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Household Saving in Developing Countries

First Cross-Country Evidence

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Steven B. Webb
and
Giancarlo Corsetti

Disposable household income is the major factor affecting the savings rate. Households save more of their income when that income is higher and when it is growing faster. They save less when they start the period with greater liquid wealth.

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This paper — a product of the Macroeconomic Adjustment and Growth Division, Country Economics Department — is part of a larger effort in PRE to study the macroeconomic determinants of growth in developing countries. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Emily Khine, room N11-069, extension 39361 (26 pages).

Schmidt-Hebbel, Webb, and Corsetti use time-series household data from 10 developing countries for which at least eight consecutive years of data exist, to test several hypotheses about saving behavior.

The surprisingly strong results of this study — considering the few countries in the sample — verify the value of using household data, but results should be checked with a larger sample when more data become available.

The authors test how household saving in developing countries responds to: the level of disposable per capita income; the growth rate of disposable income and its deviation from trend; real liquid wealth at the start of the period; the real interest rate; the inflation rate; foreign saving, government transfers to households; and some demographic variables. The results suggest the following:

- Income and wealth explain most of the variation in household savings rates. Households save more of their income when that income is higher and when it is growing faster.

- They save less when they start the period with greater liquid wealth, although wealth reduces saving less than one-for-one. (A one-percentage-point increase in the money supply as a share of income reduces the saving rate an average of one-fifth of a percentage point.)

- Real interest rates do not encourage saving in the countries in this sample. This is particularly true when one controls for liquid wealth. Households with substantial wealth are likely to reduce their saving rate in response to higher interest rates because in their case the substitution effect of higher interest rates is dominated by the wealth effect.

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by
Klaus Schmidt-Hebbel
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and
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1. INTRODUCTION

Households do a substantial part of the saving in most economies, in both industrialized and developing countries. Most economic models treat the motivation for saving from the household's perspective. The shortage of household sector data, however, has meant that most empirical work on saving in developing countries has used only total saving data, leaving one unsure of whether the results actually reflect household behavior. Extrapolating from total saving to household saving requires assuming that it is substitutable roughly one-to-one with saving by both the private corporate sector and the public sector. The latter substitution assumes implicitly that Ricardian equivalence holds between private and public saving. Using income and saving data for just the household sector, on the other hand, assumes that household saving decisions are not offset by saving decisions made elsewhere in the economy, except as they are reflected in current variables such as the interest rate and disposable income.

This study uses time-series of household data from eleven developing countries to test several hypotheses about saving behavior. Besides just widening the scope of information being used to test the hypotheses, the data set in this study has the advantage of a consistent definition across countries. With these data we test how household saving in developing countries responds to the level of per capita disposable income, the rate of growth of disposable income and its deviation from trend, real liquid wealth at the start of the period, the real interest rate, the inflation rate, foreign saving, government transfers to households, and some demographic variables. Our 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 wealth have strong negative effects on household saving, indicating the importance of liquidity constraints in developing countries.

2. DETERMINANTS OF SAVING IN THE EMPIRICAL LITERATURE

A number of studies have looked at the empirical evidence on saving from developing countries.[1] Before delving into an issue-by-issue discussion of the literature, it is useful to note the types of data used in each, because differences in the results usually derive from difference in the data sets.

Typical 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).[2] The advantage of this procedure is that more years of data are available for more countries, and it is rationalized with the argument that private saving is a large and typically predominant part of total saving. The problem with this argument is that from an econometric viewpoint what matters is the relative variances, weighted by each sector's share, and not the absolute magnitudes, and the weighted variance of public sector saving might easily be larger than the variance of private sector saving. Of course, the drawback of using aggregate data is that public sector saving may respond very differently from private sector saving.[3] Consequently, the response of public-sector saving could mask the response of private-sector saving. Furthermore, it is possible that changes in public saving, as a result of policy shifts, could cause changes in variables like the real interest rate, and at the same time the shift in public saving would overshadow the effect of the interest rate on household saving. Among these studies, there are variations in the form of the saving or consumption

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[1] For general surveys, see Mikesell and Zinser (1973), Gersovitz (1989), and Deaton (1990).

