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Government Spending, the Real Interest Rate, and Liquidity Constrained Consumers' Behavior in Developing Countries

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Abstract

This paper provides empirical evidence on the determinants of private saving in a sample of 49 developing countries over the period 1973-83. The evidence indicates that, as indicated by the theory, a positive relationship exists between the rate of growth of consumption and the expected real interest rate. However, the magnitude of that relationship is such that increases in the real rate of return are not likely to bring forth substantial increases in savings especially in low-income developing countries. Above all, consumer behavior in developing countries appears to be dominated by pervasive liquidity constraints which are exploitable for policy purposes.

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Contents

Summary

Given the recent deterioration of the climate for international capital flows into developing countries and the need to service external debt, domestic savings have assumed increasing importance as a source of new investment, and therefore of improved growth, in these countries. The formulation of policies appropriately favoring public and private savings suffers, however, from a dearth of empirical knowledge regarding the nature of the savings function in developing countries. The present paper provides additional and, it is to be hoped, more conclusive empirical evidence on this topic.

In the context of a representative consumer's dynamic model that allows for liquidity constraints, two major issues are addressed. On the one hand, the long-debated issue of the real interest rate elasticity of savings is reconsidered, and new estimates of the degree of intertemporal substitution in consumption are provided. On the other hand, the representative consumer's utility function is extended to include government spending, and the scope for direct crowding out is assessed.

The results give a coherent picture of private savings behavior in developing countries and have a number of important policy implications. With respect to the issue of the real interest rate elasticity of savings, the evidence indicates that consumption growth does adjust with changes in the expected real interest rate. The magnitude of the relationship, however, suggests that, in most developing countries, substantial increases in savings are likely to require unfeasible changes in the real rate of return. The evidence also shows that government expenditure is likely to be a weak substitute for private consumption, and is therefore not a source of direct crowding out.

Above all, consumption growth in developing countries appears to be dominated by the influence of pervasive borrowing constraints that are exploitable for stabilization. Establishing the empirical relevance of liquidity constraints has important policy implications, particularly with regard to fiscal policy, since arguments on fiscal policy ineffectiveness are seriously affected if a substantial number of consumers are liquidity constrained. In addition, in this situation, traditional arguments in favor of wage and consumption taxation or proportional taxation and against capital taxation or progressive income taxation lose some of their appeal.

Empirical results are based on a sample of 49 developing countries covering 1973-83. The data are grouped in six sets of pooled time-series cross-section observations, each one referring to a single geographical region.

I. Introduction

The importance of the mobilization of domestic savings in developing countries can hardly be understated, given the present state of international capital markets. Unfortunately, however, the understanding of the actual determinants of domestic savings in developing countries is still scanty. A number of empirical investigations (mainly reproducing the literature relating to developed economies) have been carried out in recent years, but the paucity of reliable data has made it difficult to test the underlying hypotheses and obtain results that warrant a reasonable degree of confidence.

The purpose of the present paper is to provide additional, and, it is to be hoped, more conclusive, empirical evidence on this topic. In order to allow a comparison with the most recent work on the subject we shall estimate Euler equations for the representative consumer's stochastic dynamic optimization problem. However, in contrast with much of the previous literature, the theoretical framework for the present paper is based on the consideration that some of the basic assumptions on which saving functions for developing countries have been estimated may not be entirely realistic. In particular, a significant fraction of the population in developing countries can be expected to be affected by liquidity constraints that substantially diminish the consumers' ability to substitute consumption intertemporally, as is assumed by the well-known life-cycle theory. This is attributable to a number of factors, including capital market imperfections. While the gravity of capital market imperfections continues to be a matter of debate even in countries with apparently sophisticated financial institutions and well-developed capital markets (see Hayashi (1985), for a review, and Hubbard and Judd (1986)), this phenomenon has never been explicitly accounted for in developing countries, although there are several reasons why such imperfections are likely to be exacerbated in those countries (Blejer and Cheasty (1986)). Allowance is therefore made for departing from optimal behavioral rules by the representative consuming unit described by the theory.

In the context of a theoretically plausible model of consumer behavior that allows for borrowing constraints, two major issues are addressed.

First, the long-debated issue of the real interest rate elasticity of savings is taken up again. As is well known, the effects of the rate of return on the level of savings and the rate of capital formation are of central importance to both economists and policymakers, since they bear on a number of central questions of macroeconomics. The relevance of the interest rate elasticity of savings is further enhanced in development economics, where some of the competing views on the role of financial conditions in the economic growth process rely crucially on the degree of responsiveness of aggregate savings to changes in the rate of return.

Notwithstanding considerable research to determine the interest rate responsiveness of savings behavior in developed economies, the traditional view that changes in the rate of return are likely to have only a minor effect on the savings rate holds (Modigliani (1986), p. 304), but controversy still exists (Summers (1984)). In the case of developing countries, the lack of empirical work on the responsiveness of savings in the 1960s and early 1970s is emphasized in the surveys by Mikesell and Zinser (1973) and by Snyder (1974), who describe the evidence as sketchy at best. 1/ More recently, further attempts have been made (Fry (1978, 1980); Giovannini (1983, 1985); McDonald (1983); and Pereira Leite and Makonnen (1984)). However, they can be questioned on the basis of their limited geographical coverage, the unreliability of available data, and, in some cases, the underlying methodology. Consequently, their results cannot with confidence be used for policy analysis.

Fry (1978, 1980) estimates a (national) savings function for seven Asian countries 2/ for the period 1962-72. He apparently finds strong support for the hypothesis of a negative real interest rate elasticity of domestic consumption. He estimates this elasticity to be about -0.2. Similar conclusions are reached by McDonald (1983) and Pereira Leite and Makonnen (1984). McDonald focuses on factors determining savings behavior in 12 Latin American countries 3/ and provides evidence of a negative relationship between the real interest rate and private consumption in most of the countries examined and of magnitude roughly comparable with that found by Fry. Pereira Leite and Makonnen's study,

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1/ Leaving aside studies on the relationship between changes in interest rates in the organized money markets and the volume of saving through financial intermediaries, both surveys report the works of Williamson (1968) and Gupta (1970). The first author examines the role of real interest rates in determining personal saving in selected Asian countries (Burma, India, Japan, Korea, the Philippines, and Taiwan, Province of China) over the period 1950-64, and concludes that real rates of interest are, if anything, negatively correlated with national savings. His results, particularly as they apply to India, are disputed by Gupta, who questions his savings data as well as his choice of the real interest rate. Over a longer period of time, Gupta finds instead that interest rates play a significant role in determining household savings behavior in India.

2/ Burma, India, Korea, Malaysia, the Philippines, Singapore, and Taiwan, Province of China. The main data sources are World Bank, World Tables, and International Monetary Fund, International Financial Statistics.

3/ Argentina, Chile, Colombia, Costa Rica, Guatemala, Haiti, Honduras, Mexico, Panama, Paraguay, Peru, and Uruguay. The main data source is International Monetary Fund, International Financial Statistics.

on the other hand, concentrates on six African countries 1/ and provides evidence of a small but positive relationship between private savings and the real interest rate.

The hypothesis of a positive and significant relationship between real interest rates and savings in developing countries is questioned by Giovannini (1983, 1985), who replicates Fry's results and shows that "the apparent empirical success of the high interest elasticity hypothesis depends in a crucial way on the presence in the sample of a few observations that have a disproportionately large influence on the estimated" response of savings to the real interest rate (1985, p. 199). In this work, Giovannini extends the analysis to 18 developing countries 2/ and, bypassing many of the econometric problems with aggregate savings equations, estimates the elasticity of intertemporal substitution in (private) consumption. Using annual data, Giovannini finds that in only 5 out of 18 countries is the intertemporal substitutability in consumption not likely to be very small, 3/ therefore implying, others things being equal, that the interest rate elasticity of savings is positive.

Giovannini's work represents a considerable improvement in the knowledge of savings behavior in developing countries. However, it can hardly be considered conclusive. First, his main result relates to the difficulty of obtaining precise estimates of the relevant parameters. In 11 out of 18 cases the coefficient of intertemporal substitution is positive but with standard errors so large as to permit any sort of conclusion. Since Giovannini's sample period in most cases covers the 1960s, this result is not unexpected given the very low variability of real rates in that period. Second, as far as geographical coverage is concerned, Giovannini's work does not provide evidence for those regions for which evidence is most lacking, that is, Africa and the Middle East. 4/ Third, as Giovannini points out, some assumptions under which

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1/ Benin, Burkina Faso, Côte d'Ivoire, Niger, Senegal, and Togo. The main data source is International Monetary Fund, International Financial Statistics.

2/ Argentina, Brazil, Colombia, Jamaica, and Mexico in Latin America; Burma, India, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan, Province of China, and Thailand in Asia and the Pacific; Greece, Portugal, and Turkey in Southern Europe; and Kenya in Africa. The main data source is International Monetary Fund, International Financial Statistics.

3/ Burma, Greece, India, Jamaica, and Turkey.

4/ In terms of 1975 regional GDP, Giovannini (1985) covers just 2 percent of sub-Saharan Africa, 43 percent of East and South Asia and the Pacific, 72 percent of Latin America, and 64 percent of Southern Europe. In contrast, Fry (1978, 1980) and McDonald (1983) cover only approximately 45 percent of both East and South Asia and the Pacific, and Latin America. Finally, Pereira Leite and Makonnen (1984) limit themselves to nearly 6 percent of sub-Saharan Africa.

the elasticity of substitution is estimated in his 1985 work may not be realistic in developing countries. In particular, some fraction of aggregate consumption is likely to be accounted for by consumption of liquidity constrained individuals, for which the first-order condition on which estimation is based does not hold. 1/ While the existence of liquidity constraints implies a relatively small elasticity of savings 2/ and can therefore explain Giovannini's results, it also implies misspecification of the estimated unrestricted first-order condition. Further investigation is called for.

Therefore, Section II provides a framework for the estimation of the degree of intertemporal substitution in consumption, in which liquidity constraints are explicitly allowed for. Section II addresses also the second major issue dealt with in this paper. It extends the representative consumer's utility function to include government spending and assesses the role of public expenditure in private consumption decisions. The importance of the response of private spending to changes in government spending stems from the observation that, if government spending is a substitute for private spending, then government expenditure restraint policies are likely to induce higher private consumption. However, most adjustment programs in developing countries attempt to ensure that government deficits do not absorb an unduly high share of private savings. Indeed, the existence of public surpluses (presumably to be achieved mainly through tight expenditure policies) is often seen as a way to provide a pool of loanable fund savings to private sector investors, thereby avoiding the problems that characterize more traditional policies aimed at mobilizing private savings. This argument, however, disregards the fact that direct crowding out can partly or fully counteract government efforts. 3/ Indeed, for some Latin American countries, McDonald (1983) provides evidence of a sizable degree of substitution between private and public consumption. But his results rest on an inappropriate definition of disposable income and should therefore be investigated further.

