14108

Sept. 1992

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Household Saving in Developing Countries: First Cross-Country Evidence

Klaus Schmidt-Hebbel, Steven B. Webb, and Giancarlo Corsetti

Although most studies have relied on domestic or private sector saving data, this article uses household data available from the U.N. System of National Accounts for a sample of 10 countries. Household saving functions are estimated using combined time-series and cross-country observations in order to test households' responses to income and growth, rates of return, monetary wealth, foreign saving, and demographic variables. The results show that income and wealth variables affect saving strongly and in ways consistent with standard theories. Inflation and the interest rate do not show clear effects on saving, which is also consistent with their theoretical ambiguity. Foreign saving and monetary assets have strong negative effects on household saving, which suggests the importance of liquidity constraints and monetary wealth in developing countries.

Households are responsible for a substantial part of the saving in both industrial and developing countries. Accordingly, most economic models treat the motivation for saving from the household's perspective. Because of the shortage of household data, however, most empirical work on saving in developing countries has used only aggregate saving data, so that the results may not be useful for predicting household behavior.

This study tests several hypotheses about saving behavior using panel data from the U.N. System of National Accounts. This is the first study to use cross-country variation to estimate household saving behavior in developing countries and has the advantage that the data are defined consistently across countries. The study tests how household saving in developing countries responds to income and growth, rates of return, monetary wealth, foreign saving, and demographic variables.

Section I reviews the evidence in the empirical literature on the main determinants of saving in developing countries. Section II presents an empirical frame-

work for analyzing household saving in developing countries, discusses the data set and estimation methods, and presents results. Section III concludes with a discussion of policy implications.

I. Determinants of Saving in the Empirical Literature

A number of studies have estimated saving behavior in developing countries. (For general surveys, see Mikesell and Zinser 1973, Gersovitz 1988, and Deaton 1989.) Typically, studies use cross-section, time-series data on national saving rates; see for instance Collins (1989); Fry (1978, 1980, 1988); Giovannini (1983, 1985); and Gupta (1987). The advantage of using national saving rates is that more years of data are available for more countries. Even when private or household data are available, however, as in Collins (1989), they may have limited use because of lack of comparability across countries. The use of national saving is rationalized with the argument that private saving is a large and typically predominant part of total saving.

To extrapolate from total saving behavior to household saving behavior, however, requires the assumption that the latter is a perfect substitute for both private corporate saving and public sector saving. Assuming substitutability between private and public saving requires that Ricardian equivalence holds. If income and saving data for just the household sector are used, then household saving decisions are not necessarily assumed to offset saving decisions made elsewhere in the economy, unless households respond to determinants such as disposable income, public saving, or private wealth in a way consistent with the Ricardian hypothesis.

A few studies have used private sector saving or household consumption data, but none of the studies with aggregate data from developing countries has focused on household saving. Because data of this type are only gradually becoming available, the data sets vary widely from study to study. Rossi (1988) uses a cross-section, time-series data set for 49 countries covering 10 years. Saving is implicit because per capita private consumption is estimated as a function of per capita private income, among other things. Private income includes the profits of public as well as private enterprises, so that the implicit saving includes saving by public sector enterprises. Lahiri (1988) uses time-series data for private consumption to run separate regressions for 8 Asian countries with about 20 years of data for each. Several older studies, such as Singh (1975) and Williamson (1968), also used private saving data, but they investigated Keynesian theories of saving and overlooked many of the issues currently of interest. Despite differences in the data, most studies using private sector data produce consistent results on most of the major issues. The main determinants of private saving or consumption considered in the literature fall into five groups: income and wealth, public saving, rates of return, foreign saving, and demographic variables.

As discussed below, there is a broad consensus that faster economic growth

and high incomes contribute to higher saving rates. Evidence on the pervasiveness of liquidity constraints suggests that an increase in public saving is not neutralized by an offsetting decline in private saving. There is still controversy and lack of sufficient evidence about the effects of monetary asset holdings, foreign capital inflows, the real interest rate, and inflation, as well as demographic variables.

Income and Wealth

Income and wealth are the basic determinants of consumption. Most studies use per capita income levels or growth rates and total or financial wealth as the relevant income and wealth variables.

The level of per capita income is hypothesized to have a positive effect on the saving rate because richer people can afford the luxury of saving to assure their future consumption. The poor are more likely to be at their biological or social minimum level of current consumption. This does not mean zero saving by the poor in all years, for they will attempt to cushion themselves against fluctuations in current income. But they will have relatively smaller cushions and will more frequently find themselves with zero wealth and no opportunity to borrow in order to sustain consumption when income is low (Deaton 1989; Zeldes 1989). All of the empirical studies mentioned earlier find a strong positive effect—measured in various ways—of the current income level on the saving rate.