[2] Collins (1989) has private or household sector data for some countries, which she discusses but does not use in the regressions for lack of comparability.

[3] It is theoretically possible that the private sector behaves in the aggregate as if public sector saving (and dissaving) were having a one-for-one direct effect on private wealth because of implicit future changes in taxes. In that case private sector saving would only be a residual necessary to make national saving match the desires of the households. This is a generalized version of the Barro-Ricardo equivalence argument. Empirical evidence strongly rejects this hypothesis for industrial and developing countries. For the latter, see Montiel and Hayne (1987) and Corbo and Schmidt-Hebbel (1990).

functions, including the list of explanatory variables, and in the time and country coverage of the data. Although these variations often seem marginal, some of them affect the results substantially.

A few studies have used private sector saving or household consumption data -- none of the studies with aggregate data from developing countries has focused on household saving, or the combination of household consumption and income, from which it is derived. For each country, typically only one disaggregation is available, at best, and so the relevant question is not which is better but rather how to interpret what emerges with each. Because the 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 since his dependent variable is per capita private consumption, as a function of per capita private income, among other things.[4] 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.[5] Despite the differences in the data, the results on most of the major issues are consistent across the studies with private sector data.

The main saving or consumption determinants considered by the literature fall into four groups: income and wealth, rate of return, foreign saving, and demographic variables.

Income and Wealth.

Most studies include the level of per capita income as an explanatory variable for the saving rate. Income is hypothesized to have a positive effect on the saving rate -- rich people save more -- because they can afford

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[4] Rossi's data is somewhat flawed in that private income includes the profits of public as well as private enterprises. Thus the implicit saving includes saving by public-sector enterprises.

[5] Several older studies -- Singh (1972) and Williamson (1968) -- also used private saving data (from the 1950s and 1970s), but their theories were traditional Keynesian, which overlook many of the issues currently of interest.

the luxury of doing more 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 also wish to cushion themselves against fluctuating 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 smooth consumption in a year of low income (Deaton, 1989; Zeldes, 1989). All the studies mentioned in the previous section find a strong positive effect of the current income level on the saving rate.[6]

The growth rate of income is also a typical variable in recent saving studies for developing countries. Intertemporal optimizing (i.e., permanent income or life-cycle) models of consumption or saving predict that faster growth of an individual household's income would lower its saving rate, because people would save less now if they knew that higher incomes in the future would let them have both higher consumption and higher saving in the future. Faster growth of average per capita (or average household) income could have positive effects on saving in an intertemporal optimizing model, however, depending on how the faster income grow is distributed across households of different generations and on what is the relative size of the household-age cohorts. For instance, if rapid income growth is relatively concentrated in household cohorts at an age when they save for old age, it would raise the average household saving rate. Collins (1989) develops these concepts in a simple model. Other, ad hoc stories can also predict a positive coefficient for the growth rate. For instance, people change their consumption habits slowly; or people have regressive expectations about the level of income. The studies that enter real GDP growth, like Collins (1988), Fry (1978, 1980), Giovannini (1983, 1985), and Mason (1986, 1988), find

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[6] Rossi (1988) has first differences of consumption on the left side, and current income minus past consumption on the left, so the absolute level of income does not enter explicitly and is implicit assumed not to matter in each regression. This makes sense because he groups his countries by region, which controls for income level, and also puts in country dummies. Singh (1972) uses the inverses of the square root and the fourth root of the per capita level, to test hypotheses about average and marginal propensities to save.

positive and usually significant effects on the saving rate.[7]

Consumption-smoothing models in their simple forms predict that temporary fluctuations in income should go into saving. If households are not credit constrained and the temporary fluctuation does not affect the perception of permanent income, consumption would not change at all in response to temporary fluctuations, and most of it would be saved. Households tend to be credit constrained, however, particularly in developing countries. In addition, Campbell and Deaton (1989) argue that, at least in industrial countries, perceived permanent income is driven by current shocks, with no distinction between current and permanent income flows. This argument implies that households tend to consume out of current shocks, saving less than 100% of it. Most empirical studies of developing countries have not looked closely at the effect of income fluctuations on saving. Gupta (1987) is an exception; he consistently finds a significantly positive response of the level of saving to temporary income fluctuations, with a coefficient ranging from 0.2 to 1.0.