1/ Giovannini (1985, p. 215) mentions that "some preliminary experiments where the presence of liquidity constraints was allowed in the model were not very satisfactory, but yielded the same estimates of the intertemporal substitution elasticity."

2/ Indeed, over some range, liquidity constrained individuals can be totally unresponsive to changes in real interest rates. See, however, Jackman and Sutton (1982).

3/ Notice that in this discussion we disregard the question of whether consumption is sensitive to choice of tax versus debt financing of current government expenditure and concentrate instead on the extent to which government spending directly substitutes for private consumer expenditure. Both are cases of direct crowding out, but their "dimension" is different: the Ricardian-equivalence proposition is concerned with what is regarded as income and wealth by the private sector, as opposed to what is regarded as consumption by the private sector in the latter case.

As Section III makes clear, an effort is made to construct as accurate and extensive a data set as existing sources allow. In particular, the empirical analysis in Sections IV and V focuses on private savings behavior over the period 1973-83 in 49 developing countries, grouped in six sets of pooled time-series cross-section observations, each one referring to a single geographical region.

Finally, Section VI presents the main conclusions of the analysis and its policy implications.

II. Theory

Research on consumption in the early 1980s (reviewed in Deaton (1985), and King (1985)) has been marked by the important works of Hall (1978), Grossman and Shiller (1981), and Hansen and Singleton (1982), which open the possibility of a direct estimation of the parameters of the intertemporal utility function characterizing the behavior of a representative individual without requiring explicit solutions of the consumers' dynamic optimization problem. In addition, Hansen and Singleton (1982) have shown how to test the overidentifying restrictions implied by the hypothesis of continuous optimization of a stable, additively separable objective function.

Following this line of research, we posit that aggregate consumption can be modeled as the outcome of optimizing decisions of a representative consumption unit (household). 1/ The household faces an economic environment in which future opportunities are uncertain, and has a stationary utility function that is additively separable through time, and is defined over a composite consumption good as follows:

$$V_t = E_t \left[\Sigma_{\tau=t}^{T} \rho^{\tau-t} \left(U_\tau^{\gamma}/\gamma\right)\right] \qquad (\gamma < 1) \qquad (1)$$

with

$$U_\tau = \left(C_\tau^{1-\alpha} G_\tau^{\alpha}\right) \qquad (0 \leq \alpha \leq 1). \qquad (2)$$

In equations (1) and (2), V_t is expected utility at t, E_t is the expectations operator conditional on information available at t, ρ is a constant discount factor, C_τ is private consumption of goods at τ, and G_τ is government expenditure in period τ. The parameter γ in equation (1) controls intertemporal substitution: large and negative values of γ characterize consumers who are willing to smooth

1/ Incidentally, notice that casting the analysis in terms of a household makes the "immortality" assumption, which is required for an aggregate version of the Euler condition to hold, slightly more palatable. See, however, Deaton's (1985, p. 13) comments.

consumption over time and who respond only to substantial changes in incentives. Finally, U is a function increasing and concave in a Cobb-Douglas aggregate of per capita private and public consumption.

The consumer (household) maximizes equation (1), subject to the following period-to-period budget constraint:

$$A_\tau = A_{\tau-1} R_\tau + Y_\tau - C_\tau, \tag{3}$$

where A_τ defines real assets at the end of period τ, R_τ is the real rate of return between periods $\tau-1$ and τ, and Y_τ is real nonproperty income (net of taxes) in period τ. As long as the optimum path lies in the interior of the budget set, we can use simple perturbation arguments to establish certain characteristics of the optimal path. At any point along an optimal path the representative consumption unit cannot make itself better off by foregoing one unit of consumption at time t and using the proceeds to purchase any other good at any other point in time. Formally, at time t the marginal condition will be given by:

$$E_t [R_{t+1} (\partial V_t/\partial C_{t+1})/(\partial V_t/\partial C_t) - 1] = E_t[F_{t+1} - 1] = 0 \tag{4}$$

which, apart from implicitly defining F_{t+1}, is satisfied for any free traded risky asset (even if other assets such as human capital cannot be traded freely) and holds for consumers who expect with certainty to be alive in the next period regardless of the length of horizon of their maximization problem. Notice also that condition (4) does not depend on any assumption about expectations regarding future labor income, government spending, or rates of return.

Estimation of the first-order condition for utility maximization (e.g., equation (4)) represents an alternative approach to estimating standard consumption functions. The difficulties associated with the latter are well-known and mostly concern the Lucas critique: the relation between consumption, income, and interest rates depends on the wider macroeconomic context and may not be stable over time, even though preferences remain unchanged. However, the research done so far has provided only limited support for the econometric restrictions implied by the Euler equation approach. Furthermore, the assumptions usually underlying the application of the Euler equation approach are far from being generally accepted (see Ando and Kennickell (1985), Blinder and Deaton (1985), Deaton (1985), and King (1985)).

Under rational expectations and market clearing, the first-order condition (4) holds ex post except for an error term uncorrelated with information available to the consumption unit at time t. In other words,

$$F_{t+1} = 1 + \varepsilon_{t+1}, \tag{5}$$

where ε_{t+1} is the mean zero and constant variance (σ^2) forecast error.

In the case of the time separable, constant relative risk aversion setting given by equations (1) and (2), and letting lowercase letters denote natural logarithms and Δ be the difference operator, equations (4) and (5) imply: 1/

$$\Delta c_{t+1} = \Psi_c + \Psi_r \; E_t \; r_{t+1} + \Psi_g \; E_t \; \Delta g_{t+1} + u_{t+1} \qquad (6)$$

where $\psi_c = \psi_c \; (\rho, \; \sigma^2, \; \gamma, \; \alpha)$, $\psi_r = 1/[\gamma(\alpha-1) + 1]$, and $\psi_g = \gamma\alpha\psi_r$.

Since $\Psi_r > 0$, Ψ_g is greater, equal, or less than zero depending or whether γ is positive, zero, or negative. In equation (6), the error term u_{t+1} reflects the impact of "news" (or "surprises") about current levels of income, interest rates, and government spending. It is therefore orthogonal to all past information. 2/

As it stands, though, equation (6) still disregards the possibility that some consumers may face quantity constraints on the amount of borrowing, or that loan rates available to them may be higher than the corresponding lending rates. These possibilities may arise for a number of reasons, including imperfections in capital markets and tax policy. For example, the tax system can generate divergencies between post tax rates on borrowing and lending. Alternatively, large transaction costs, the possibility of bankruptcy, and/or asymmetric information about creditworthiness between lenders and borrowers can result in lenders denying loans to potential borrowers with particular characteristics.

Suppose, then, that the liquidity constraint takes the form of a restriction on the total net stock of traded assets, as follows:

$$- A_t \leq \phi_t + \phi \; y_t \qquad (\forall t) \qquad (7)$$

where a negative value of A_t indicates net indebtedness in period t. The additional condition $A_T \leq 0$ provides the necessary endpoint constraint. Equation (7) is expressed in terms of the net position in order to allow the use of illiquid assets as collateral. According to

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1/ It is assumed that r_{t+1}, g_{t+1}, and c_{t+1} follow a joint lognormal distribution. See Hansen and Singleton (1982).

2/ Notice that formulation (6) does not allow transitory elements of consumption owing to imperfect execution of plans, which would introduce a first-order moving average component into the error term. This assumption is not as strong as it seems at the aggregate level since transitory elements should be uncorrelated between individuals and therefore should average out.

it, potential lenders make the size of the loan conditional upon nonproperty income. Notice that the lending rule is time dependent, since the intercept ϕ_t is allowed to respond to changes in government legislation and macroeconomic conditions in general.

Expressing liquidity constraints in the form of equation (7), that is, exogenous stock constraints, is important because such borrowing restrictions are exploitable by stabilization policy (Hubbard and Judd (1986)). Of course, other alternatives are conceivable. For example, Hayashi (1985) discusses the case of imperfect information in the loan market and shows that it is not necessarily exploitable for stabilization purposes (see also King (1986)).

Under the additional constraints given by equation (7), it can be shown (see Muellbauer (1983, 1986a) and Zeldes (1985)) that equation (6) has to be augmented by adding a term $[\Psi_r \mu_t]$ where μ_t is an increasing function of the shadow price associated at t with being credit-rationed, or, in other words, is the marginal increase in expected lifetime utility derived from a unit relaxation of the credit constraint in period t. Since agents are constrained from borrowing more, but not from saving more, μ_t is zero when the constraint is not binding and positive when it is binding.

In principle, μ_t could be derived by solving the whole intertemporal programming problem. However, a sufficiently general solution is hardly likely to be operational. As an alternative, Muellbauer (1986a) therefore suggests that, "if consumers are most likely to want to borrow and hence, other things being equal, to encounter credit restrictions when future income prospects look bright compared with current circumstances," then, in the aggregate, μ_t is likely to depend positively on terms like $E_t(z_{t+1}-c_t)$ where $Z_t = A_{t-1}(R_t-1) + Y_t$, that is, real disposable income. 1/ In other words, consumers liquidity constrained at t may not expect to be constrained at t+1 and may therefore be forced to let their consumption path follow more closely their income path. Equation (6) would therefore be rewritten as:

$$\Delta c_{t+1} = \Psi_0 + \Psi_r E_t r_{t+1} + \Psi_g E_t \Delta g_{t+1}$$

$$+ \psi_\mu E_t (z_{t+1}-c_t) + u_{t+1} \qquad (8)$$

which can be interpreted as an approximation to the Euler equation for

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1/ Nonproperty income would certainly be a more appropriate variable. Disposable income is, however, preferred in the light of the information available. See, however, Appendix I.

consumption incorporating credit constraints. 1/ Notice that, for $\psi_g = \psi_\mu = 0$, equation (8) reduces to Hall's (1981) original formulation estimated by Giovannini (1985).

III. The Data Set

A thorough empirical analysis of private savings behavior in developing countries raises several difficult statistical problems, mostly stemming from the inadequacies in the data and their lack of comparability. A reasonable number of observations on aggregate time-series data is available, on a consistent basis, for only a few developing countries. In the great majority of cases, less than 20 annual observations are available. 2/ In such a situation, pooling cross-section and time-series data for a number of countries seems to be the most sensible procedure, provided that sufficient allowance is made for obvious institutional and cultural differences among countries.