Saving may also depend on income fluctuations. Simple consumption-smoothing models predict that temporary fluctuations in income should primarily affect saving. If households are not credit constrained and the temporary fluctuation does not change much permanent income, consumption would respond only marginally to temporary income fluctuations. Households, particularly in developing countries, tend to be credit constrained, however, which would imply that consumption would respond significantly to temporary income changes. Campbell and Deaton (1989) also argue that, at least in industrial countries, a household's perception of its permanent income is strongly affected by current shocks, with no evident distinction made between current and permanent income flows. This implies that households will consume out of current shocks, saving much less out of shocks than predicted by consumption-smoothing models. Most empirical studies of developing countries have not looked closely at the effect of income fluctuations on saving. An exception is Gupta (1987), which consistently finds that saving responds significantly and positively to temporary income shocks.

The growth rate of income is also typically included in recent saving studies for developing countries, but its effect cannot be signed *a priori*. Intertemporal models of consumption or saving (that is, permanent income or life-cycle models) predict that an increase in the growth rate of an individual household's income would lower its saving rate; households would save less now if they expected higher incomes in the future, which would allow both higher consumption and higher saving in the future. Faster growth of average per capita (or

average household) income could also have positive effects on saving. More rapid income growth would raise the average household saving rate if the growth were concentrated in households with high saving rates, such as rich or middle-age households. Collins (1989) develops these concepts in a simple model. A positive coefficient for the growth rate could also reflect the slowness with which people change their consumption habits or indicate that people have regressive expectations about their level of income. The studies that investigate real growth of gross domestic product (GDP) as a determinant of saving—such as Collins (1989); Fry (1978, 1980); Giovannini (1983, 1985); Mason (1987, 1988); and Mason and others (1986)—find positive and usually significant effects on the saving rate.[1]

Wealth is usually a key determinant of consumption or saving in theoretical models of intertemporal optimization. Of course, permanent income can be viewed as the stream of income from total wealth, but a narrower definition of wealth would be the assets that can be exchanged for current consumption. Theory unambiguously predicts that greater wealth would reduce saving out of current income. Since most concepts of wealth are not directly observable, wealth has not been used in most empirical studies of saving in developing countries. Schmidt-Hebbel (1987) uses five alternative measures of total wealth in an empirical intertemporal consumption model for Chile, based on different assumptions regarding expectation formation. Behrman and Sussangkarn (1989) use household-level data on wealth and saving in Thailand. In both studies, wealth has a strong negative effect on saving.

Monetary or financial assets also lessen a household's dependence on current income sources when income declines temporarily, because consumers can draw on the assets to maintain their consumption levels. Hence, holding a higher stock of assets allows a household to maintain a higher consumption rate on average, thus depressing the saving rate. In addition, monetary asset holdings are an important component of total consumer wealth. This implies that monetary holdings have a second, negative influence on saving rates; previous studies have not tested for this.

Government Deficits and Government Saving

Fiscal stabilization programs aim to lower public sector deficits or raise public saving, which is equal to public investment minus the deficit. Changes in government deficits or government saving may change households' perceived permanent income and therefore affect private saving rates. A voluminous empirical literature has been devoted to the Ricardian equivalence proposition as reformu-

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1. There might be some simultaneity bias—both high saving and high growth reflecting the effect of good investment opportunities, which are not fully reflected in the real deposit interest rates. Also, with the public sector included in aggregate saving, one would expect revenues to adjust more automatically to income increases than current expenditures. Furthermore, government investment (which counts as saving) might be driving both faster growth and higher aggregate saving.

lated by Barro (1974), which states that public debt issues are macro-economically indistinguishable from tax increases, and hence a change in public saving should be offset by an equal and opposite change in private saving.

For Ricardian equivalence to hold, the following conditions must be satisfied jointly: no liquidity constraints; equal discount rates for the public and private sectors; and certainty of future income, tax, and public expenditure flows. For a further discussion of these conditions and surveys of empirical studies, see Hayashi (1985), Hubbard and Judd (1986), Bernheim (1987), and Leiderman and Blejer (1988). Ricardian equivalence has been widely rejected in empirical studies of industrial countries. The pervasiveness of borrowing constraints is most often cited as the main reason for its rejection. For a sample of developing countries, Haque and Montiel (1989) also find that borrowing constraints are the main cause of the deviations from Ricardian equivalence. They also test for differences between public and private discount rates but do not find that such differences explain the deviations from Ricardian equivalence. Credit constraints, proxied by current income levels or financial asset holdings, are also major determinants of private saving in the cross-developing-country study by Rossi (1988). Corbo and Schmidt-Hebbel (1991) explicitly test the Ricardian hypotheses by regressing private consumption on permanent government saving in 13 developing countries. They conclude that the Ricardian hypothesis does not explain consumption behavior. Because it implies that private and public saving are not perfect substitutes, empirical rejection of Ricardian equivalence is a powerful argument in favor of using household saving data instead of aggregate saving data.