Intertemporal optimizing models of consumption or saving model typically have wealth as a key argument. 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 clearly predicts that greater wealth would reduce saving as a share of current income. Since the most concepts of wealth are not easily observed directly, they have not been used in most empirical studies of saving in developing countries. Schmidt-Hebbel (1987) uses five alternative measures of total wealth for an empirical intertemporal consumption model for Chile, based on different assumptions on how expectations of future variables are formed. Behrman and Sussangkarn (1989) have micro data on household wealth and saving. Both studies find a negative effect of wealth on saving.

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[7] 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-including 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.

Monetary or financial assets lessens a household's dependence on current income sources when income decline transitorily, because consumers can draw on the assets to maintain their consumption levels. Hence, holding a higher stock of assets over the business cycle allows the household on average to maintain a higher consumption rate, depressing the saving rate. In addition, monetary asset holdings are an important component of total consumer wealth. Not all of its value has a corresponding counterpart in current and permanent income flows; the returns of base money holdings, for instance, are excluded from private disposable income. This implies that monetary holdings have a second, negative influence on saving rates. Corbo and Schmidt-Hebbel (1990) find a significant negative impact of monetary assets on private saving in Latin America.

Rates of Return.

On the effect of rates of return on saving there is no clear theoretical prediction; the income and substitution of higher interest rates work in opposite directions. Economists have heatedly debated what the empirical evidence indicates. McKinnon (1973) and Shaw (1973), and more recently Belassa (1989), argued that the rate of return on saving as indicated by the real interest rate would have a positive effect on saving rates. Fry (1978, 1980) found statistical evidence to support the contention that higher real interest rates contributed to higher saving rates. In his recent book, Fry (1988, p. 140) concedes that the magnitude of the effect is small, although the coefficient is statistically significant. 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 (Korea in 1967 and 1968) accounted for the entire result. With an expanded data set, Giovannini found that the interest rate did not contribute significantly to explaining saving. Both Fry and Giovannini used aggregate data, which is

especially problematic for testing the effects of interest rates.[8] 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 elasticities of substitution of consumption for Southern Cone countries and find the elasticity to be around 1.0, implying that consumption is insensitive to the interest rate.

Changing real interest rates do cause reallocations of household portfolios that may be mismeasured as changes in the saving rate. For instance, negative real interest rates resulting from high inflation tends, especially if interest rates are regulated, cause a flight into real assets, among them consumer durables, and into foreign currency via capital flight. Both higher consumption of durables and capital flight reduce private saving as measured by national accounts.

While inflation enters in the calculation of the real interest rate, it may also have independent effects. High inflation often contributes to stagnation in output or outright recession; such effects are picked up by the income variable. Higher inflation also increases instability and uncertainty about future variables, including income levels and rates of return on real assets. Consequently, inflation has a theoretically ambiguous effect on private saving, because uncertainty about the future value of assets could either discourage saving because of the substitution effect of the lower effective rate of return or it could encourage saving for precautionary motives. Similarly, higher riskiness of income streams, often increased by inflation, affect private saving ambiguously, depending on the form of the underlying utility function.[9] Gupta (1987) and Lahiri (1988) include the expected and unexpected components of the inflation rate as separate determinants of saving; Gupta also includes the nominal interest rate; Lahiri

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[8] Giovannini (1985) implicitly recognizes this in pointing out that much of the increase of Korean saving in the late 1960s resulted from the increase of government saving.

[9] For a comprehensive treatment of the effects of different sources of uncertainty on saving, see Gersovitz (1988).

does not. 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 all-Asian sample, the signs on both inflation variables are mixed for the eight separate country regressions.

Foreign Saving.

During most of the post-WWII period developing countries have not had access to unrestricted voluntary lending from private commercial sources, the exception being the brief 1976-1981 period before the debt crisis erupted. However, even during that short span many developing countries maintained domestic restrictions to foreign borrowing. Thus, for most of the relevant period, foreign saving has been exogenous with respect to household saving decisions and has acted as a credit constraint which held down domestic spending. Thus one would expect to find that foreign saving is a substitute for household saving.

