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EXPLAINING DIFFERENCES IN THE DOMESTIC SAVINGS RATIO ACROSS COUNTRIES: A PANEL DATA STUDY

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Abstract

This paper seeks to analyse the major determinants of differences in the domestic savings ratio between countries using panel data for 62 countries over the period 1967-1995. A basic distinction is made between the determinants of the capacity to save and the willingness to save. The capacity to save depends primarily on the level of per capita income (but non-linearly) and the growth of income (the life cycle hypothesis), and the empirics strongly support these hypotheses. The willingness to save is assumed to depend on financial variables such as the rate of interest, the level of financial deepening and inflation. We find no support for a positive interest rate effect, but strong support for the level of financial deepening measured by the ratio of quasi-liquid liabilities to GDP. Inflation exerts a mild positive effect on saving but soon turns negative. Total saving also depends on government saving, and a surprisingly strong negative relation is found between the ratio of tax revenue to GDP and the domestic savings ratio.

JEL Classification: E21

Keywords: Domestic savings, income, financial variables, tax.

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EXPLAINING DIFFERENCES IN THE DOMESTIC SAVINGS RATIO ACROSS COUNTRIES: A PANEL DATA STUDY

1. Introduction

Across the world, there are huge differences between countries in the ratio of domestic savings to national income. In a sample of 62 countries over the period 1967 to 1995, shown in Table 1 (taken from the World Development Indicators, 1998), the mean domestic savings ratio is 17.8 percent; the standard deviation is 8.9, and the range is from 1.6 percent in Rwanda to 41.4 percent in Saudi Arabia. The countries taken were dictated by the consistency of data over the chosen time period. In this paper, an attempt is made to account for these differences in country savings performance, distinguishing between variables that affect the *capacity* or *ability* to save on the one hand and the *willingness* to save on the other. Important variables that determine the ability to save include the level of per capita income; the growth of income (which comprises the growth of per capita income and population growth); the age structure of the population (or dependency ratio) if population is not in balanced growth, and the distribution of income. Key variables that determine the willingness to save include the rate of interest, the degree of financial deepening, and the rate of inflation. The overall domestic savings ratio will also be affected by the government's fiscal stance.

There has been no recent study of this nature taking such a large data set for so many countries over such a long period of time. The study that comes closest is that by Edwards (1996) which takes panel data for 36 countries over the period 1970 to 1992, distinguishing between private and government savings. As explanatory variables, he takes a vector of life-cycle factors; monetary and fiscal variables (including measures of macroeconomic stability); external indicators, and political variables. The results are interesting, and Edwards himself highlights the following conclusions: per capita income growth is an important determinant of

private and public saving; higher government saving crowds out private saving, but less than proportionately; government social security systems affect private saving negatively; high foreign saving is associated with lower domestic saving, and lastly the level of financial development is an important determinant of private saving. There are no particular surprises here. What is surprising, however, is the neglect of any discussion of the potential importance of the level of per capita income (*PCY*, hereafter) as a measure of the capacity to save, and how this variable should be specified in empirical estimation. The regression equations in Edwards' study include the variable in linear form, but *PCY* is not highlighted as an important determinant of savings performance because its statistical significance is relatively low compared with other variables.

This neglect is serious for two reasons. First, it ignores the most basic theory of all of what determines the level of consumption and saving. Secondly, it is very clear from casual inspection of the data that when the savings ratio of countries is plotted against the level of *PCY*, the relationship is strong, but *non-linear*. That is, the savings ratio rises as *PCY* rises but at a decreasing rate, and eventually levels off at around 20-25 percent of national income. This is shown for our own data set in Figure 1.

This means that entering the level of *PCY* in linear form in equations to explain differences in the savings ratio can lead to seriously misleading results and conclusions concerning the importance of income. Indeed, in our own sample of countries, using a non-linear specification, nearly 40 percent of the variation in the domestic savings ratio between countries can be explained by differences in the level of *PCY*. Basic Keynesian theory predicts such a non-linear relation, as demonstrated below.