Following this line of research, the empirical analysis of the present paper is based on six sets of pooled time-series cross-section data, each one referring to what, hopefully, is a homogenous geographical region. The first set includes 12 countries in sub-Saharan Africa. To give a different order of magnitude, this sample covers 40 percent of the 1975 GDP of the whole region as defined in the World Bank's World Tables. The second set includes five countries in North Africa and the Middle East, totaling to 61 percent of the 1975 GDP of the whole region. The third set covers nine countries in East and South Asia and the Pacific, or 46 percent of the 1975 region GDP. The fourth and fifth sets cover eight countries in Central America (including the Caribbean) and nine in South America, respectively, with coverage in terms of 1975 regional GDP of 76.2 percent and 83.1 percent, respectively. 3/ Finally, the sixth set of data includes six Southern European countries, totaling 77 percent of the 1975 regional GDP. The sample as a whole contains 11 low-income, and 38 middle-income countries. Low-income countries are, therefore, somewhat

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1/ Interestingly, equation (8) bears a close resemblance to the empirically successful consumption function attributable to Davidson and others (1978).

2/ For example, McDonald's (1983) and Giovannini's (1985) regressions rarely present more than 15 degrees of freedom.

3/ Apart from the countries listed in Table 1 of Appendix I, the South American sample originally also included Argentina. As it turned out, however, the Argentine subsample, ranging from 1973 to 1980, was dominated by two large outliers in 1974 and 1976. Given the small size of the subsample, it was therefore decided to omit the country altogether.

underrepresented. 1/ Appendix I provides a detailed description of the data set.

It is important to recall that appropriate measurement is particularly difficult in the case of real interest rates, where the problem of choosing a particular interest rate series from series that may be available is coupled with the question of the appropriately deflating nominal interest rates (Khatkhate (1985)). In this respect, the approach described in the previous section turns out to be particularly useful because the relationship represented by equation (6) should hold for all real rates of return corresponding to freely traded assets.

In order to provide an indication of the robustness of the results, two alternative measures of the nominal rate are used. On the one hand, domestic interest rates on term deposits of commercial banks, which constitute a relatively large segment of the financial system in developing countries, are considered. 2/ On the other, implicitly making reference to the small open economy model, the nominal interest rate is derived as the relevant foreign interest rate adjusted for expected changes in the exchange rate. The latter alternative implies that the relevant real interest rate depends on the rate of change of the real price of home goods (Dornbusch (1983)). Of course, it may be argued that the small open economy stereotype is inappropriate for most developing countries that are characterized by pervasive foreign exchange and trade controls. However, it has been suggested (Tanzi and Blejer (1982)) that, even in countries with severe restrictions on capital movements and other exchange controls, it is unlikely that economic agents will be prevented from illicitly substituting foreign currency and foreign financial assets for domestic currency and domestic financial assets if incentives in that direction are sufficiently strong. 3/

IV. Estimation

For estimation purposes, let us rewrite the theoretical model described in Section II as follows:

1/ Reference is made here to the developing countries eligible to use the International Development Association's (IDA) resources. On the basis of that classification, low-income countries are approximately two fifths of the 142 developing countries.

2/ Nevertheless, in a few cases it proved necessary to use discount rates. See Appendix I for details.

3/ It should be recognized that in most developing countries the size of the capital market is small and usually confined to one central city, and that wealth is held in the form of consumer durables such as jewelry and livestock. In such cases rates of return on financial instruments are likely to be largely irrelevant.

$$\Delta c^{i}_{t+1} = \psi^{i}_{c} + \psi_{r}\, E_t\, r^{i}_{t+1} + \psi_{g}\, E_t\, \Delta g^{i}_{t+1} + \psi_{\mu,\ell}\, E_t\, (z^{j}_{t+1} - c^{j}_{t})$$

$$+ \psi_{\mu,m}\, E_t(z^{k}_{t+1} - c^{k}_{t}) + \zeta_{z}\, [z^{i}_{t+1} - E_t(z^{i}_{t+1})]$$

$$+ \zeta_{g}[g^{i}_{t+1} - E_t(g^{i}_{t+1})] + \zeta_{r}\, [r^{i}_{t+1} - E_t(r_{t+1})] + \bar{v}_{t+1} + v^{i}_{t+1}$$

$$(\forall\, j \in \ell,\ \forall\, k \in m) \qquad (9)$$

where the suffix "i" identifies the i-th country in each of the geographical areas referred to in the previous section. In other words, the constant term in equation (9), being a function of the variance of the forecast error, is allowed to differ among countries because, for example, countries with a higher share of the product originating from agriculture are likely to face higher uncertainty. In addition, we allow the coefficient of the proxy for borrowing constraints, ψ_{μ}, to take different values in low-income countries (i.e., those countries identified by the superscript j and belonging to the subset identified by the suffix "ℓ") and in middle-income countries (i.e., identified by the superscript k and belonging to the subset "m"). Low-income countries are taken to be the countries currently eligible for use of the IDA resources. Of course, under the interpretation given to ψ_{μ} in this paper, we expect $\psi_{\mu,\ell} > \psi_{\mu,m}$. 1/ Finally, the original error term in equation (6), that is, u_{t+1}, is now linearly decomposed into three innovation terms referring to z, g, and r, respectively, as well as two random components with mean zero but not necessarily homoscedastic, because the variance of different countries forecast errors may differ and this difference could be only partially incorporated into the innovation terms. The first component is country specific and is uncorrelated across countries, (v^{i}_{t+1}), while the second one is an area-wide component, which equally affects all countries in a particular geographical area ($\bar{v}_{t+1}$). 2/ The obvious example of the latter

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1/ It may be argued that as the intensity of borrowing constraints varies across countries, so can the parameters of the underlying representation of preferences vary. On the basis of the available evidence (Zeldes (1985)), this does not appear to be the case.

2/ Countries are not randomly selected, and therefore the area-wide shock cannot be analyzed in an "error-component" kind of model. Besides, the available evidence suggests that the fixed-effects estimator is robust with respect to various forms of dynamic misspecification. See Baltagi and Griffin (1984).

component is given by the recent drought in sub-Saharan Africa, as long as its effects are not already incorporated in the income "news."

Notice that the variable r_t^i is alternatively defined as $[q_t^i - \Delta p_t^i]$ where q_t is the domestic nominal interest rate and p^i is the (logarithm of the) consumer price level, or as $[q_t^* + \Delta e_t^i - \Delta p_t^i]$ where, apart from p_t^i, q_t^* is the representative nominal interest rate paid on foreign currency assets, and e_t is the (logarithm of the) exchange rate defined as domestic currency per unit of foreign currency.

Disregarding, for the time being, the expected (or unexpected) nature of the variables on the right-hand side of equation (9), the appropriate estimator for the kind of setting described by equation (9) is given by what is known as the <u>between-within groups fixed-effects estimator</u>, if we can regard each country as a group. As Mundlak (1978) shows, this estimator amounts to applying Ordinary Least Squares to equation (9) expressed in terms of "transformed" variables, that is:

$$\begin{aligned}\bar{\Delta c}^i_{t+1} = {} & \psi_r E_t \bar{r}^i_{t+1} + \psi_g E_t \bar{\Delta g}^i_{t+1} + \psi_{\mu,\ell} E_t (\bar{z}^j_{t+1} - \bar{c}^j_t) \\ & + \psi_{\mu,m} E_t [\bar{z}^k_{t+1} - \bar{c}^k_t) + \zeta_z [\bar{z}^i_{t+1} - E (\bar{z}^i_{t+1})] \\ & + \zeta_g [\bar{g}^i_{t+1} - E_t [\bar{g}^i_{t+1})] + \zeta_r [\bar{r}^i_{t+1} - E_t (\bar{r}^i_{t+1})] + \bar{v}^i_{t+1}\end{aligned}$$

$$(\forall\ j \in \ell, \forall\ k \in m) \qquad (10)$$

where the transformation takes the following form:

$$\bar{x}^i_t = x^i_t - (1/T) \Sigma_j x^i_j - (1/N) \Sigma_k x^k_t + (1/NT) \Sigma_j \Sigma_k x^k_j$$

$$(j = 1. \ . \ . \ T;\ k = 1. \ . \ . \ N) \qquad (11)$$

for a generic variable x_t, and where T and N denote the number of time periods and the number of countries, respectively. That is, the transformed variable is the original variable minus the country and time means plus the total mean. Notice that the transformation eliminates the constant term and the area-wide error term. In general, the transformation would eliminate all variables not simultaneously indexed on i and t. Therefore, if the nominal interest rate is given by the

adjusted foreign interest rate, the term $E_t \bar{r}^i_{t+1}$ reduces to $E_t[\Delta(e^i_{t+1}-p^i_{t+1})]$.

Reverting now to the modeling of expected and unexpected (or "surprise") variables, in equation (10), we make use of the well-known two-step procedure involving the estimation of an auxiliary set of equations describing the variables about which expectations are formed and then substituting the estimated residuals and predicted values as appropriate in the structural equation of interest. 1/ A vector autoregression (VAR) is estimated for the transformed variables $\bar{z}$, $\bar{g}$, and $\bar{r}$, the right-hand side variables of the VAR including lagged consumption, lagged disposable income, lagged government spending, lagged nominal interest rate (or lagged devaluation), two lags of the price level, and a time trend. 2/ In general, the VAR equations for $\bar{z}$ and $\bar{g}$ fit the transformed data quite well, while, as we would expect (Hall (1981)), the real interest rate $\bar{r}$ appears to be more difficult to predict (see Appendix II). Disposable income and government spending are strongly autoregressive, and, in addition, they help to predict each other, while increased inflation signals a future slowdown in the rate of growth.

Once anticipated and unanticipated series are available, equation (10) can be estimated by Ordinary Least Squares. However, as shown by Pagan (1984), the two-step procedure does not yield correct estimates of all the standard errors. In particular, while the standard errors of the coefficients of the "surprise" variables are correct, standard errors for the remaining coefficients have to be obtained from a Two-Stage Least Squares regression that omits the surprise terms and uses the VAR as the first stage.

V. Empirical Results

Tables 1-6 report the estimates of the coefficients of equation (10) for the six geographical regions described in Section III. Before examining the tables in detail, it is worth emphasizing their main

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1/ Besides being simpler computationally, the two-step procedure (like other limited information methods) reduces the contamination of the estimated coefficients in the structural equation by specification errors in the auxiliary equations.

2/ In order to identify the system given by equation (10) and the vector autoregression, the strong assumption of zero covariance between v_{t+1} and the "surprises" in disposable income, government spending and the real interest rate is necessary. Furthermore, it should be noticed that the system given by equation (10) and the vector autoregression is observationally equivalent to the system given by equation (10) without "surprises" but with simultaneity affecting z, g, and r. Therefore, the interpretation given in the present paper relies on the author's choice.

implications. First, the omission of liquidity constraints appears to consistently and seriously bias downward the estimates of the intertemporal elasticity of substitution. Second, where liquidity constraints are substantial (as in regions where the use of IDA resources is common), intertemporal substitution is weak, and very large changes in incentives are necessary to induce postponement of consumption. Third, as expected, low-income countries suffer most from liquidity constraints and therefore react strongly to expected income changes although there is no clear-cut pattern in the way different countries react to unexpected income shocks. In short, the picture that emerges from the evidence is a highly coherent one in which differences in behavioral responses appear to be linked more to the stage of development of different areas or countries than to unexplained shifts in preferences.