A number of empirical studies have included foreign saving as a determinant of saving rates. Fry (1978, 1980) and Giovannini (1985) find a significant and negative coefficients on foreign saving, although they are also significantly less than one. With a non-econometric analysis, Chenery and Strout (1966) also find a negative initial impact of capital inflows on domestic saving, although the secondary effects on capacity growth work the other way. Giovannini (1983) finds coefficients with mixed and insignificant signs. Gupta (1987) finds positive coefficients, significant for Latin America but not for Asia. The result seems to depend on the sample and model specification. All the studies with the foreign saving variable were looking at total saving, so the results may reflect the extent to which capital inflows went straight to public and corporate sector investment, which counts as an increase of saving.

Demographic Variables.

Demographic influences on saving have generated much research (Collins 1989, Hammer 1987, Leff 1968, Mason 1986, Webb and Zia 1990; see Hammer 1986 for a survey). This paper touches on the topic on cursorily, because demographic changes are mostly too gradual to show up in the short time series of this study. The life-cycle models of saving imply that demographic variables should affect saving rates. The dependency ratio -- those under age 15 or over 65 as a share of total population -- is the most common variable. In the life-cycle model, older people work less and at least partially live off their saving. Households with more children at home are also thought to save less because they would defer saving for retirement until the children moved out (raising per-capita income of the parents) 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 a strong negative effect of the dependency ratio on saving. Subsequent studies challenged the robustness of his result and have gone back to look more carefully at the theory and the measurement of demographic variables (Mason 1986). The result seems to depend a lot on the sample and on the other variables included. Mason (1986) and Collins (1989) got good results using an interaction term of the dependency ratio with the growth rate of per capita income.

To summarize the empirical findings, there is a broad consensus that faster growth and high incomes contribute to higher saving rates. Some evidence indicates that more monetary wealth, holding income constant, leads to lower saving. There is still controversy about the effect of foreign capital inflows, the real interest rate, and inflation, as well as demographic variables.

3. NEW EVIDENCE ON HOUSEHOLD SAVING

3.1 A Framework

To test for the determinants of saving with new data, we estimated the behavioral function for household saving described below. It incorporates variables to address the major issues in the literature.

The dependent variable is the saving rate (the ratio of household saving to private disposable income), rather than the absolute level of saving, for three reasons. First, there is no adequate deflator for saving which can be used to obtain current-price saving series. Second, the use of ratios instead of levels avoids the need to choose the appropriate exchange rates to make cross-country comparisons. Finally, saving rates tend to be stationary while absolute saving flows grow over time, so that the use of the first can avoid spurious correlation with right-hand variables also presenting time trends.

The specification for the household saving rate, based on the discussion of the previous section, is the following:

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

where S is household saving, I is household disposable income, LIP is the natural logarithm of per capita 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, 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 an average of I in the current and previous years, FS is foreign saving (the current account deficit), DEP is the dependency ratio, and URB is the urbanization rate. Signs below variables indicate expected a priori signs according to the discussion of the preceding section.

Three dimensions of income are included as determinants of the household

saving rate in eq. (1): the log of trend per capita private disposable income, its growth rate, and the log deviation of current from trend private disposable income. Note that log trend income plus log income deviation equals the log of current income. Thus, we can test the proposition, implicitly assumed in some earlier studies, that the coefficients on the two components of income are the same. A fourth income variable included here is household transfers.

Domestic real interest and inflation rates, both with a priori ambiguous signs, could affect intertemporal consumption and portfolio composition decisions, with consequences for household saving. Monetary wealth (which affects liquidity constraints and constitutes consumer wealth) and foreign saving should depress household saving rates. Finally, while the dependency ratio also reduces saving, the urbanization variable was added to control for the potential effect of differences in measurement of urban and rural saving, as well as for structural differences in the underlying saving behavior.