2. Per Capita Income as a Determinant of Saving

One of the most important innovations that Keynes made in his *General Theory* was to link, for the first time, consumption (and therefore saving) to the level of income through the innovation of the consumption function. More explicitly, there is the suggestion that the consumption or savings function is non-proportional; that is, that the rich (people or countries) consume proportionately less, and save proportionately more, of their income than the poor. One way of expressing this idea is to start with the savings function:

$$\frac{S}{P} = -a_1 + b_1\left(\frac{Y}{P}\right) \tag{1}$$

where S/P is the level of savings per head of population (P), and Y/P is *PCY*. The negative constant term means that the marginal propensity to save is above the average, so raising the average as *PCY* rises.

To convert this function so that the savings ratio is the dependent variable, multiply both sides of equation (1) by *P* and divide by *Y*. This gives:

$$\frac{S}{Y} = b_1 - a_1\left(\frac{Y}{P}\right)^{-1} \tag{2}$$

where the savings ratio is a non-linear function of the level of *PCY*, as depicted in Figure 2. As Y/P approaches ∞, $S/Y \to b_1$. In other words, as *PCY* rises, the savings ratio approaches the asymptote b_1.

This is broadly the pattern we observe in Figure 1. The savings ratio is lower in poor countries than in rich countries, but the ratio does not continue rising linearly as *PCY* rises. It increases at a diminishing rate and then levels off. Indeed, there is even some indication that it starts falling at very high levels of income. In an early study, one of the present authors (Thirlwall, 1974a) tested this simple relationship in equation (2) across 63 countries over the

period 1958-68, and estimated an asymptote of 20.9 percent, with 40 percent of the variation in the savings ratio explained by the level of *PCY* alone.[1] One of the striking features of our new research, taking a different set of countries over a much longer time period, is that this result is hardly changed (see later).

It is evident from Figure 1, however, that there is quite a wide dispersion of scatter points around the relation between S/Y and *PCY*; that at the same level of *PCY*, some countries are saving much more than others. The question is why? As indicated in the introduction, this must relate to other differences in the capacity to save, and in the willingness to save, and it is to these factors that we now turn. Following a brief description of the theory behind each of the variables to be considered, we then proceed to examine whether each of the variables is separately significant, and then test for the robustness of the variables using the methodology of Levine and Renelt (1992). We shall conclude with our preferred equation for understanding differences in the savings performance of countries across the world.

3. The Capacity to Save

Apart from the absolute level of income, another major determinant of the domestic savings ratio is likely to be the growth of income as suggested by the life-cycle hypothesis of saving. The basis of the hypothesis, as originally formulated by Modigliani and Brumberg (1954), is that individuals and households attempt to spread out consumption evenly over their lifetime so that decisions to save are assumed to be a function of total lifetime earnings and

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[1] The precise equation estimated was: $S/Y = 20.846 - 993.393(Y/P)^{-1}$, with a *t*-value for the regression coefficient of 6, and an $R^2 = 0.402$.

the stage reached in the earnings cycle. A typical pattern of behaviour would be dissaving in youth, positive saving in middle-age and dissaving in retirement, breaking even on death (on the assumption of no bequests). Consider now the effect of income growth within this framework. If income is rising over time, this means that the life earnings and consumption of each successive age group will be higher than the preceding one. If each successive age group is aiming for a higher level of consumption in retirement, the volume of saving of the active households will exceed the dissaving of the currently retired households with a lower level of lifetime consumption. The savings ratio will then tend to rise with the rate of growth of income because the higher the growth rate, the greater the gap between the target consumption levels of the current generation of working households and the dissaving of retired people from a less prosperous generation. Thus, countries with higher growth rates might be expected to have at least higher personal savings ratios than countries with lower growth rates.

But income growth comprises two components: the growth of income per head and the growth of population. Income growth due to population growth will affect the savings ratio according to how population growth affects the ratio of active to non-active households. If population is in balanced growth (i.e. it has stabilised at a particular rate over a long period), the population growth rate and the age structure of the population will be uniquely related, and the effect of population growth on the savings ratio will be the same as the growth of income per head. If population is not in balanced growth, however, it is difficult to say what the relation between population growth and the savings ratio will be. It will depend on the balance between the extra consumption demands made on society by a growing child-dependency ratio in the early stages of rapid population growth and the increase in saving that comes about as a result of a rise in the ratio of the active to retired households as the population growth persists. Thus, there are two possible tests of the life-cycle hypothesis. The first is to test the simple relation between the savings ratio and the growth of per capita income. The second is

to disaggregate the growth of income into the growth of per capita income and the growth of population, and to examine the separate effects. If the effect of population growth is insignificant or negative, a third test is to relate the savings ratio to the growth of per capita income and to the age structure of the population (or dependency ratio). Pioneer studies of this nature include Leff (1969) and Modigliani (1970).