Rates of Return

Because the income and substitution effects of higher interest rates work in opposite directions, the effect of rates of return on saving cannot be predicted. In addition to the well-known income and substitution effects, rates of return also affect saving through a wealth effect. A higher real interest rate reduces the present value of future income streams from human capital or fixed-interest financial assets. Consumption is therefore depressed even if the substitution and income effects cancel each other. Economists have heatedly debated the interpretation of the empirical evidence. Based on noneconometric country studies, McKinnon (1973) and Shaw (1973) argued that the rate of return on saving, as measured by the real interest rate, would have a positive effect on saving rates. This view was also held by Balassa (1990) in his survey on the issue. Fry (1978, 1980) found statistical evidence to support this contention, although he conceded that the magnitude of the effect is small (Fry 1988). Thus, only large changes in real interest rates would be economically important. Giovannini (1983, 1985) revisited Fry's earlier work and found that two observations (on the Republic of Korea in 1967 and 1968) accounted for the entire result. With an expanded data set, Giovannini found that the interest rate did not signifi-

cantly affect saving. Both Fry and Giovannini used aggregate data, which is especially problematic for testing the effects of interest rates. Giovannini (1985) implicitly recognizes this; he points out that much of the increase of Korean saving in the late 1960s resulted from an increase in government saving. Gupta (1987) finds some support for a positive effect of interest rates on saving in Asia, but not in Latin America. Schmidt-Hebbel (1987) and Arrau (1989) estimate intertemporal consumption substitution elasticities for Southern Cone countries and find values close to 1.0. With an elasticity of 1.0 and for given wealth stocks, consumption is insensitive to the interest rate because the substitution effect is canceled by the income effect.

Even if higher real interest rates are unlikely to raise private saving and hence total private wealth, they can substantially alter the portfolio composition of private wealth. Negative real interest rates on deposits (resulting from high inflation), for example, cause substitution into real assets, especially consumer durables, and into foreign currency assets through capital flight. Both higher purchases of durables and capital flight tend to reduce private saving as measured by official national accounts, without affecting private saving defined as total private wealth accumulation.

Inflation may affect saving independently from its effect through the real interest rate. High inflation often contributes to stagnation in output or outright recession, which will be reflected in the income variable. Higher inflation also increases economic instability and uncertainty about future rates of return on real assets and income levels. Theoretically, the effect of inflation on private saving is ambiguous, as uncertainty about future asset values could either discourage saving because of the substitution effect of the lower real rate of return or encourage saving for precautionary motives. Similarly, the increase in uncertainty of future income streams affects private saving ambiguously, depending on the form of the underlying utility function. A comprehensive treatment of the effects of different sources of uncertainty on saving can be found in Gersovitz (1988).

Gupta (1987) and Lahiri (1988) include the expected and unexpected components of the inflation rate as separate determinants of saving, and Gupta also includes the nominal interest rate. Gupta's results differ sharply by region. In Asia both expected and unexpected inflation have positive and significant coefficients. In Latin America neither coefficient was significant with the preferred estimation technique. In Lahiri's sample, comprised only of Asian countries, the signs on both inflation variables are mixed for the eight separate country regressions. Therefore, there is no clear empirical evidence that inflation generally affects saving in developing countries.

Foreign Saving

If access to foreign borrowing at international interest rates is unlimited, foreign saving passively fills the gap between domestic investment and national saving. In this case, foreign saving (or borrowing from abroad) is simply the

result of national saving decisions and not one of its determinants. If foreign borrowing is rationed, however, either by the lenders or by government regulation in developing countries, then domestic savers (and investors) are constrained in their intertemporal choices by the amount of available foreign finance, and foreign saving becomes a determinant of domestic saving.

During most of the post–World War II period, developing countries have not had unrestricted access to private commercial lending, a partial exception being the period from 1976 to 1981, before the debt crisis erupted. Even during that short time, governments in developing countries restricted access to foreign borrowing. When restrictions were partially lifted, governments and corporations typically made use of their freer access to foreign borrowing to increase investment, but households were the last and least likely sector to have unlimited access to sources of foreign loans. Hence, even during 1976–81, households were effectively constrained by foreign lending: for given income levels, a fraction of total foreign lending finances higher private consumption, hence reducing household saving.