3.2 Data

Our data set is especially well suited for testing hypotheses about household saving behavior. It is based on household saving and disposable income series for ten countries for which we could find at least seven and as many as 13 consecutive annual observations from the 1970-85 period. The countries were Botswana, Colombia, Ecuador, Honduras, Korea, Philippines, Paraguay, Thailand, South Africa, and Taiwan. The United Nations National Accounts break down income and consumption series into general government, corporate, and household sectors, from which we calculated household disposable income, household saving, and transfers from the general government to households.[10] Interest rates come from a data set developed by the Financial Policy Division of the World Bank. The remaining data (inflation,

[10] For Taiwan the data come from the Statistical Yearbook of the Republic of China.

urban population share, dependency ratio, current account balance, and money balances) is from the IMF's International Financial Statistics and Government Financial Statistics and the World Bank's BESD database.

Household disposable income includes all current receipts by households, less taxes and social security contributions. The key question is whether the exclusion of the retained earnings of (private) corporations owned by households gives a distorted picture of household decision making. The household sector already includes all agricultural firms and firms in the informal non-agriculture sector. Excluding the income of private corporations does not affect the results as long as most of the variation of household income and saving is for households that would not count the corporate income and saving as part of their own budget and would not make household saving decisions to offset what was going on the corporate sector. Most economists agree that households in developing countries are very unlikely to take saving decisions to offset those of the public sector, as discussed in footnote 3 above.

To calculate the three income variables actually used in the analysis, we ran regressions with 5-year overlapping series, up to and including the current year, regressing the log of household disposable income on time. The estimated value for the current year gives the trend value of current income; the coefficient on time is the trend rate of growth; and the deviation from the estimated value in the current year is the temporary component of income.[11]

In order to test whether saving out of transfers to households was different than out of other income, it was included on the right-hand side. Transfers include social security, unemployment relief, and transfers from abroad; they do not include indirect transfers such as farm price supports or subsidies that permit food to be sold at below-market prices. Since transfers are already counted as part of total income, the coefficient on transfers

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[11] In order not to lose too may degrees of freedom with this method, we extrapolated household income back 4 years prior to the start of our sample period by using the growth rate of GDP.

would be zero if consumption out of that income were the same as other income. A significant negative coefficient would indicate that saving out of transfer income was on average less than out of other income.

The interest rate is the rate on 3-month time deposits. The inflation rate is the change in the log of the household consumption deflator, going from the year average for the previous year to the year average for the subsequent year to the observation. The real interest rate is the difference between the two.

As a measure of monetary asset holdings, we used money plus quasi-money at the end of the previous period -- as a measure of liquid wealth available for consumption in the current period. To get its real value relative to income, it was divided by the geometric average of nominal disposable income in the current and previous years.

Foreign saving is the current account balance, again as a share of household disposable income. There are two reasons for believing that foreign saving is exogenous with respect to household saving. First, developing countries were credit constrained during most of the period; most of the countries in the sample were borrowers throughout the period, and during the subperiod of freer access to foreign lending (1976-81) many LDC governments restricted access of the private sector to foreign capital. Second, any endogenous response of capital inflows to domestic investment would be most likely in the public and corporate sectors, not the household sector.

The two demographic variables in the regression are the dependency and urbanization rates. The variables change little for each country over the observation periods and in many cases are not actually known on an annual basis. They are entered mainly as control variables and not too much importance should be attached to the coefficient estimates. The dependency ratio is the population below 15 year and above 65 year as a percent of total population. The urbanization rate is the share of population in cities, from U.N. data; the cutoff for city size varies from country to country.

3.3 Estimation Methods

This subsection briefly describes the estimation methods applied to our sample.

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

$$(2) \qquad Y_{it} = \beta_0 + \gamma_2 W_{it,2} + \ldots + \gamma_N W_{it,N} + \beta_1 X_{1it} + \ldots + \beta_K X_{kit} + \epsilon_{it}$$

$$i = 1,2,\ldots,N$$
$$t = 1,2,\ldots,T$$

where the subscripts i and t refer to individual countries and time, respectively, $\{Y_{it}\}$ is the (N*T by 1) vector of saving rates, $\{X_{kit}\}$ the (N*T by K) matrix of the K independent variables and $\{\epsilon_{it}\}$ is the (N*T by 1) vector of residuals, which are at first supposed to satisfy the assumptions of the classical normal linear model. Also, $W_{it,j}$ are dummy variables such that

$W_{it,j}$ = 1 for the j-th country,
= 0 otherwise.