Another potentially important factor determining the amount of saving is the distribution of income. If, for example, the propensity to save of the rich is higher than that of the poor, the aggregate savings ratio will be positively related to the degree of inequality both in the personal income distribution, and also in the functional distribution on the assumption that the propensity to save out of profits is higher than out of wages. Indeed, movements in the income distribution, both personal and functional, may be an independent explanation of why the savings ratio first rises with the level of *PCY* and then levels off. The transformation of economies from Rostow's traditional and transitional stages through 'take-off' to high mass consumption is bound to be accompanied in the early stages by widening disparities between individuals and a rise in the share of profits in national income. Some individuals are more enterprising, and more adept at accumulating wealth, than others. Profits, too, are a feature of capitalist development and will increase as a proportion of national income as the capitalist sector grows in importance, and as the share of profits in capitalist income rises because increasing returns prevail in industry and labour is available to industry at a constant real wage (although not for ever). In other words, the savings ratio may be expected to rise as *PCY* rises and then level off, if the distribution of income also grows more unequal but at a decreasing rate, and ultimately becomes more egalitarian. The pioneering work of Adelman and Morris (1971), extended by Paukert (1973), for developing countries shows fairly conclusively that income inequality increases up to a certain stage of development and then declines, graphically tracing out an inverted U-shape similar to the original historical findings of Kravis

(1960) and Kuznets (1966) for the developed countries. The most up-to-date study of income inequality across the world by Deininger and Squire (1996) of the World Bank also shows this. We know of no study that considers the personal distribution of income as a determinant of inter-country differences in the savings ratio, as measured, say, by the Gini ratio or by the proportion of income received by the top 10 percent of the income distribution, which is the measure we shall take in this study.[2]

4. The Willingness to Save

Saving represents an intertemporal choice between consumption today and consumption tomorrow. It might be expected, therefore, that the price of present consumption, namely the rate of interest, will affect saving positively. This assumed positive relation also reflects the classical idea of the rate of interest as the reward for waiting, and lies behind the financial liberalisation programmes in developing countries which seek to raise the real interest rate in order to maximise saving, investment and growth. In the last twenty years or so there has been extensive testing of the financial liberalisation hypothesis, and the role of the interest rate in promoting saving, with mixed and largely inconclusive results. Perhaps this is not surprising since the financial liberalisation argument largely refers to financial saving, but financial saving is only one component of total saving. If interest rates rise, financial saving may rise but at the expense of other assets, leaving total saving unchanged (see Warman and Thirlwall,

[2] An early study by Modigliani (1970) considered the functional distribution of income, relating the savings ratio across 33 countries to the profits-income ratio as measured by the ratio of non-wage income (including income from self-employment) to total income. The relation turned out to be negative which Modigliani rationalised in terms of large amounts of self-employment in agriculture in low income/low savings countries. Taking a sample of 19 developed countries, however, gave a positive and significant relation between the profits ratio and the savings ratio.

1994). It is also standard theory that any price change has both income and substitution effects. The substitution effect promotes saving, but the income effect reduces saving, and the two effects may cancel each other out. In his extensive overview of the literature, Maxwell Fry (1995) concludes: 'What is agreed … is that if an effect [on saving] exists at all, it is relatively small' and that 'positive interest effects are easier to find in Asia than in other parts of the world, but even in Asia the effects appear to have diminished over the past two decades'. We shall look at the impact of the real interest rate is our own sample of countries as a measure of the willingness to save.

Probably a more important determinant of the willingness to save, however, is the existence of financial institutions and the range and availability of financial assets to suit savers. There is no single measure that can capture these institutional determinants of the willingness to save. It is necessary to proceed by trial and error using different measures. The number, proximity and diversity of financial institutions serving the different needs of savers could be important. Equally, the volume and range of financial assets might matter as a measure of financial deepening. Here we take as indicators: money and quasi-money as a percentage of GDP; money and quasi money growth, and quasi-liquid liabilities as a percentage of GDP. We also look at domestic credit provided by the banking sector as a percentage of GDP on the hypothesis that bank credit finances investment and growth, which in turn generates saving.