In Tables 1-6, the columns labelled (ii) and (iv) report the coefficient estimates for the two measures of the real interest rate and the six subsamples, respectively, their heteroscedasticity consistent (White (1980)) standard errors (derived as above), as well as some diagnostic statistics such as the Durbin-Watson statistic for fixed-effects models given in Bhargava and others (1982), and a Chow stability test across the 1981-83 period. 1/ This period coincides with the downward trend of oil prices (in U.S. dollars) and, therefore, also with substantial (and in recent times unprecedented) shifts of real income from oil exporting to oil importing countries. In addition, the same period witnesses the emergence of the debt crisis. To allow for comparison with previous work, columns (i) and (iii) in Tables 1-6 report the results of following Giovannini (1985) and of estimating Hall's (1981) original formulation (corresponding to equation (10) with $\psi_g = \psi_{\mu,\ell} = \psi_{\mu,m} = \zeta_z = \zeta_g = \zeta_r = 0$).

Tables 1-6 report also the estimates of the implied behavioral parameters as well as some interesting functions of the same parameters, along with their standard errors derived by linearizing the underlying nonlinear functions. 2/ In particular, the tables show estimates of the parameters γ and α. In the restricted model, the former parameter controls the intertemporal elasticity of substitution in consumption, which is given, instead, by $\gamma(1-\alpha)$ in the full model (10). The latter parameter defines the weight of government spending in the Cobb-Douglas consumption index (2) and, if nondistortionary taxes are available and perfect transformation in production is assumed, it defines also the optimal provision of public goods as a percentage of private ones (i.e., $\alpha/(1-\alpha)$).

1/ Estimation and hypothesis testing were carried out by means of the PC version of TSP (version 4.0I).

2/ These standard errors should be taken with some care considering the poor approximation usually provided by the linearization. See Krinsky and Robb (1986).

Table 1. Parameter Estimates and Test Statistics: Sub-Saharan Africa

	$r^i = q^i - \Delta p^i$		$r^i = q^* - \Delta(e^i/p^i)$	
	(i) 1/	(ii) 1/	(iii) 1/	(iv) 1/
ψ_r	0.06 (0.38)	0.33 (0.43)	-0.04 (0.16)	- 2/
ψ_g	-	-0.32 (0.21)	-	-0.25 (0.21)
$\psi_{\mu,m}$	-	0.22 (0.08)	-	0.23 (0.08)
$\psi_{\mu,\ell}$	-	0.72 (0.19)	-	0.70 (0.19)
ζ_z	-	0.41 (0.07)	-	0.42 (0.07)
ζ_g	-	0.06 (0.08)	-	0.02 (0.08)
ζ_r	-	0.04 (0.10)	-	-0.01 (0.07)
γ	-16.27 (112.89)	-3.25 (5.73)	-	-
$\gamma(1-\alpha)$	-	-2.24 (4.48)	-	-
α	-	0.31 (0.22)	-	0.20 (0.13)
$\alpha/(1-\alpha)$	-	0.45 (0.46)	-	0.25 (0.21)
$\hat{\sigma}$	0.07	0.05	0.07	0.05
R^2	0.51	0.72	0.51	0.72
d.w.	1.74	1.81	1.75	1.82
Chow	0.59 3/	0.76 4/	0.60 3/	0.71 5/
n.ob.	104	104	104	104

1/ The regressions also include a dummy variable taking a value of 1 in 1973 and of -1 in 1974 for Swaziland. This accounts for two large outliers but does not affect the remaining coefficients. Its coefficient takes a value of -0.51 (0.03) in the equation of columns (i) and (iii), and -0.47 (0.02) in the equations of columns (ii) and (iv).

2/ (Incorrectly signed and insignificant) coefficient set to zero.

3/ Distributed as F(20,82).

4/ Distributed as F(20,76).

5/ Distributed as F(20,77).

Table 2. Parameter Estimates and Test Statistics: Middle East and North Africa

	$r^i = q^i - \Delta p^i$		$r^i = q^* - \Delta(e^i/p^i)$	
	(i)	(ii)	(iii)	(iv)
ψ_r	0.99 (0.77)	0.98 (0.68)	0.23 (0.44)	1.17 (0.51)
ψ_g	-	- 1/	-	- 1/
$\psi_{\mu,m}$	-	0.22 (0.09)	-	0.41 (0.14)
$\psi_{\mu,\ell}$	-	-	-	-
ζ_z	-	0.38 (0.14)	-	0.39 (0.11)
ζ_g	-	0.09 (0.14)	-	0.08 (0.14)
ζ_r	-	0.02 (0.42)	-	-0.12 (0.19)
γ	-0.01 (0.79)	-0.02 (0.71)	-3.38 (8.41)	0.15 (0.37)
$\gamma(1-\alpha)$	-	-	-	-
α	-	-	-	-
$\alpha/(1-\alpha)$	-	-	-	-
$\hat{\sigma}$	0.07	0.06	0.07	0.05
R^2	0.06	0.39	0.01	0.47
d.w.	1.77	1.86	1.78	1.68
Chow	0.43 2/	0.54 3/	0.30 2/	0.33 3/
n.ob.	44	44	44	44

1/ (Incorrectly signed and insignificant) coefficient set to zero.
2/ Distributed as F(10,33).
3/ Distributed as F(10,29).

Table 3. Parameter Estimates and Test Statistics: East and South Asia and the Pacific

	$r^i = q^i - \Delta p^i$		$r^i = q^* - \Delta(e^i/p^i)$	
	(i)	(ii)	(iii)	(iv)
ψ_r	0.07 (0.17)	0.18 (0.18)	-0.04 (0.10)	0.09 (0.11)
ψ_g	-	-0.03 (0.10)	-	- 1/
$\psi_{\mu,m}$	-	0.17 (0.14)	-	0.23 (0.16)
$\psi_{\mu,\ell}$	-	0.79 (0.39)	-	0.65 (0.33)
ζ_z	-	0.58 (0.04)	-	0.63 (0.05)
ζ_g	-	-0.05 (0.04)	-	-0.04 (0.05)
ζ_r	-	0.12 (0.08)	-	-0.01 (0.02)
γ	-12.79 (31.78)	-4.74 (5.82)	-	-10.23 (13.74)
$\gamma(1-\alpha)$	-	-5.40 (5.73)	-	-
α	-	0.03 (0.12)	-	-
$\alpha/(1-\alpha)$	-	0.04 (0.13)	-	-
$\hat{\sigma}$	0.03	0.02	0.03	0.02
R^2	0.01	0.65	0.01	0.63
d.w.	2.11	2.33	2.14	2.16
Chow	0.60 2/	0.73 3/	0.62 2/	0.67 4/
n.ob.	84	84	84	84

1/ (Incorrectly signed and insignificant) coefficient set to zero.
2/ Distributed as F(21,62).
3/ Distributed as F(21,56).
4/ Distributed as F(21,57).

Table 4. Parameter Estimates and Test Statistics: Southern Europe

	$r^i = q^i - \Delta p^i$		$r^i = q^* - \Delta(e^i/p^i)$	
	(i) 1/	(ii) 1/	(iii) 1/	(iv) 1/
ψ_r	0.08 (0.08)	- 2/	0.05 (0.06)	0.17 (0.05)
ψ_g	-	- 2/	-	- 2/
$\psi_{\mu,m}$	-	0.39 (0.09)	-	0.49 (0.14)
$\psi_{\mu,\ell}$	-	-	-	-
ζ_z	-	0.61 (0.11)	-	0.58 (0.10)
ζ_g	-	-0.18 (0.10)	-	-0.17 (0.11)
ζ_r	-	-0.04 (0.05)	-	-0.09 (0.05)
γ	-11.66 (13.24)	-	-18.44 (21.74)	-4.98 (2.15)
$\gamma(1-\alpha)$	-	-	-	-
α	-	-	-	-
$\alpha/(1-\alpha)$	-	-	-	-
$\hat{\sigma}$	0.04	0.03	0.04	0.03
R^2	0.30	0.71	0.30	0.77
d.w.	1.60	1.58	1.61	1.84
Chow	0.46 3/	0.54 4/	0.35 3/	0.53 5/
n.ob.	56	56	56	56

1/ The regressions also include two dummy variables taking a value of 1 in 1974 for both Cyprus and Portugal. They do not affect the remaining coefficients and their coefficients take the following values: -0.19 (0.01), -0.10 (0.02), -0.20 (0.01), -0.08 (0.02) for the first dummy variable in equation (i) to (iv), respectively; 0.09 (0.01), 0.07 (0.01), 0.09 (0.01), 0.05 (0.01) for the second dummy variable in equations (i) to (iv), respectively.

2/ (Incorrectly signed and insignificant) coefficient set to zero.

3/ Distributed as F(14,39).

4/ Distributed as F(14,36).

5/ Distributed as F(14,35).

Table 5. Parameter Estimates and Test Statistics: Central America and the Caribbean

	$r^i = q^i - \Delta p^i$		$r^i = q^* - \Delta(e^i/p^i)$	
	(i)	(ii)	(iii)	(iv)
ψ_r	0.37 (0.16)	0.35 (0.17)	-0.05 (0.19)	1/
ψ_g	-	- 1/	-	1/
$\psi_{\mu,m}$	-	0.22 (0.21)	-	0.34 (0.19)
$\psi_{\mu,\ell}$	-	-	-	-
ζ_z	-	0.45 (0.10)	-	0.49 (0.10)
ζ_g	-	0.02 (0.06)	-	0.03 (0.06)
ζ_r	-	0.19 (0.07)	-	-0.13 (0.03)
γ	-1.86 (1.32)	-1.86 (1.39)	-	-
$\gamma(1-\alpha)$	-	-	-	-
α	-	-	-	-
$\alpha/(1-\alpha)$	-	-	-	-
$\hat{\sigma}$	0.05	0.04	0.05	0.04
R^2	0.08	0.44	0.01	0.39
d.w.	1.28	1.46	1.13	1.49
Chow	1.29 2/	1.19 3/	1.54 2/	1.12 4/
n.ob.	74	74	74	74

1/ (Incorrectly signed and insignificant) coefficient set to zero.
2/ Distributed as F(18,55).
3/ Distributed as F(18,50).
4/ Distributed as F(18,51).