A number of empirical studies have included foreign saving as a determinant of domestic saving rates. Fry (1978, 1980) and Giovannini (1985) find the effect of foreign saving is significant and negative, although its size is small. With a noneconometric analysis, Chenery and Strout (1966) also find a negative initial impact of capital inflows on domestic saving, although the secondary effects on capacity growth tend to increase saving. Giovannini (1983) finds coefficients on foreign saving to have mixed signs and to be insignificant. Gupta (1987) finds positive coefficients on foreign saving, which are significant for Latin America but not for Asia. The results of these studies seem to depend on the sample and model specification. All of the studies with foreign saving as an explanatory variable used total saving as the dependent variable, so the results may reflect the extent to which capital inflows went straight to public and corporate investment, which appears as an increase in saving.

Demographic Variables

The life-cycle models of saving imply that demographic variables should affect saving rates, and demographic influences on saving have been widely researched (Collins 1989; Leff 1969; Mason 1987, 1988; Mason and others 1986; Rossi 1989; Webb and Zia 1990; see Hammer 1986 for a survey). The dependency ratio—those under age 15 or over 65 as a share of total population—is the most commonly used explanatory variable. In the life-cycle model, older people work less and consume out of their savings. Households with more children at home may also save less because saving for retirement would be deferred until the children left home, which would raise the per capita income of the household, or because parents would expect old-age support from their children. Thus, one would expect saving rates to depend negatively on the dependency ratio.

Early work on the topic, especially that of Leff (1969), found that the dependency ratio had a strong negative effect on saving. Subsequent studies challenged

the robustness of this result and have examined both the theory and the measurement of demographic variables more carefully (Mason and others 1986; Mason 1987, 1988). The results seem to depend on the data used and on the other explanatory variables included. The models of Mason and others (1986) and Collins (1989), applied to cross-country samples of Asian economies, add to the dependency ratio and the growth rate of per capita income (among other variables) an interaction term between the two. Although Mason and others find that higher population dependency lowers saving unambiguously, Collins's results show an ambiguous effect of the dependency ratio, with a negative (positive) influence on saving in countries with high (low) growth rates.

II. New Evidence on Household Saving

To test for the determinants of saving with household data, a behavioral function for household saving was estimated. The function incorporates variables to address the major unresolved issues in the literature. The saving rate (the ratio of household saving to private disposable income), rather than the absolute level of saving, is used as the dependent variable for three reasons. First, there is no adequate deflator for saving that can be used to obtain constant-price saving series. Second, by using ratios instead of levels, cross-country comparisons can be made without having to choose appropriate exchange rates. Third, saving rates tend to be stationary, whereas absolute saving flows grow over time, so that, by using rates, spurious correlation with time-trended explanation variables can be minimized.

The specification for the household saving rate is consistent with the consumption hypotheses reviewed in the previous section but is not derived from an explicit optimizing framework. The reason for the latter is the difficulty of deriving a closed-form saving equation with the host of economic and structural determinants considered in this study. Hence the following general saving function is implemented in a linear form:

$$(1) \quad \frac{S}{I} = \frac{S}{I} \left[\text{LITP}, \text{GITP}, (\text{LIP} - \text{LITP}), \frac{\text{HT}}{I}, R, \text{INF}, \frac{\text{MQM}}{I^*}, \frac{\text{FS}}{I}, \text{DEP}, \text{URB} \right]$$
$$ (+) \quad (+) \qquad (+) \qquad (?) \quad (?) \quad (?) \quad (-) \quad (-) \quad (?) \quad (?)$$

where S is household saving, I is household disposable income, LITP is the natural logarithm of trend per capita household disposable income, GITP is the growth rate of trend per capita household disposable income, LIP is the natural logarithm of per capita household disposable income, HT is transfers to households, R is the real interest rate, INF is the inflation rate, MQM is money plus quasi-money at the end of the previous period, I^* is the average of household disposable income in the current and previous years, FS is foreign saving, DEP is the dependency ratio, and URB is the urbanization rate. Signs below the variables indicate the expected coefficient signs, given the discussion of the preceding section. Equation 1 generalizes the saving functions estimated for developing countries in the recent empirical literature by including explanatory variables

from each of the five main groups: four income determinants, two rates of return, broad money, foreign saving, and two demographic variables.

The first three income variables are the natural logarithm of trend per capita private disposable income, its growth rate, and the deviation of log current from log trend per capita private disposable income. Unlike previous studies, both the trend and the deviation of current from trend per capita income are introduced as saving determinants in order to discriminate between the permanent and cyclical influences of income on the saving rate. Because the sum of log trend income and the deviation of log current from log trend income equals log current income, we can test the proposition, implicitly assumed in some earlier studies, that the coefficients on the two components of income are the same. Growth of per capita trend income enters as a separate, third determinant. Finally, in order to test whether saving out of transfers differs from saving out of other income, transfers to households is included. Since transfers are already counted as part of total household income, the coefficient on transfers would be zero if consumption out of that income were the same as that out of other income. A significant negative coefficient would indicate that households saved less out of transfers than out of other income.