The fixed-effect estimator is our basic regression model. This class of models assumes that the empirical results are conditional on the particular sample used in the estimation. Alternative estimators, such as the error component (or random effect) model, inherently treat the available units as a random sample from some universe. Given the small size of our country sample and the marked differences in the economic features of the countries, the fixed effect estimator seems to be a more appropriate choice.

This choice has also been verified by the usual set of specification tests between competing models.[11] The first test carried out is the Breusch-Pagan test for the presence of both cross-sectional and time-related effects

[11] For a description of the tests described below, see, for instance, Kmenta (1986) and Hsiao (1986).

in the residuals of a simple OLS estimate.[12] Rejection of the OLS implies that fixed effects is superior. The second test applied here is the Hausman specification test, which compares fixed-effect against random-effect estimators.[13] Random-effect estimators are more efficient but are consistent only in the absence of correlation between the included regressors and the errors. Fixed effects are less efficient but still consistent when the above condition is not satisfied. Rejection of the random effects as inconsistent implies that fixed effects is superior. The application of the test, consistently support the use of the fixed-effects model.[14]

These tests consistently support the use of the fixed effect model.

An important caveat refers to the low number of cross-sectional units considered in the estimation, since the properties of the panel data models are based on asymptotic results for large N. The choice for building a data set consistent with the theoretical results to be tested has limited the sample to only those countries for which disaggregated data on savings are available over a sufficiently long time span.

Issues such as endogeneity of explanatory variables and errors in variables have been addressed by using instrumental variable estimation.

3.4 Results

A linear form of the saving equation (1) was estimated using the panel

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[12] Consider the residuals of a single-intercept OLS model run on the pooled cross-sectional and time-series data. We want to test for the appropriateness of a two-component model, i.e., an individual-specific effect constant over time, plus an error that is i.i.d. over time and individuals: $\epsilon_{it} = \upsilon_i + \eta_{it}$. For the Breusch-Pagan test the null and the alternative hypotheses are:
$H_0 : \sigma_\upsilon = 0$; $H_1 : H_0$ not true. The test statistic is distributed as a χ^2_1.

[13] Consider $H_0 : E(\epsilon_{it}|X) = 0$ against $H_1 : E(\epsilon_{it}|X) \neq 0$. The Hausman specification test compares fixed-effect estimators, which are consistent under both hypotheses, against random-effect estimators, which are consistent and efficient under H_0 but inconsistent under H_1. The test statistic is distributed as a χ^2.

[14] Also, regression t-tests for the presence of trend and/or time-specific effects have been carried out, by including appropriate dummy variables. These effects were never significant in any of the model specifications.

sample discussed above, applying the econometric techniques summarized briefly in the preceding subsection. Tables 1 and 2 summarize the regression results, showing first results with different methods of estimation, and then some runs with certain variables excluded.

Four estimation techniques used -- OLS, instrumental variables IV for the interest rate term, fixed-effects country dummy, and random effects. A priori we expected that fixed effect with IV for the interest rate would be best, and results in Table 1 bore that out.

Instrumental variable estimation, reported at the bottom of table 1, was used to take care of the possible simultaneity bias stemming from the interaction between saving and domestic real interest rates. LIBOR corrected by international inflation was used as the instrument for the domestic real interest rate.[15] Equation 4 in table 1 -- fixed-effects estimation with instrumentalization of the real interest rate -- thus constitutes the primary set of results. Table 2 presents a set of fixed-effects results obtained from omitting some variables.

The income variables all have a strong 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 (GITP) has a strong effect on the household saving rate in developing countries: a 1 percentage point increase in per capita income growth raises the household saving rate by at least 0.5 percentage points in our sample of developing countries. Faster growth of per capita income over the medium is the best way to raise the private saving rate, which suggests the presence of a virtuous cycle between growth and saving.