Table 6. Parameter Estimates and Test Statistics: South America

	$r^i = q^i - \Delta p^i$		$r^i = q^* - \Delta(e^i/p^i)$	
	(i)	(ii)	(iii)	(iv)
ψ_r	0.09 (0.07)	0.01 (0.05)	-0.31 (0.15)	3/
ψ_g	-	- 1/	-	-
$\psi_{\mu,m}$	-	0.65 (0.12)	-	0.71 (0.10)
$\psi_{\mu,\ell}$	-	-	-	-
ζ_z	-	0.48 (0.09)	-	0.48 (0.09)
ζ_g	-	0.02 (0.05)	-	-0.04 (0.05)
ζ_r	-	0.01 (0.04)	-	-0.05 (0.04)
γ	-9.83 (8.11)	-154.52 (1,153.8)	-	-
$\gamma(1-\alpha)$	-	-	-	-
α	-	-	-	-
$\alpha/(1-\alpha)$	-	-	-	-
$\hat{\sigma}$	0.05	0.04	0.05	0.03
R^2	0.06	0.57	0.06	0.60
d.w.	1.66	1.51	1.47	1.64
Chow	1.20 3/	2.24 4/	1.18 3/	2.57 5/
n.ob.	88	88	88	88

1/ (Incorrectly signed and insignificant) coefficient set to zero.
2/ Incorrectly signed coefficient (-0.40 with standard error equal to 0.10) set to zero.
3/ Distributed as F(25,62).
4/ Distributed as F(25,58).
5/ Distributed as F(25,59).

Table 7. Real Interest Rate Elasticities of Consumption 1/

	$r^i = q^i - \Delta p^i$ (i)	(ii)	$r^i = q^* - \Delta (e^i/p^i)$ (iii)	(iv)
Sub-Saharan Africa	-0.06	-0.25	-	-
Middle East and North Africa	-1.05	-1.04	-0.24	-1.25
East and South Asia and the Pacific	-0.08	-0.18	-	-0.09
Southern Europe	-	-	-0.05	-0.18
Central America and the Caribbean	-0.37	-0.37	-	-
South America	-0.10	-0.01	-	-

1/ Elasticities are computed assuming $\rho = 1 + r = 1.03$ and assuming, for simplicity, $\alpha = 0$. Changes in these assumptions imply only marginal changes in the elasticities.

In general, model (10) constitutes a substantial improvement over its restricted version. The available diagnostic does not suggest misspecification, and, in particular, the hypothesis of parameter constancy across the 1981-83 period cannot be rejected except in South America.

Contrary to Giovannini's (1985) findings there is quite clear-cut evidence of a positive relationship between the rate of growth of per capita consumption and the expected real interest rate. Furthermore, in three regions out of six (Middle East and North Africa, Southern Europe, and Central America), the coefficient ψ_r also turns out to be positive and significantly different from zero, although this result depends on the definition of the real interest rate. It may be argued that assets denominated in foreign currency are unlikely to be a significant item in private portfolios in sub-Saharan Africa, while the indication is the reverse in the Middle East and North Africa and in Southern Europe. 1/ In general, however, the restricted model estimated by Giovannini (1985) tends to bias downward the estimate of ψ_r.

Notwithstanding these results, ψ_r still remains quite small and the intertemporal elasticity of substitution therefore tends to take on negative values that are larger, in absolute terms, than those observed in developed economies. 2/ In addition, with the exception of the Middle East and North Africa and Central America and the Caribbean, the estimates of γ do not tend to differ widely across regions and they indicate a reduced response by the consumers to changes in incentives. It is important to stress that if the sample excluded 1982 and 1983, South America too would show a positive and significantly different from zero ψ_r coefficient. 3/ As is apparent from the Chow test, however, the relationship weakens considerably in the early 1980s. Therefore, although the extent of the misspecification of the restricted model is apparent and substantial, the main thrust of Giovannini's work remains to some extent unaffected.

Government spending never appears to play a substantial role in the regressions. No definite pattern of substitution emerges from the estimates. On the contrary, private consumption is mostly insensitive to the expected path of government spending, with the exception of

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1/ The apparent negative and strong relationship between consumption growth and the expected real interest rate (defined in terms of the world interest rate) in South America should not be taken too seriously in the light of the quite poor performance of the underlying VAR equations in that case.

2/ Hansen and Singleton (1982), using U.S. data, find values of the intertemporal elasticity of substitution of between plus and minus unity. Summers (1984) presents various estimates of γ ranging from -18.0 to 0.4, while Bean (1986) estimates it to be about -1.5.

3/ Equal to 0.09 (0.04) and implying γ of equal to -10.4 (6.1).

sub-Saharan Africa where, for what it is worth, the implied estimate of the optimal provision of public goods (as a percentage of private consumption) exceeds the average government spending/private consumption ratio over the 1973-83 period (i.e., 0.27).

Most of the improvement with respect to the restricted formulation shown in columns (i) and (iii) is therefore clearly attributable to the liquidity constraint proxies and to the impact of "news" on disposable income. The "surprise" variables explain a substantial amount (from 10 percent to nearly 35 percent) 1/ of the variance of the error in the regressions reported in columns (ii) and (iv) in Tables 1 to 6, as the rational expectations approach to the consumption function suggests. Statistically, the innovation in income is the most important such variable.

However, it cannot be safely said that only unexpected changes in income cause consumption to change, as modern versions of the permanent income hypothesis suggest. The coefficients of the liquidity constraint proxies ($\psi_{\mu,\ell}$ and $\psi_{\mu,m}$) are always positive, of substantial magnitude, and significantly different from zero. 2/ In addition, $\psi_{\mu,\ell}$ turns out to be always greater and significantly different from $\psi_{\mu,m}$ and both coefficients are roughly of the same order of magnitude across regions. 3/ Interestingly, as we should expect, the relationship between the rate of growth of consumption and the expected real interest rate shows up more clearly and strongly where the proxy for liquidity constraints plays a minor role.

To clarify further these issues, Table 7 focuses on the effects of changes in interest rates on consumption. To fully characterize the consumer's response to random shocks, a closed-form solution to the stochastic control problem described in Section II would be needed. Since such solutions remain intractable, we follow Mankiw, Rotemberg and Summers (1985) and concentrate on the effects of interest rate changes in a deterministic environment. The elasticities reported in Table 7 illustrate the changes in consumption at t in response to temporary

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1/ Between 10 percent and 15 percent in sub-Saharan Africa, North Africa and the Middle East, respectively; nearly 20 percent in Latin America; and about 30 percent both in East and South Asia and the Pacific and in Southern Europe.

2/ Comparable estimates of ψ_{μ} for developed economies are available only for the U.S. economy: Muellbauer (1986b) estimates it to be about 0.1.

3/ The exception is South America, where the coefficient of the liquidity constraint proxy for the low-income country (Bolivia) turns out to be negative and to possess a large standard error. In addition, $\psi_{\mu,m}$ tends to take on higher values than those in other regions.

changes in the real interest rate, from t to t+1. These are short-run elasticities in the sense that the effect of such changes after t+1 is ignored. 1/

Figures in Table 7 describe the percentage change in consumption following a 1 percent change in the variable (1 + r). Hence, if the real rate of interest jumps, say, from 3 to 4 percent in sub-Saharan Africa, the corresponding reduction in consumption as implied by model (10) is about 1/4 of one percent.

Table 7 conveys, although in a different form, the same message of Tables 1-6. In particular, the relationship between the degree of responsiveness of consumption to changes in the real interest rate and the magnitude of liquidity constraints (as described by the coefficients $\psi_{\mu,\ell}$ and $\psi_{\mu,m}$) is, if anything, emphasized.

Assuming that $\psi_{\mu} = 0$ yields the Euler equation satisfied under market clearing, or, in other words, assuming that $\{\psi_{\mu}\ [E_t\ (z_{t+1})-c_t]\}$ can provide an estimate of the Lagrange multiplier associated with transferring resources between tomorrow and today, 2/ the pervasiveness of liquidity constraint can be seen easily by computing the (lower) rate of growth of consumption that would have taken place in the absence of such constraints. 3/ It turns out that sub-Saharan Africa, North Africa and the Middle East, and South America, which witnessed an average rate of growth of per capita consumption of about 0.6 percent, 4.8 percent, and 1.7 percent, respectively, in 1973-83, would actually have experienced much lower rates of growth (around -0.4 percent, 3.2 percent, and 0.9 percent, respectively). Instead, East and South Asia and the Pacific, and Southern Europe, whose per capita consumption grew by 3.2 percent and 2.4 percent, respectively, over the same period, would have had annual growth rates approximately 0.3 percent lower. The only region that actually experienced, on average, negative values of the $[E_t(z_{t+1})-c_t]$ variable over that period, that is, Central America and the Caribbean, is actually the only region to show an estimate of ψ_{μ} not significantly different from zero.

1/ Changes in the subsequent period are, however, mediated through changes in future wealth. Hence, for consumers with long horizons, this is likely to be a valid approximation.

2/ Of course, we expect $\{\psi_{\mu}(E_t(z_{t+1})-c_t)\} \geq 0$, at least on the average across time periods and countries. In a world with borrowing constraints as opposed to one without, consumption can be expected to grow faster, but never slower.

3/ All the computations that follow are based on the estimates reported in column (ii) of Tables 1-6. Calculations on the basis of the estimates of column (iv) do not change the picture.

VI. Policy Implications

Analyses based on intercountry data are subject to several well-known caveats, which warrant appropriate caution in the interpretation of the results. This is even truer when, as in the present case, data problems are known to be substantial. Nonetheless, the results of the present study appear to be robust in most respects. They provide a coherent picture of private savings behavior in developing countries, offer reasons for the existing behavioral differences among geographical regions, and suggest a number of important policy implications.

With respect to the issue of the real interest rate elasticity of savings, the available evidence indicates that in all regions considered the expected growth of consumption does change with changes in the real interest rate. In addition, in regions such as the Middle East and North Africa, Southern Europe, and Central America and the Caribbean, the response of consumption growth to the expected real interest rate is also significantly different from zero. However, if the magnitude of the estimated parameters is to be taken seriously, the effective mobilization of domestic savings through changes in savings incentives is likely to require changes in the real interest rates, which, given the existing constraints, may prove unfeasible, especially in low-income developing countries. In such a case, a viable alternative is the one considered by Blejer and Cheasty (1986), that is, the generation of budgetary surpluses. As long as these are derived by expenditure restraints they are not likely to crowd in additional private expenditure and thereby be counteracted by private agents' behavior.