Domestic real interest and inflation rates, both with ambiguous signs, could affect intertemporal consumption and portfolio composition decisions, with consequences for household saving. Monetary wealth (which reflects both consumer wealth and liquidity constraints) and foreign saving should depress household saving rates. Finally, the two demographic variables have ambiguous signs. Although the dependency ratio should reduce saving due to life-cycle patterns, its net influence on saving seems to depend on its measurement and the inclusion of other variables. The urbanization variable was added to control for the effect of differences in the measurement of urban and rural saving, as well as for structural differences in the underlying saving behavior of urban and rural households.

In estimating equation 1, simultaneity biases could arise from the potential endogeneity of some explanatory variables. For this study the potentially most important simultaneity is between household saving and the real interest rate, which will be addressed by instrumenting the latter variable. The responsiveness of foreign saving to household saving appears to be minimal in the sample of developing countries used, for the reasons discussed in section I. Also, household saving does not appear to have important contemporaneous effects on household income, because even the effects on GDP, from which household income derives, are dominated by other influences. Hence neither foreign saving nor household income will be instrumented.

Data

The data set is especially well suited for investigating household saving behavior. It is based on household saving and disposable income series for 10 economies for which at least 7 and as many as 13 consecutive annual observations were available during 1970–85. The economies are Botswana, Colombia, Ecu-

ador, Honduras, Republic of Korea, Philippines, Paraguay, Thailand, South Africa, and Taiwan. Except for Taiwan, the data come from the U.N. System of National Accounts, which breaks down income and consumption into general government, corporate, and household sectors. From these, household disposable income, household saving, and transfers from the general government to households were calculated. The data for Taiwan come from the *Statistical Yearbook of the Republic of China*, compiled by the Taiwanese government using the U.N. method. All household data (saving, disposable income, and transfers) are aggregate data obtained from national accounts sources, not microeconomic data from household surveys. Interest rates come from a data set developed by the Country Economics Department of the World Bank. The remaining data (inflation, urban population share, dependency ratio, current account balance, and money balances) are from the International Monetary Fund's *International Financial Statistics* and *Government Financial Statistics* and the World Bank Economic and Social Database.

Household disposable income includes all current receipts by households, less taxes and social security contributions. One potential problem is that excluding the retained earnings of (private) corporations owned by households may distort the picture of household decisionmaking. The household sector does include all agricultural firms and firms in the informal nonagriculture sector. Excluding the income of private corporations will not affect the results as long as most of the variation of household income and saving is accounted for by households that would not consider the corporate income and saving as part of their own budget and would not make household saving decisions to offset corporate sector decisions. Another potential problem is that in the System of National Accounts net saving is defined as the difference between current receipts and current outlays and is therefore a balancing item. Hence measurement errors in receipts and current outlays are reflected in measured saving. As long as these errors are systematic and stable over time for each country, they are completely accounted for by the use of country-specific intercepts in the empirical model introduced below.

To calculate the three income variables, the log of household disposable income was regressed on a time trend using five-year overlapping data series, up to and including the current year. The estimated value for the current year gives the trend value of current income, the coefficient for time is the trend rate of growth, and the deviation from the estimated value in the current year is the temporary fluctuation in income. This simple deterministic time trend method was used instead of more sophisticated time-series procedures because of lack of data. Although one should view the results with caution, this method avoids some of the pitfalls of using simple moving averages. To obtain results for the first sample observations for each country, household income for the four years before the start of the sample was estimated using the growth rate of GDP in each year. Transfer income includes social security, unemployment insurance, and transfers from abroad; it does not include indirect transfers such as farm price supports or subsidies that permit food to be sold at below-market prices.

The nominal interest rate is the annual rate on three-month time deposits. The inflation rate is the annual (December-to-December) change in the log of the household consumption deflator. The sample includes countries with low to medium inflation, with annual average inflation rates ranging from 7 percent in Honduras to 23 percent in Colombia. Household income, which includes net nominal interest income, is therefore only slightly distorted by including the inflationary component of interest income. Data to correct for this bias are not available for the sample of countries used. The real interest rate is calculated as: $R = [(1 + \text{NOI})/(1 + \text{INF})] - 1$, where R and INF were introduced in equation 1 above and NOI is the nominal interest rate. Money and quasi-money holdings at the end of the previous period were used as a measure of liquid wealth available for consumption in the current period. To obtain its value as a share of income, the sum of money and quasi-money holdings was divided by the geometric average of nominal disposable income in the current and previous years, which is an adequate measure for low- to medium-inflation countries. Foreign saving is the current account balance, again as a share of household disposable income.