The business cycle as proxied by the deviation of income from its trend level has a positive influence on the saving rate. However, its coefficient is approximately 0.30, being significantly lower than the 1.0 coefficient

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[15] Other sets of instrumental variables, such as the lagged independent variables, were also tried but did not improve on the reported results. Instrumental variables without fixed effect country dummies were also rejected in favor of IV with fixed effect dummies.

predicted by the permanent income theory. The implication is that of each additional percentage point of current (transitory) income over its trend level, households will save about one-third. This important effect of current income on consumption probably signals the combined effect of borrowing constraints faced by households and their use of current income in reestimating their permanent income levels.

The (log of the) level of per capita trend disposable income also plays a significant role in increasing saving as reported in tables 1 and 2. Over the relevant income distribution of our sample, saving is a superior good, increasing by a higher percentage rate than (trend) household income. The high elasticity of the saving rate with respect to the per capita trend income level (around 0.25) suggests that this coefficient should not be used for wide out-of-sample extrapolations, since saving rates cannot rise indefinitely with income. Omitting this variable with the present sample, as in equation 7 in table 2, significantly worsens the fit of the regression and affects the coefficients on other variables that are correlated with income levels -- mainly the ratios of monetization, dependency, and urbanization.

The two components of current income -- trend and deviation from trend -- have almost identical coefficients.[16] Although the effect of higher current income shows up in a higher value of trend income and a higher estimate of trend growth, temporarily raising income seems to have a relatively weak impact on saving. This could be because many households are credit constrained, or because they sharply revised their estimates of permanent income in the response to current-income fluctuation.

The coefficient on transfers is negative, frequently significant, and surprisingly large. Since transfers are already counted in disposable income, it indicates that households consume on average 1.4 units more for one additional unit of transfers.

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[16] One cannot reject the hypothesis that their coefficients are identical. This implies that for the present sample there would be no error in using just the log of current income, rather than decomposing income into trend and fluctuation.

The domestic real interest rate has a small, mostly negative, and non-significant influence on household saving rates. This result, confirming most previous studies on the role of interest rates in determining consumption or saving, reflects either that income and substitution effects cancel each other, or that liquidity constraints weaken the effects of intertemporal relative prices.

Inflation has a negative effect on saving, as most stories predict, but the effect is not statistically significant. Since the real interest rate and the inflation rate are somewhat collinear, we tried entering them one at a time, in table 2. This raises the significance of inflation to about the 10 percent level (equation 6), with still the negative sign. Omitting inflation, on the other hand, does not make the effect of the real interest rate significant. In other words, reducing inflation seems to encourage saving, but raising the deposit rate relative to inflation has no positive effect on saving and might even discourage it.

Monetary assets play a dual role in our specification: first, they constitute a stock variable signalling (inversely) the extent of domestic liquidity constraints and, second, they are related to household financial wealth. For both reasons we expect a negative influence of monetary stocks on saving. The results show a negative and significant coefficient for the money to income ratio of around 0.18 in most equations with fixed effect estimation.

Foreign saving acts as an external liquidity constraint, excepting possibly the period of access by developing countries to foreign lending (1976-1981). Its role in boosting private consumption is reflected by our results, which show a stable and negative influence of it on saving.

Because of the short time series for each country and because the fixed-effect (country dummy) technique of estimation does not consider cross-country variation, we do not attach much significance to the coefficients on the demographic variables. The urbanization rate has no discernible effect on saving. The dependency ratio has widely varying effects depending on the

specification and estimation technique.[17] It was also highly collinear with the growth term for each country, making both coefficients highly unstable.

POLICY IMPLICATIONS AND CONCLUSIONS

The measures of income and wealth explain most of the variation in household saving rates. Households save a larger share of their income when that income is higher and when it is growing faster. They save less when they start the period with greater liquid wealth, although wealth reduces saving much less than one-for-one. Table 3 calculates the required changes in all significant non-demographic saving determinants to raise the household saving rate by one percentage point, based on the fixed-effect IV regression with all variables included, equation 4 in table 1.

To raise the household saving rate one percentage point 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 3.7 percentage point increase in the ratio of current to trend disposable income is required to achieve a one percentage point rise in the saving rate. A 5.6 percentage point reduction in the money-to-income ratio or 8.3 percentage point reduction of current account deficit corresponds to a one percentage point increase of the household saving rate.