More far reaching, however, are the implications of the existence of pervasive liquidity constraints for fiscal policy design and implementation. The fact that current resources are low relative to lifetime resources but consumers are, to some extent, not permitted to borrow against future income, clearly affects the way we look at issues such as the efficacy of temporary tax cuts and the effects of government budget deficits on aggregate demand. In Tobin's (1980, p. 57) words, liquidity constrained consumers are not "indifferent to the opportunity to defer tax payments. Even if they themselves must pay the taxes later, they will increase their consumption now. In effect the government lends to them at its borrowing rate of interest, an option not otherwise available in the credit market." Fiscal policy ineffectiveness arguments are therefore affected if a substantial number of consumers are liquidity constrained, 1/ although, in assessing the real world effects of debt-financed tax cuts, the actual distribution of tax changes is likely to be of significance. Of course, the reduced

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1/ Actually, the simulation study by Hubbard and Judd (1986, pp. 33-43) clearly points out that, in the discussion on the Ricardian-equivalence proposition, borrowing constraints are likely to be substantially more important than the absence of intergenerational wealth redistribution (i.e., finite horizons).

responsiveness of savings to changes in the real interest rate further emphasizes the role of traditional stabilization policies.

The same arguments that, under borrowing constraints can lead to countercyclical policies on efficiency grounds, impinge also on a number of issues in tax policy evaluation and tax reform. If liquidity constraints are present, traditional arguments in favor of wage and consumption taxation or proportional taxation and against capital taxation and progressive income taxation lose some of their appeal. For example, Hubbard and Judd (1986, p. 27) show that "a switch from progressive to proportional income taxation would speed up tax collection, raising tax rates on low-income consumers and reducing their consumption substantially when liquidity constraints are important." In other words, tax exemptions, as well as other forms of social insurance, would not only obey considerations of equity, but would also be grounded on efficiency.

Similarly, the usual conclusion which suggests that substantial efficiency costs are likely to characterize capital income taxation as opposed to labor income taxation, is likely to be reversed to some extent when liquidity constraints are introduced. Again, this is because capital income taxation effectively delays the collection of tax payments over an individual's life cycle.

It should be stressed that tax policies designed to lessen the burden of borrowing constraints may induce substantial welfare gain if the public does not substitute easily between present and future consumption. If, as appears to be the case in developing countries, people prefer an even consumption path and show low elasticity of intertemporal substitution, the welfare cost of borrowing constraints is likely to be exacerbated. In this respect, the results of this paper underline the role of financial reforms in developing countries.

In recent years a substantial amount of work has been carried out in developed economies on the effects of liquidity constraints on consumers' behavior. Given the importance of considering capital market imperfections as pre-existing distortions in normative and positive economic analyses, it is only surprising that liquidity constraints have received so little attention in the analysis of savings behavior in developing countries, where they seem to be a simple matter of common-sense observation.

The Data

The data set for the present study has been constructed by assembling information from all available international sources (United Nations, National Accounts Statistics; International Monetary Fund, International Financial Statistics Yearbook and Government Finance Statistics Yearbook; and World Bank, World Tables), as well as national sources as needed.

As is well known, because of the unreliability and internal inconsistency of data and the varying methodology in different countries, data in the present sample may be subject to a wide margin of error. In addition, in assembling different sources of information, attention should be paid to conceptual differences and their implications. These remarks apply, in particular, to the construction of the variable Z_t (i.e., the per capita private disposable income, in constant prices), to the estimation of the real interest rate, and to the definition of G_t. In particular:

C_t: per capita private final consumption expenditure, in constant prices (index: 1980=1). Sources: United Nations, National Accounts Statistics: Main Aggregates and Detailed Tables, 1983 (New York, 1986) (Tables 1.1 and 1.2) for consumption data; World Bank, Economic Analysis and Projections Department, Social Indicators of Development, for population data.

G_t: per capita government final consumption expenditure, in constant prices (index: 1980=1). Sources: as for C_t above. According to the definitions in the National Accounts Statistics, this item comprises compensation of employees and other purchases of goods and services. We therefore disregard capital expenditure and, what is more important, we neglect the long-debated question of the correct definition of current as opposed to capital expenditure.

Z_t: per capita private disposable income, in constant prices (index: 1980=1). Defined as gross national product (gnp), less consumption of fixed capital (cfc, when available), plus net transfers from abroad (nta, when available), less tax revenue (tr), plus subsidies and current transfers (sct, when available), deflated by private final consumption implicit price index. Table 1 reports the availability of the mentioned data for the 57 countries in the sample. Sources: United Nations, National Accounts Statistics: Main Aggregates and Detailed Tables, 1983 (New York, 1986) (Table 1.12) for gross national products, consumption of fixed capital, and net current transfers from abroad; United Nations, National Accounts Statistics: Main Aggregates and Detailed Tables, 1983 (New York, 1986) (Table 1.4) and/or International Monetary Fund, Government Finance Statistics Yearbook (Washington, 1985), Summary Table and Table C for tax revenue and subsidies and current transfers; and World Bank, Economic Analysis and Projections Department, Social Indicators of Development, for population data. Notice that, while national disposable income (i.e., gross national

product less consumption of fixed capital plus net current transfers from the rest of the world) is often reported in the United Nations' National Accounts Statistics, the same is seldom true for the general government current receipts and disbursements, and, in particular, for the current tax revenue and for subsidies and current transfers. Therefore, in such cases, use was made of International Monetary Fund, Government Finance Statistics Yearbook, thereby combining transactions recorded on a payments basis and flows measured and classified by their characteristics at the time of transaction (as in Government Finance Statistics), with transactions recorded on an accrual basis and flows measured and classified by future use or purpose (as in National Accounts Statistics).

r_t: real interest rate. Defined as $(1+r^i) = (1+q^i)/(1+\Delta p^i)$ or, alternatively, as $(1+r^i) = ((1+q^*)[1+\Delta e^i)/(1+\Delta p^i)]$. Table 1 reports the definitions of the domestic nominal interest rate and of the inflation rate adopted for each country. Sources (apart from national sources): United Nations, National Accounts Statistics: Main Aggregates and Detailed Tables, 1983 (New York, 1986) (Tables 1.1 and 1.2) for the private final consumption deflator, and International Monetary Fund, International Financial Statistics Yearbook (Washington, 1985) for interest rates, exchange rates, and the consumer price index.

For each country in the six subsamples, Table 2 reports the time period considered, the average and the standard deviation of the ratio to GNP of gross private savings as derived by subtracting private final consumption from the measure of disposable income mentioned above, as well as the average and the standard deviation of the ratio to GNP of gross private savings as derived by adding the current account surplus to gross capital formation and subtracting government gross savings. The comparison of the two average ratios is a useful check of the quality of the approximation embodied in our definition of private disposable income. As is apparent from the table, in most cases the two averages match quite closely. However, substantial discrepancies arise in a few cases such as South Africa, Iran, Jamaica, Greece, and Israel. Tracing the reasons for these discrepancies is, of course, far from easy. However, the discrepancies are likely to be due partly to the fact that our approximation to the concept of disposable income disregards interest payments on the public debt and, therefore, in some cases, substantially underestimates income. 1/ Unfortunately, there are very few countries for which statistics are available that allow for isolating the volume of interest payments on domestic public debt paid to the private sector. In addition, in cases such as South Africa, the difference partially derives also from a sizable statistical discrepancy that allows the reconciliation of the national accounting aggregates.

1/ This implies, however, that the variable Z_t is nearer to the concept of net nonproperty income required by the theory of Section II.

As Table 2 shows, the sample is characterized by a substantial variability across time and across countries, and, for the latter case, both between and within regional subsets.

All the information mentioned is available on diskettes for use with Lotus 123, a "spreadsheet" program for the IBM-PC.

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Table 1. Availability and Sources of Input Data

Country	Private Disposable Income					Real Rate of Interest	
	gnp	cfc	nta	tr	sct	nr	ir
Sub-Saharan Africa							
Botswana	nas	nas	nas	nas	nas	br, ifs	pcd, nas
Burundi	nas	n.a.	n.a.	gfs	n.a.	dr, ifs	pcd, nas
Cameroon	nas	nas	nas	nas	nas	br, ifs	pcd, nas
Ethiopia	wt	n.a.	n.a.	gfs	gfs	tr, ifs	pcd, nas
Ghana	nas	nas	nas	gfs	gfs	br, ifs	pcd, nas
Kenya	nas	n.a.	nas	gfs	gfs	dr, ifs	pcd, nas
Liberia	nas	n.a.	n.a.	gfs	gfs	dr, ifs	pcd, nas
Malawi	nas	n.a.	n.a.	nas	gfs	br, ifs	pci, ifs
South Africa	nas	nas	nas	nas	nas	tr, ifs	pcd, nas
Swaziland	nas	n.a.	nas	gfs	gfs	dr, ifs	pcd, nas
Zambia	nas	nas	nas	gfs	gfs	dr, ifs	pci, ifs
Zimbabwe	nas	n.a.	nas	nas	nas	dr, ifs	pcd, nas
North Africa and Middle East							
Iran	nas	nas	nas	nas	nas	br, ifs	pcd, nas
Jordan	nas	nas	nas	gfs	gfs	br, ifs	poi, ifs
Morocco	nas	n.a.	nas	gfs	gfs	br, ifs	pci, ifs
Syria	nas	n.a.	n.a.	gfs	n.a.	br, ifs	pcd, nas
Tunisia	nas	nas	nas	nas	nas	br, ifs	pcd, nas
East and South Asia and the Pacific							
Fiji	nas	n.a.	nas	gfs	gfs	br, ifs	pcd, nas
India	nas	nas	nas	nas	nas	dr, dk	pcd, nas
Indonesia	nas	nas	n.a.	gfs	gfs	dr, ifs	pcd, nas
Korea	nas	nas	nas	nas	nas	dr, ifs	pcd, nas
Malaysia	nas	n.a.	n.a.	gfs	gfs	dr, ifs	pcd, nas
Pakistan	nas	nas	n.a.	gfs	gfs	dr, dk	pcd, nas
Philippines	nas	nas	nas	nas	nas	dr, dk	pcd, nas
Sri Lanka	nas	nas	nas	nas	nas	dr, ifs	pcd, nas
Thailand	nas	nas	nas	nas	nas	dr, ifs	pcd, nas
Southern Europe							
Cyprus	nas	nas	nas	gfs	gfs	dr, ifs	pcd, nas
Greece	nas	nas	nas	nas	nas	dr, ifs	pcd, nas
Israel	nas	nas	nas	nas	nas	dr, ns	pcd, nas
Malta	nas	nas	nas	nas	nas	dr, ifs	pcd, nas
Portugal	nas	nas	nas	nas	nas	dr, ifs	pcd, nas
Turkey	nas	nas	nas	gfs	gfs	dr, ifs	pcd, nas
Central America and the Caribbean							
Costa Rica	nas	nas	nas	nas	nas	dr, ifs	pcd, nas
Dominican Republic	nas	nas	nas	gfs	gfs	dr, dk	pcd, nas
El Salvador	nas	nas	nas	gfs	gfs	dr, dk	pcd, nas
Guatemala	nas	n.a.	nas	gfs	gfs	dr, dk	pcd, nas
Honduras	nas	nas	nas	nas	nas	dr, ifs	pcd, nas
Jamaica	nas	nas	nas	nas	nas	dr, ifs	pci, ifs
Mexico	nas	nas	nas	gfs	gfs	dr, ifs	pcd, nas
Panama	nas	nas	nas	nas	nas	dr, ifs	pcd, nas
South America							
Bolivia	nas	n.a.	nas	gfs	gfs	dr, dk	pcd, nas
Brazil	nas	nas	n.a.	nas	nas	tr, ifs	pcd, nas
Chile	nas	nas	nas	gfs	gfs	dr, ifs	pcd, nas
Colombia	nas	n.a.	nas	nas	nas	dr, ifs	pcd, nas
Ecuador	nas	nas	nas	nas	nas	dr, ifs	pcd, nas
Paraguay	nas	nas	n.a.	nas	nas	dr, dk	pcd, nas
Peru	nas	nas	nas	nas	nas	dr, dk	pcd, nas
Uruguay	nas	nas	nas	gfs	gfs	dr, dk	pcd, nas
Venezuela	nas	nas	nas	gfs	gfs	dr, dk	pci, ifs