The two demographic variables, the dependency and urbanization rates, change little for each country during the observation period and in many cases are not known on an annual basis. Because both variables vary widely across countries but little over time, collinearity between country dummies and these variables is unavoidable. The dependency ratio is the population below 15 years and above 65 years as a percentage of total population. The urbanization rate is the share of population in cities, originally put together by the United Nations; the population cutoff for an area to be designated as a city varies from country to country.

Estimation Methods

The base specification is a fixed effect model of the form:

$$(2) \qquad Y_{it} = \beta_0 + \sum_{i=2}^{N} \gamma_i W_{it} + \sum_{k=1}^{K} \beta_k X_{kit} + \epsilon_{it}$$

where the subscript i refers to countries, t refers to time, and k refers to independent variables. Y_{it} is the vector of saving rates, W_{it} is the vector of country dummy variables (such that W_{it} is equal to 1 for the ith country, and 0 otherwise), X_{kit} is the matrix of independent variables, and ϵ_{it} is the vector of errors, which are assumed to satisfy the assumptions of the classical normal linear model.

This basic model incorporates fixed country-specific effects in the intercept term. In fixed-effects models, the empirical results are conditional on the particular sample used in the estimation. Alternative estimators, such as the error-components (or random-effect) model, treat the available observations as a random sample from a population. Given the small number of countries included here and the marked differences in their economic features, the fixed-effect estimator seems to be an appropriate choice.

Table 1. *Determinants of Household Saving, with Household Sector Saving as a Percentage of Household Disposable Income as Dependent Variable*

	Independent variable										
Estimation technique	Trend income (log)	Income growth rate (five-year average)	Deviation of income from trend (log)	Transfers to households (ratio to income)	Real interest rate	Inflation rate	Beginning of period money and quasi-money (ratio to income)	Foreign saving (ratio to income)	Dependency ratio	Urban population ratio	Adjusted R^2
1. OLS[a]	0.03 (1.4)	0.75 (6.2)	0.12 (0.8)	−0.32 (−1.7)	−0.10 (−0.8)	−0.06 (−0.6)	−0.03 (−1.0)	−0.23 (−4.3)	−0.48 (−3.2)	−0.001 (−2.1)	0.646
2. Fixed effect	0.26 (5.4)	0.54 (4.2)	0.30 (2.5)	−0.40 (−2.1)	−0.08 (−0.7)	−0.14 (−1.5)	−0.19 (−3.1)	−0.14 (−2.8)	0.83 (2.5)	0.0001 (0.1)	0.811
3. Random effect[b]	0.04 (1.6)	0.70 (5.8)	0.19 (1.3)	−0.38 (−1.9)	−0.13 (−1.1)	−0.13 (−1.2)	−0.06 (−1.7)	−0.18 (−3.4)	−0.54 (−3.1)	−0.001 (−1.6)	0.703
4. Fixed effect with instrumental variables	0.25 (4.6)	0.51 (3.5)	0.27 (2.0)	−0.42 (−2.1)	−0.19 (−0.7)	−0.23 (−1.0)	−0.18 (−3.0)	−0.12 (−2.2)	0.75 (2.0)	0.0004 (0.2)	0.809
5. Fixed effect with instrumental variables[c]	0.22 (3.1)	0.56 (3.9)	0.26 (1.8)	−0.19 (−0.7)	−0.15 (−0.5)	n.a. n.a.	−0.16 (−2.3)	−0.14 (−2.7)	0.56 (1.0)	−0.0004 (−0.2)	0.765
6. Fixed effect[d]	0.26 (5.7)	0.56 (4.4)	0.31 (2.8)	−0.38 (−2.0)	n.a. n.a.	−0.08 (−1.9)	−0.18 (−3.2)	−0.14 (−3.1)	0.87 (2.7)	−0.0001 (−0.04)	0.812

n.a. Not applicable.

Note: *t*-statistics are in parentheses.

a. Breusch-Pagan test for the null hypothesis of the absence of individual effects in the errors: $x_1^2 = 15.99$ (*P*-value = 0.00006).

b. Hausman specification test for the null hypothesis of random-effect estimators equal to fixed-effect estimators: $x_1^2 = 28.4$ (*P*-value = 0.002).

c. Inflation rate is omitted variable.

d. Real interest rate is omitted variable.

Source: Authors' calculations.

This choice has also been verified by the usual set of specification tests. (For a detailed description of these tests, see Kmenta 1986 and Hsiao 1986.) The test results are reported in table 1. The first of these is the Breusch-Pagan test for the presence of both individual (cross-section) and time effects in the residuals of a simple ordinary least squares (OLS) regression on pooled data. The OLS specification was rejected, which implies that either the fixed effects model or the random effects model is superior. The second test applied is the Hausman specification test, which compares fixed-effect and random-effect estimators. Random-effect estimators are efficient but are consistent only in the absence of correlation between the included regressors and the errors. Fixed-effect estimators are not efficient but are still consistent even when the regressors and errors are correlated. The random effects estimates were found to be inconsistent, implying that a fixed-effects specification is superior. Finally, regression *t*-tests for the presence of trend- and time-specific effects showed such effects were never significant in any of the models specified here.

