.081	(1.18)
OPEN(1)	-0.003	(-5.00)	-0.002	(-0.89)	-0.003	(-4.88)	-0.004	(-2.24)
IND	0.252	(2.11)			0.224	(1.66)		
WESHEM	-0.329	(-3.42)			-0.303	(-2.78)		
AFRICA	0.084	(1.02)			0.124	(1.33)		
Usable Obs		220		220		184		184
Deg. of Fr.		202		153		167		118
R ²		0.251		0.686		0.251		0.671
Mean Dep. Var.		0.722		0.722		0.735		0.735
Std Err Dep Var		0.430		0.430		0.422		0.422

*t-statistics in parentheses

the results in the previous section, where capital controls are used as explanatory variables for macroeconomic variables such as inflation, interest rates and growth, may be plagued by endogeneity problems. In order to check for the potential endogeneity, we conducted a Hausman-type test (for a similar procedure, see Dowrick and Nguyen, 1989). This test was conducted by adding to the inflation and growth regressions the residual from the regressions of the variable suspected of endogeneity on a set of independent variables (see Table 8). The residuals turned out to be insignificant: for example, the t-statistics for the endogeneity tests for CAPCON, CURRCON and MULTER respectively in the inflation equations (5-year averages) were 0.84, 0.85 and 0.94 respectively. More generally, however, future empirical analysis should focus on a simultaneous equation framework with a dynamic structure in order to check the robustness of the basic correlations highlighted in this paper.

VII. Concluding Remarks

The study of effects and determinants of capital controls reveals several interesting empirical regularities. Capital controls, current account restrictions and multiple currency practices are in general associated with higher rates of inflation, a higher share of seigniorage in total taxes and lower real interest rates. We do not find any robust correlation of current and capital account restrictions with economic growth. We find, however, that countries with large black market premia (themselves correlated with foreign exchange restrictions) tend to grow more slowly.

Capital controls are more likely to be imposed in countries where monetary policy is more firmly under government's control, because the central bank is not independent. Also, they are more likely to be imposed in poorer countries, with a less developed tax system. An explanation for the latter finding is that capital controls appear to have strong fiscal implications, working through their impact on the use of seigniorage as a source of revenue and through their effects on the real return on domestic government debt. Furthermore, capital controls are more likely to be in place in countries with a larger share of government and a more closed economy.

Future research should study the intensity and effectiveness of controls using more sophisticated measures than our dummy variables. Because of the increased degree of capital mobility and the technological improvements in the financial sector, the effectiveness of controls is likely to have declined during the period under examination.

1. List of countries

- | | |
|--------------------|-------------------|
| 1. United States* | 32. Honduras |
| 2. United Kingdom* | 33. Mexico |
| 3. Austria* | 34. Nicaragua |
| 4. Belgium* | 35. Panama |
| 5. Denmark* | 36. Peru |
| 6. France* | 37. Uruguay |
| 7. Germany* | 38. Venezuela |
| 8. Italy* | 39. Bahamas |
| 9. Netherlands* | 40. Barbados |
| 10. Norway* | 41. Israel |
| 11. Sweden* | 42. Egypt |
| 12. Canada* | 43. India |
| 13. Japan* | 44. Indonesia |
| 14. Finland* | 45. Malaysia |
| 15. Greece* | 46. Nepal |
| 16. Iceland* | 47. Pakistan |
| 17. Ireland* | 48. Philippines |
| 18. Malta | 49. Singapore |
| 19. Portugal* | 50. Thailand |
| 20. Spain* | 51. Botswana |
| 21. Turkey | 52. Zaire |
| 22. Yugoslavia | 53. Ethiopia |
| 23. Australia* | 54. Ghana |
| 24. New Zealand* | 55. Kenya |
| 25. South Africa | 56. Morocco |
| 26. Argentina | 57. Nigeria |
| 27. Bolivia | 58. Tanzania |
| 28. Brazil | 59. Uganda |
| 29. Chile | 60. Zambia |
| 30. Colombia | 61. Western Samoa |
| 31. Costa Rica | |

*Countries marked with an asterisk were classified as industrial countries in the regressions of Sections V and VI.

Variables: Sources and Definitions

- CAPCONTR: Dummy variable taking the value of one when capital controls are in place, zero otherwise. Capital controls defined as "Restrictions on payments on capital transactions".
Sources: elaborations on IMF Exchange Arrangements and Exchange Restrictions, various issues.
- CURRCON: Dummy variable taking the value of one when restrictions on current account transactions are in place, zero otherwise. Current account restrictions defined as "Restrictions on payments for current transactions".
Sources: elaborations on IMF Exchange Rate Arrangements and Exchange Restrictions, various issues.
- MULTER: Dummy variable taking the value of one when multiple exchange rate practices are in place and zero otherwise. Multiple exchange rate practices defined as : "Separate exchange rate(s) for some or all capital transactions and/or some or all invisibles".
Source: elaborations on IMF Exchange Rate Arrangements and Exchange Restrictions, various issues.
- INFLATION RATE: Annual rate of change of the Consumer Price Index.
Source: IMF, International Financial Statistics, various issues.
- INFLATION TAX (% of Total revenue): the inflation tax is measured as the inflation rate times the lagged value of high-powered money.
Source: Cukierman, Edwards and Tabellini (1992).
- INFLATION TAX (% OF GDP). See above.
Source: Cukierman, Edwards and Tabellini (1992).
- REAL INTEREST RATE: Long-term nominal interest rate on government debt minus actual inflation.
Source: IMF, International Financial Statistics, various issues.
- REAL GDP PER CAPITA GROWTH RATE:
Source: Summers and Heston (1991) and PWT 5.5 update.
- LRGDP: (Log of) real GDP per capita.
Source: Summers and Heston (1991) and subsequent PWT 5.5 update.
- GCONS: Ratio of government consumption to GDP.
Source: Summers and Heston (1991) and PWT 5.5 update.
- GOVSH: Ratio of real government consumption to GDP, net of spending on defense and education (5-year average).
Source: Barro and Lee (1994).

- OPEN: Ratio of the sum of imports and exports to GDP.
Source: Summers and Heston (1991) and PWT 5.5 update.
- CAY: Ratio of current account deficit to GDP.
Source: IMF's International Financial Statistics, various issues.
- EXR: Dummy variable taking the value of one during periods of fixed or managed exchange rates and zero during periods of freely floating exchange rates.
Source: elaboration on IMF Exchange Arrangements and Exchange Restrictions, various issues.
- SYRM: Average years of secondary schooling in the male population over age 25.
Source: Barro and Lee (1994).
- LEGAL: Index of legal central bank independence. Higher numbers correspond to more CB independence.
Source: Cukierman, Webb and Neyapti (1992).
- TURNOVER: Actual turnover of central bankers per year.
Source: Cukierman, Webb and Neyapti (1992).
- LEFT: Dummy variable taking the value of one when a democratic left-wing government is in power, and zero otherwise.
Source: Banks, various issues.
- MAJ: Dummy variable taking the value of one when a majority government is in power, and zero in the case of a coalition or minority government.
Source: Banks, various issues.
- NODEM: Dummy variable taking the value of one when a totalitarian government is in power, and zero otherwise.
Source: Banks, various issues.
- TCHANGE: Total number of government changes for a given country in the period 1950-82.
Source: Taylor and Jodice (1983).
- TCOUP: Total number of successful coups for a given country in the period 1950-82.
Source: Taylor and Jodice (1983).

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