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Notes:

n.a.: Not available.

ns: National sources.

nas: United Nations, National Accounts Statistics: Main Aggregates and Detailed Tables, 1983 (New York, 1986).

wt: World Bank, World Tables: The Third Edition, Volume I: Economic Data (Baltimore: Johns Hopkins University Press, 1981).

gfs: International Monetary Fund, Government Finance Statistics Yearbook (Washington, 1985).

ifs: International Monetary Fund, International Financial Statistics (Washington, 1985).

dk: Khatkhate (1985).

br: Bank rate and discount rate.

dr: Deposit rate.

tr: Treasury bill rate.

pcd: Final private consumption implicit price index.

pci: Consumer price index.

Table 2. Coverage and Main Characteristics of the Data

	Period	Private Savings/GNP Ratios: Estimate mean (s.e.)	Private Savings/GNP Ratios: Residual mean (s.e.)
Sub-Saharan Africa			
Botswana	1973-81	.111 (.086)	.068 (.071)
Burundi*	1973-81	.038 (.037)	n.a.
Cameroon	1973-81	.069 (.043)	.112 (.041)
Ethiopia*	1973-81	.094 (.036)	.100 (.029)
Ghana*	1973-81	.081 (.020)	.129 (.032)
Kenya*	1973-82	.206 (.034)	.163 (.033)
Liberia*	1973-82	.316 (.045)	.291 (.071)
Malawi*	1973-83	.171 (.071)	.122 (.075)
South Africa	1973-83	.114 (.032)	.262 (.036)
Swaziland	1973-82	.227 (.140)	.127 (.127)
Zambia*	1973-82	.116 (.076)	.203 (.072)
Zimbabwe	1973-82	.235 (.023)	.213 (.020)
North Africa and Middle East			
Iran	1973-79	.462 (.072)	.233 (.078)
Jordan	1973-83	.496 (.093)	.466 (.096)
Morocco	1973-83	.207 (.030)	.147 (.031)
Syria	1973-81	.220 (.035)	.229 (.081)
Tunisia	1973-83	.082 (.037)	.137 (.022)
East and South Asia and the Pacific			
Fiji	1973-82	.185 (.048)	.161 (.053)
India*	1973-83	.134 (.016)	.201 (.016)
Indonesia	1973-83	.091 (.024)	.106 (.026)
Korea	1973-83	.133 (.027)	.190 (.024)
Malaysia	1973-81	.288 (.023)	.238 (.024)
Pakistan*	1973-82	.085 (.013)	.110 (.014)
Philippines	1973-82	.122 (.012)	.207 (.015)
Sri Lanka*	1973-82	.112 (.029)	.127 (.031)
Thailand	1973-83	.140 (.023)	.194 (.016)
Southern Europe			
Cyprus	1973-83	.180 (.024)	.250 (.023)
Greece	1973-83	.095 (.036)	.249 (.030)
Israel	1973-83	.065 (.049)	.361 (.051)
Malta	1973-83	.250 (.051)	.171 (.041)
Portugal	1973-81	.189 (.051)	.234 (.063)
Turkey	1973-81	.119 (.023)	.136 (.036)
Central America and the Caribbean			
Costa Rica	1973-83	.055 (.028)	.119 (.031)
Dominican Republic	1973-81	.076 (.036)	.141 (.020)
El Salvador	1973-82	.140 (.024)	.164 (.026)
Guatemala	1973-83	.139 (.027)	.123 (.028)
Honduras	1973-83	.059 (.048)	.096 (.033)
Jamaica	1973-82	.015 (.046)	.146 (.036)
Mexico	1973-83	.188 (.024)	.218 (.041)
Panama	1973-80	.201 (.017)	.219 (.041)
South America			
Bolivia*	1973-83	.172 (.070)	.115 (.071)
Brazil	1973-82	.144 (.035)	.184 (.021)
Chile	1973-83	.035 (.049)	.079 (.035)
Colombia	1973-83	.178 (.016)	.157 (.011)
Ecuador	1973-83	.110 (.038)	.154 (.030)
Paraguay	1973-83	.108 (.032)	.185 (.016)
Peru	1973-83	.068 (.023)	.042 (.064)
Uruguay	1973-83	.104 (.035)	.118 (.027)
Venezuela	1973-82	.215 (.051)	.204 (.041)

* Indicates an IDA-designated country.

APPENDIX II

VAR Estimation

This Appendix reports in detail the VAR equations estimated for the six geographical regions and the two alternative definitions of the real rate of return. In all tables, symbols are as in the main text.

APPENDIX II

Table 1. VAR Estimation: Sub-Saharan Africa

	Dependent Variable		
	Δz_t	Δg_t	r_t
z_{t-1}	-0.52 (0.15)	0.11 (0.09)	0.07 (0.07)
g_{t-1}	-0.12 (0.09)	-0.34 (0.07)	-0.06 (0.06)
c_{t-1}	0.18 (0.10)	-0.08 (0.08)	-0.03 (0.05)
q_{t-1}	-0.30 (0.55)	0.07 (0.66)	0.87 (0.38)
Δp_{t-1}	-0.17 (0.14)	-0.18 (0.15)	0.11 (0.15)
p_{t-1}	0.06 (0.05)	0.02 (0.05)	-0.09 (0.07)
d	-0.06 (0.06)	-0.04 (0.03)	0.01 (0.02)
t	-0.02 (0.02)	0.004 (0.02)	-0.02 (0.01)
d.w.	1.76	1.91	1.86
R^2	0.22	0.23	0.08
$\hat{\sigma}$	0.09	0.08	0.07
n. ob.	104	104	104
$\sigma(x)$	0.096	0.084	0.066
$\sigma(\hat{x})$	0.045	0.040	0.019
$\sigma(x-\hat{x})$	0.085	0.073	0.063

Notes: The variable d takes values of 1 in 1974 and of -1 in 1975 for Swaziland. In parentheses, White's (1980) standard errors.

Table 2. VAR Estimation: Sub-Saharan Africa

	Dependent Variable		
	Δz_t	Δg_t	$\Delta(e-p)_t$
z_{t-1}	-0.52 (0.15)	0.11 (0.09)	0.06 (0.12)
g_{t-1}	-0.11 (0.09)	-0.34 (0.06)	-0.07 (0.09)
c_{t-1}	0.20 (0.10)	-0.09 (0.07)	0.02 (0.09)
Δe_{t-1}	0.09 (0.10)	0.04 (0.08)	0.39 (0.19)
Δp_{t-1}	-0.14 (0.14)	-0.18 (0.15)	0.61 (0.28)
p_{t-1}	0.03 (0.05)	0.03 (0.05)	-0.16 (0.11)
d	-0.06 (0.06)	-0.05 (0.03)	-0.06 (0.06)
t	-0.02 (0.02)	-0.003 (0.02)	-0.04 (0.02)
d.w.	1.73	1.91	1.89
R^2	0.23	0.23	0.18
$\hat{\sigma}$	0.09	0.08	0.10
n. ob.	104	104	104
$\sigma(x)$	0.096	0.084	0.106
$\sigma(\hat{x})$	0.046	0.040	0.045
$\sigma(x-\hat{x})$	0.084	0.073	0.096

Notes: The variable d takes values of 1 in 1974 and of -1 in 1975 for Swaziland. In parentheses, White's (1980) standard errors.

Table 3. VAR Estimation: Middle East and North Africa

	Dependent Variable		
	Δz_t	Δg_t	r_t
z_{t-1}	0.02 (0.12)	0.20 (0.12)	0.04 (0.03)
g_{t-1}	-0.27 (0.17)	-0.61 (0.13)	-0.09 (0.03)
c_{t-1}	-0.58 (0.30)	-0.59 (0.33)	-0.18 (0.07)
q_{t-1}	3.40 (3.73)	1.08 (3.22)	3.45 (0.64)
Δp_{t-1}	-0.20 (0.41)	-0.42 (0.49)	-0.31 (0.10)
p_{t-1}	0.06 (0.21)	-0.54 (0.26)	0.23 (0.05)
t	0.02 (0.04)	-0.08 (0.04)	-0.01 (0.01)
d.w.	2.08	1.65	2.35
R^2	0.26	0.42	0.44
$\hat{\sigma}$	0.09	0.09	0.02
n. ob.	44	44	44
$\sigma(x)$	0.092	0.106	0.028
$\sigma(\hat{x})$	0.047	0.068	0.018
$\sigma(x-\hat{x})$	0.080	0.081	0.021

Note: In parentheses, White's (1980) standard errors.

Table 4. VAR Estimation: Middle East and North Africa

	Dependent Variable		
	Δz_t	Δg_t	$\Delta(e_t-p_t)$
z_{t-1}	-0.01 (0.10)	0.15 (0.12)	-0.14 (0.06)
g_{t-1}	-0.26 (0.17)	-0.59 (0.13)	-0.08 (0.07)
c_{t-1}	-0.52 (0.27)	-0.53 (0.34)	0.04 (0.13)
Δe_{t-1}	0.07 (0.39)	-0.37 (0.43)	-0.31 (0.17)
Δp_{t-1}	-0.14 (0.45)	-0.22 (0.62)	0.004 (0.21)
p_{t-1}	-0.15 (0.19)	-0.58 (0.21)	0.01 (0.11)
t	0.03 (0.04)	0.09 (0.04)	0.03 (0.02)
d.w.	1.97	1.62	2.17
R^2	0.24	0.42	0.37
$\hat{\sigma}$	0.09	0.09	0.04
n. ob.	44	44	44
$\sigma(x)$	0.092	0.106	0.047
$\sigma(\hat{x})$	0.045	0.069	0.028
$\sigma(x-\hat{x})$	0.080	0.080	0.037

Note: In parentheses, White's (1980) standard errors.