An important caveat to the results below is that the number of cross-sectional units considered in the estimation is small, which is problematic because the properties of panel data estimators are based on asymptotic results for a large number of cross-sectional units. This problem could not be avoided because the construction of a data set useful for testing household saving behavior limits the sample to only those countries for which disaggregated data on saving are available over a sufficiently long period. Its implication is that the empirical results reported below could change in the future when more household data at the country level become available.

Results

Table 1 summarizes the regression results with different estimation methods and with different sets of regressors. Four estimation techniques were used: OLS, country-specific fixed effects, country-specific random effects, and fixed effects instrumental variables to instrument the real interest rate. It was expected that the country-specific, fixed-effects method—with or without instrumental variables—would be best, and the results in table 1 confirm this.

Instrumental variable estimation corrects for the possible simultaneity bias stemming from the interaction between saving and domestic real interest rates. LIBOR, corrected for world inflation, was used as the instrument for the domestic real interest rate. Other sets of instrumental variables, such as the lagged independent variables, were also tried but did not improve upon the reported results. Regression 4 in table 1—fixed-effects estimation with instrumentalization of the real interest rate—thus constitutes the primary set of results.

The estimated regressions fit the data well, as can be seen in the adjusted R^2 coefficients. Starting at 0.65 for the OLS estimation, the adjusted R^2 increases to 0.81 under fixed-effects estimation. This overall fit compares favorably with other panel data estimations of saving functions in developing countries, such as Corbo and Schmidt-Hebbel (1991), which explain roughly half of the variation of the dependent variable.

The income variables all have a positive effect on saving rates, which accords with most of the previous studies for developing countries. The growth rate of trend per capita disposable income has a strong effect on the household saving rate in the sample countries: a 1 percentage point increase in per capita income growth raises the household saving rate by about 0.5 percentage points. An increase in the growth of per capita income seems the best way to raise the private saving rate, which suggests the presence of a virtuous circle between growth and saving.

The deviation of income from its trend level has a positive influence on the saving rate. Its coefficient is in the neighborhood of 0.30, however, which is much lower than that predicted by the permanent income theory. Given the saving function in equation 1, it is easy to show that this coefficient is equal to the difference between the average and marginal propensities to consume out of current (transitory) income. Only if the estimated value of this coefficient were close to 0.75, which is the average propensity to consume out of current income in the sample, would the marginal propensity be close to zero, as predicted by the permanent income hypothesis. This effect of transitory income on consumption reflects the importance of borrowing constraints faced by households or their use of current income in estimating permanent income levels.

The dominance of transitory over trend (permanent) income in determining household consumption is confirmed by the coefficient of the log of the level of per capita trend disposable income. Although it is highly significant, one cannot reject the hypothesis that it is identical to the estimated coefficient of the deviation of current from trend income. According to the permanent income hypothesis, the marginal propensity to save out of permanent income should be close to -1. For the saving equation specified here, this would require that the coefficient of trend income should be equal to the difference between the coefficient of the deviation of current from trend income and 1—a far cry from the actual results. This implies that, for the present sample, trend income could be omitted as a determinant of household saving, using instead just current income rather than decomposing income into its trend and fluctuation. With regard to the last income variable, the coefficient on transfers is negative and usually large and significant, thus indicating that households consume more out of transfers on average than out of other sources of disposable income.

The domestic real interest rate has a small, mostly negative, and not significant influence on household saving rates. This result, confirming many recent studies that show a negligible role of interest rates in determining consumption or saving, reflects either that income and substitution effects offset each other or that liquidity constraints weaken the effects of intertemporal relative prices on intertemporal consumption choices. The important role of liquidity constraints in our sample is corroborated by the significance of current income, monetary wealth, and foreign saving in affecting household consumption and saving.

Inflation has a negative but statistically not significant effect on saving. Because of collinearity between the real interest rate and the inflation rate, these

variables were entered alternately, as reported in regressions 5 and 6. The inflation rate is significant at about the 10 percent level when the real interest rate is excluded, and its coefficient is negative. Omitting inflation, however, does not make the effect of the real interest rate significant. In other words, reducing inflation seems to encourage household saving, but raising the deposit rate relative to inflation has no discernible effect on saving.

Monetary assets play a dual role here: first, they constitute a stock variable signaling the extent of domestic liquidity constraints; second, they are related to household financial wealth. For both reasons monetary stocks were expected to have a negative influence on saving. The results show a negative and significant coefficient for the ratio of money to income in the fixed-effect estimations. Foreign saving, which acts as an external liquidity constraint, boosts private consumption, as shown by its significantly negative influence on saving.