As many people suspected, inflation may discourage saving. The result is at best marginally statistically significant, but there are few high-inflation observations in the sample. Real interest rates do not encourage saving in the countries in this sample; the coefficient is not statistically significant. The lack of effect of real interest rates on saving is especially striking because we control for liquid wealth. Households with high wealth would be more likely to reduce their saving rate in response to increased interest rates, because the wealth effect would more likely

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[17] We tried an interaction term of growth and dependency, in the spirit of Collins (1989) and Mason (1986), but it was insignificant.

predominate.

The surprisingly strong results of this study, considering the small number of countries in the sample, verifies the value of using household data, but also means that these results need to be checked with a larger sample when more data become available.

TABLE 1

DETERMINANTS OF HOUSEHOLD SAVING: DIFFERENT ESTIMATION METHODS

Dependent Variable:
Household Sector Saving as a Percentage of Household Disposable Income

Omitted Variable:	Independent Variables: Trend Income (Log)	Income Growth Rate (5-Year Average)	Income Deviation From Trend (Log)	Transfer To Household (Ratio To Income)	Real Interest Rate	Inflation	Beginning Of Period Money And Quasi Money (Ratio To Income)	Foreign Savings (Ratio To Income)	Dependency Ratio	Urban Population Ratio	R^2_{adj}
1. OLS	0.30 (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)	-0.32 (-4.3)	-0.48 (-3.2)	-0.001 (-2.1)	0.646
2. Fixed Effect[a]	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)	0.15 (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 IV	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

t-statistics in parenthesis

a/ Breusch-Pagan test for the absence of individual effects in the errors: $X^2_1 = 15.89$ (P-value = .00006).

b/ Hausman Specification test, comparing random effect and fixed effect: $X^2_1 = 28.4$ (P-value = .002).

TABLE 2

DETERMINANTS OF HOUSEHOLD SAVING

Dependent Variable:
Household Sector Saving as a Percentage of Household Disposable Income[a]

Omitted Variable:	Independent Variables: Trend Income (Log)	Income Growth Rate (5-Year Average)	Income Deviation From Trend (Log)	Transfer To Household (Ratio To Income)	Real Interest Rate	Inflation	Beginning Of Period Money And Quasi Money (Ratio To Income)	Foreign Savings (Ratio To Income)	Dependency Ratio	Urban Population Ratiou	R^2
5. Inflation Rate	0.22 (3.11)	0.56 (3.88)	0.26 (1.77)	-0.19 (-0.73)	-0.15 (-0.54)	--	-0.16 (-2.26)	-0.14 (-2.70)	-0.56 (1.00)	-0.0004 (-0.22)	0.765
6. Real Income	0.26 (5.67)	0.56 (4.43)	0.31 (2.78)	-0.38 (-2.00)	--	-0.08 (-1.88)	-0.18 (-3.21)	-0.14 (-3.05)	0.87 (2.68)	-0.0001 (-0.04)	0.812
7. Trend Income	--	0.75 (4.2)	0 24 (1.5)	-0.34 (-1.4)	-0.13 (-0.4)	-0.15 (-0.6)	-0.08 (-1.2)	-0.14 (-2.2)	-0.26 (-0.8)	0.003 (1.5)	0.748

t statistics in parenthesis

a/ All estimations are with fixed effect country dummies and instrumental variables for the real interest rate.

TABLE 3

REQUIRED CHANGES IN SAVING DETERMINANTS
TO RAISE SAVING RATE BY ONE PERCENTAGE POINTS

The regression results in table 1 equation 4 infer that a 1-percentage point increase in the household saving rate in developing countries results on average from any of the following changes:

1.	Percent change in the level of trend per capita disposable income	4.0
2.	Percentage point change in the trend growth rate of per capita disposable income	2.0
3.	Percentage point change in the ratio of current per capita disposable income to the trend level	3.7
4.	Percentage point change in the ratio of household transfers to private disposable income	-2.4
5.	Percentage point change in the ratio of monetary assets to private disposable income	-5.6
6.	Percentage point change in the ratio of foreign saving to private disposable income	-8.3

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