Table 5. VAR Estimation: East and South Asia and the Pacific

	Dependent Variable		
	Δz_t	Δg_t	r_t
z_{t-1}	-0.56 (0.14)	0.28 (0.18)	-0.15 (0.11)
g_{t-1}	0.04 (0.06)	-0.45 (0.08)	-0.05 (0.05)
c_{t-1}	0.35 (0.15)	0.12 (0.18)	0.04 (0.11)
q_{t-1}	0.02 (0.27)	-0.69 (0.35)	0.67 (0.19)
Δp_{t-1}	0.13 (0.09)	-0.02 (0.14)	-0.08 (0.10)
P_{t-1}	-0.004 (0.04)	-0.17 (0.05)	0.14 (0.04)
t	0.01 (0.02)	0.03 (0.02)	-0.001 (0.01)
d.w.	1.78	1.62	1.95
R^2	0.19	0.33	0.31
$\hat{\sigma}$	0.04	0.05	0.03
n. ob.	84	84	84
$\sigma(x)$	0.045	0.059	0.037
$\sigma(\hat{x})$	0.020	0.034	0.021
$\sigma(x-\hat{x})$	0.040	0.048	0.031

Note: In parentheses, White's (1980) standard errors.

Table 6. VAR Estimation: East and South Asia and the Pacific

	Dependent Variable		
	Δz_t	Δg_t	$\Delta(e_t-p_t)$
z_{t-1}	-0.55 (0.14)	0.27 (0.17)	-0.25 (0.29)
g_{t-1}	0.02 (0.06)	-0.38 (0.06)	0.02 (0.15)
c_{t-1}	0.36 (0.14)	0.12 (0.17)	0.04 (0.23)
Δe_{t-1}	0.10 (0.06)	0.05 (0.04)	-0.19 (0.09)
Δp_{t-1}	0.13 (0.08)	-0.09 (0.16)	-0.11 (0.17)
p_{t-1}	-0.01 (0.04)	-0.14 (0.05)	0.25 (0.07)
t	0.01 (0.02)	0.02 (0.01)	0.001 (0.003)
d.w.	1.82	1.74	1.92
R^2	0.22	0.30	0.13
$\hat{\sigma}$	0.04	0.05	0.08
n. ob.	84	84	84
$\sigma(x)$	0.045	0.059	0.085
$\sigma(\hat{x})$	0.021	0.032	0.030
$\sigma(x-\hat{x})$	0.040	0.049	0.079

Note: In parentheses, White's (1980) standard errors.

Table 7. VAR Estimation: Southern Europe

	Dependent Variable		
	Δz_t	Δg_t	r_t
z_{t-1}	-0.24 (0.13)	0.31 (0.12)	0.09 (0.16)
g_{t-1}	-0.24 (0.12)	-0.38 (0.11)	0.32 (0.20)
c_{t-1}	-0.16 (0.16)	-0.44 (0.16)	-0.10 (0.23)
q_{t-1}	0.50 (0.29)	-0.001 (0.25)	0.27 (0.68)
Δp_{t-1}	-0.15 (0.14)	0.07 (0.11)	-0.57 (25)
P_{t-1}	-0.05 (0.04)	-0.05 (0.03)	0.10 (0.07)
d_1	-0.10 (0.03)	0.07 (0.03)	-0.09 (0.03)
d_2	0.04 (0.02)	0.02 (0.02)	-0.03 (0.03)
t	0.02 (0.02)	0.02 (0.02)	0.02 (0.03)
d.w.	1.72	2.06	1.49
R^2	0.45	0.29	0.32
$\hat{\sigma}$	0.05	0.05	0.08
n. ob.	56	56	56
$\sigma(x)$	0.063	0.053	0.093
$\sigma(\hat{x})$	0.043	0.029	0.052
$\sigma(x-\hat{x})$	0.047	0.045	0.077

Notes: The variables d_1 and d_2 take values of 1 in 1974 for both Cyprus and Portugal. In parentheses, White's (1980) standard errors.

Table 8. VAR Estimation: Southern Europe

	Dependent Variable		
	Δz_t	Δg_t	$\Delta(e_t-p_t)$
z_{t-1}	-0.20 (0.12)	0.27 (0.10)	-0.65 (0.25)
g_{t-1}	-0.24 (0.12)	-0.30 (0.09)	-0.29 (0.19)
c_{t-1}	-0.23 (0.16)	-0.32 (0.16)	0.25 (0.28)
Δe_{t-1}	-0.03 (0.07)	0.20 (0.05)	-0.54 (0.16)
Δp_{t-1}	-0.19 (0.15)	-0.09 (0.11)	0.30 (0.24)
p_{t-1}	-0.01 (0.03)	-0.05 (0.02)	0.04 (0.05)
d_1	-0.09 (0.03)	0.06 (0.03)	0.03 (0.04)
d_2	0.02 (0.02)	0.03 (0.02)	0.01 (0.03)
t	0.02 (0.02)	0.01 (0.02)	0.06 (0.03)
d.w.	1.80	2.19	2.05
R^2	0.43	0.44	0.46
$\hat{\sigma}$	0.05	0.04	0.09
n. ob.	56	56	56
$\sigma(x)$	0.063	0.053	0.114
$\sigma(\hat{x})$	0.042	0.035	0.077
$\sigma(x-\hat{x})$	0.048	0.039	0.083

Notes: The variables d_1 and d_2 take values of 1 in 1974 for both Cyprus and Portugal. In parentheses, White's (1980) standard errors.

Table 9. VAR Estimation: Central America and the Caribbean

	Dependent Variable		
	Δz_t	Δg_t	r_t
z_{t-1}	-0.85 (0.14)	0.08 (0.22)	-0.49 (0.23)
g_{t-1}	0.17 (0.07)	-0.38 (0.19)	0.14 (0.08)
c_{t-1}	0.84 (0.14)	0.48 (0.18)	0.55 (0.20)
q_{t-1}	-0.18 (0.21)	-0.30 (0.20)	-0.12 (0.28)
Δp_{t-1}	-0.22 (0.10)	-0.14 (0.12)	-0.48 (0.14)
p_{t-1}	0.16 (0.05)	0.05 (0.07)	0.17 (0.06)
t	-0.03 (0.01)	0.001 (0.02)	-0.01 (0.01)
d.w.	1.33	1.15	1.70
R^2	0.40	0.22	0.25
$\hat{\sigma}$	0.05	0.08	0.06
n. ob.	74	74	74
$\sigma(x)$	0.064	0.082	0.072
$\sigma(\hat{x})$	0.041	0.038	0.036
$\sigma(x-\hat{x})$	0.050	0.072	0.062

Note: In parentheses, White's (1980) standard errors.

Table 10. VAR Estimation: Central America and the Caribbean

	Dependent Variable		
	Δz_t	Δg_t	$\Delta(e_t-p_t)$
z_{t-1}	-0.81 (0.13)	0.10 (0.21)	0.48 (0.32)
g_{t-1}	0.17 (0.07)	-0.38 (0.19)	0.07 (0.10)
c_{t-1}	0.78 (0.15)	0.44 (0.18)	-0.40 (0.29)
Δe_{t-1}	-0.12 (0.05)	-0.06 (0.05)	0.9 (0.14)
Δp_{t-1}	-0.03 (0.12)	-0.03 (0.17)	-0.11 (0.22)
p_{t-1}	0.13 (0.05)	0.002 (0.07)	0.07 (0.11)
t	-0.03 (0.01)	0.001 (0.02)	0.01 (0.02)
d.w.	0.124	1.14	1.99
R^2	0.43	0.21	0.08
$\hat{\sigma}$	0.05	0.08	0.10
n. ob.	74	74	74
$\sigma(x)$	0.064	0.082	0.104
$\sigma(\hat{x})$	0.042	0.038	0.030
$\sigma(x-\hat{x})$	0.049	0.072	0.099

Note: In parentheses, White's (1980) standard errors.

Table 11. VAR Estimation: South America

	Dependent Variable		
	Δz_t	Δg_t	r_t
z_{t-1}	-0.90 (0.20)	-0.13 (0.24)	2.13 (0.77)
g_{t-1}	0.23 (0.07)	-0.37 (0.13)	0.05 (0.21)
c_{t-1}	0.65 (0.20)	0.28 (0.24)	-1.53 (0.71)
q_{t-1}	0.01 (0.03)	-0.02 (0.03)	0.53 (0.12)
Δp_{t-1}	-0.10 (0.05)	0.02 (0.05)	-0.20 (0.21)
p_{t-1}	0.03 (0.01)	0.01 (0.02)	0.05 (0.04)
t	-0.04 (0.03)	-0.02 (0.04)	-0.05 (0.07)
d.w.	1.84	1.42	1.66
R^2	0.42	0.20	0.45
$\hat{\sigma}$	0.06	0.08	0.16
n. ob.	88	88	88
$\sigma(x)$	0.070	0.085	0.204
$\sigma(\hat{x})$	0.045	0.038	0.137
$\sigma(x-\hat{x})$	0.053	0.076	0.151

Note: In parentheses, White's (1980) standard errors.

Table 12. VAR Estimation: South America

	Dependent Variable		
	Δz_t	Δg_t	$\Delta(e_t-p_t)$
z_{t-1}	-0.87 (0.20)	0.05 (0.21)	0.42 (0.33)
g_{t-1}	0.21 (0.08)	-0.41 (0.12)	0.06 (0.14)
c_{t-1}	0.63 (0.20)	0.25 (0.22)	-0.36 (0.33)
Δe_{t-1}	-0.14 (0.08)	-0.23 (0.09)	0.22 (0.14)
Δp_{t-1}	0.05 (0.08)	0.22 (0.10)	-0.32 (0.14)
p_{t-1}	0.02 (0.02)	-0.01 (0.02)	-0.02 (0.02)
t	-0.04 (0.03)	-0.01 (0.04)	0.03 (0.04)
d.w.	1.82	1.54	1.90
R^2	0.45	0.25	0.18
$\hat{\sigma}$	0.05	0.08	0.10
n. ob.	88	88	88
$\sigma(x)$	0.070	0.085	0.103
$\sigma(\hat{x})$	0.047	0.042	0.043
$\sigma(x-\hat{x})$	0.052	0.074	0.093

Note: In parentheses, White's (1980) standard errors.

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