Because of the lack of variation in the demographic variables over time and because the fixed-effect estimation technique does consider cross-country variation only in its country dummies, one should not attach much significance to the coefficients on the demographic variables. The urbanization rate has no discernible effect on saving under fixed-effect estimation, probably because of the collinearity between this variable and the country dummies. With OLS and random-effect estimation, the urbanization rate exerts a small negative and barely significant effect on household saving, which indicates a weak difference between urban and rural behavior that is consistent with higher consumption opportunities in cities. The dependency ratio has widely varying effects depending on the estimation technique. An interaction term between income growth and the dependency ratio was included, in the spirit of Mason and others (1986) and Collins (1989), but was found to be insignificant.

III. Conclusions and Policy Implications

The surprisingly strong results of this study, considering the small number of countries sampled, verify the value of using household data. These results should, of course, be reevaluated with a larger sample when more data become available. The empirical findings of this study confirm the central role of income and wealth in determining household saving in developing countries. Households save a larger share of their income when that income is higher and when it is growing faster. They save less the greater is their monetary wealth (compared with other forms of wealth). Borrowing constraints are also major determinants of household saving: in addition to domestic liquidity constraints (affected by current income and monetary wealth), consumers seem to face foreign liquidity constraints on the use of foreign saving. Real interest rates do not encourage saving in the countries investigated here. This may be because the substitution and income effects of higher real interest rates offset each other or because intertemporal consumption decisions are limited by liquidity constraints. As is often expected, the effect of inflation on saving is negative. This effect is at best

marginally statistically significant, however, which may result from the lack of high-inflation countries in the sample.

Table 2 summarizes the empirical results by calculating the changes in significant variables required to raise the household saving rate by one percentage point, based on the fixed-effect instrumental variables regression (equation 4 in table 1). Raising the household saving rate 1 percentage point, for example, would require an increase of 2.0 percentage points in the trend growth rate of per capita disposable income. Because the business cycle has a relatively small influence on the saving rate, a high (3.7 percentage point) increase in the ratio of current to trend disposable income is required to achieve a 1 percentage point rise in the saving rate.

Public policies can affect national saving either directly, by aiming fiscal policies at changing public sector saving, or indirectly, by inducing changes in variables that affect private saving. Although other studies have focused on the effectiveness of the first types of policies (see Corbo and Schmidt-Hebbel 1991), the results of this study may be used to derive implications for the effectiveness of indirect policies in raising household saving.

Successful stabilization policies reduce public sector deficits and hence domestic financing requirements of deficits, which lowers domestic real interest rates and inflation. Although the change in real interest rates itself has no significant effect on household saving, price stabilization could raise saving, possibly due to the reversion of past flight into consumer durables when inflation was high. A cyclical downturn caused by the stabilization measures, however, reduces household saving as long as the temporary income decline lasts.

Financial liberalization lifts interest rate controls, relaxes credit constraints, and deregulates domestic financial intermediation. Frequently this results in increased domestic real interest rates and increased monetary or financial wealth. Although the former has no discernible effect on household saving, financial deepening could depress saving as monetary wealth is raised. As shown in table 2, a 5.6 percentage point rise in the ratio of money to income would depress the saving rate by 1 percentage point. If the buildup of monetary wealth comes mostly from a portfolio substitution away from consumer durables, however, household saving could rise. It may be concluded that financial liberalization has no clear effect on household saving.

Table 2. *Changes in Saving Determinants Required to Raise Saving Rate by 1 Percentage Point*

Percentage change in the level of trend per capita disposable income	4.0
Percentage point change in the trend growth rate of per capita disposable income	2.0
Percentage point change in the ratio of current per capita disposable income to the trend level	3.7
Percentage point change in the ratio of household transfers to private disposable income	−2.4
Percentage point change in the ratio of monetary assets to private disposable income	−5.6
Percentage point change in the ratio of foreign saving to private disposable income	−8.3

Source: Authors' calculations.

Foreign capital inflows tend to reduce household saving in the short run; a fraction of each additional dollar of foreign borrowing finances private consumption. A rise in the ratio of foreign saving to income of 8.3 percentage points will result in a fall in household saving of 1 percentage point. The long-run effect of increased foreign lending on household saving is very likely positive, however, once the income growth from the investment financed by foreign lending is realized.

Successful structural adjustment and growth policies are the most effective ways to raise household saving. Reforming the incentive structure in developing countries to spur growth will feed back into higher household and, hence, national saving, thus allowing for even more economic growth. Structural reforms that move an economy beyond its initial conditions of low resource mobilization and income growth give rise to a virtuous cycle of mutually reinforcing saving and growth efforts.

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