Finally, the rate of inflation can be expected to affect the willingness to save, but the effect is ambiguous. On the one hand, inflation acts as a tax on money balance holdings. If individuals wish to restore the real value of their money balance holdings (the so-called real balance effect), saving will rise with the rate of inflation. On the other hand, it is natural to expect individuals to avoid the tax if it becomes burdensome in relation to the convenience of holding money. It can be shown (Friedman, 1971) that the yield from the inflation tax will be

maximised when the elasticity of the tax base (the level of real money balance holdings) with respect to the rate of inflation is minus unity. Even if private saving does increase, however, total saving may not increase if the government fully consumes the proceeds of the inflation tax. Inflation may also discourage other forms of voluntary saving because its real value is falling.

Inflation will also redistribute income from wages to profits within the private sector if the wage-price coefficient is less than unity. This will increase saving if the propensity to save out of profits is higher than out of wages (see earlier), but this process can only last as long as there is money illusion (or as long as real wages rise slower than productivity growth in the growing economy[3]). The most likely relation between inflation and the savings ratio is a quadratic showing saving rising with mild inflation and then falling as inflation becomes excessive. This type of non-linear relation is also suggested by the evidence we have on the relation between inflation and economic growth (Sarel, 1996 and Bruno and Easterly, 1998). We shall enter inflation both linearly and non-linearly into our equations.

5. Government Saving

Total domestic saving consists of private saving and government saving. Edwards (1996) tests for the determinants of government saving, and uses largely the same independent variables that are employed to explain private saving, which in our view does not make a great deal of economic sense. Government saving/dissaving depends on whether the government budget is in surplus or deficit on current account and therefore depends on the willingness and ability to tax and spend. In the model here we test for the influence of government on total

[3] See Thirlwall (1974a) for a full discussion.

domestic saving by examining the relation between the domestic savings ratio and the ratio of tax revenue to GDP. In other words, do countries which tax more, save more? If the relation is positive, this suggests that countries with higher tax ratios run larger surpluses/smaller deficits than countries with lower tax ratios. A negative relation would indicate that a high tax ratio either discourages private saving or that countries with high tax ratios still have larger budget deficits/smaller surpluses.

6. Empirical Results

The empirical results are presented in sequence, first examining the variables determining the capacity or ability to save, and then the variables determining the willingness to save. We test for the robustness of results using a modification of the approach adopted by Levine and Renelt (1992). Consider the equation:

$$Y = b_i I + b_z Z + \mu$$

where I is the variable of interest, and Z is a set of other variables added to the equation. First the regression is run with the variable of interest (I). Then other variables are added. If the coefficient on the variable of interest remains statistically significant without changing sign, the variable is regarded as 'robust'. Otherwise, it is considered 'fragile'. In our results, *PCY* is always a robust variable whatever other variables are included in the equations and we include it in every equation. Other variables are also robust but are not included in every equation. To anticipate the results and conclusions, differences in the savings ratio between countries can largely be explained by differences in the level of *PCY*; the growth of income (or the growth of *PCY* and population separately); the quasi-liquid liabilities ratio (as a measure of financial deepening); the tax ratio (negatively), and inflation (non-linearly). All other variables turn out

to be 'fragile'.

Owing to the varying availability of data for different variables, the sample size varies according to the variable of interest, but in all cases (especially with the panel data) the sample size is always sufficiently large to draw statistical inference. The variation in the sample size also becomes another convenient test of the robustness of the results; that is, whether the significance of key variables changes as the sample size changes. We find that they do not.

In reporting the results of our empirical investigations, two model specifications are used (i) cross section estimates taking mean values of the variables for each country over the sample period, and (ii) panel estimates (taking pooled time series and cross section data). The panel data estimator is the 'two way' fixed effects model where it allows an overall constant as well as a 'group' effect for each country and a 'time' effect for each period. The bracketed terms in all equations are *t* values. A * signifies significance of the regression at the 95 percent confidence level or above.[4]

The Keynes Absolute Income Hypothesis

We first report the simple non-linear relation between the savings ratio and the level of *PCY* as expressed in equation (2).

<< Table 2 about here >>

In the cross section of 62 countries over the period 1967 to 1995, 40 percent of the difference in the savings ratio is accounted for by differences in the level of income when *PCY* is entered non-linearly, with the savings ratio reaching an asymptote of 24 percent. This result is strikingly similar to that obtained in Thirlwall (1974a) mentioned earlier where for a different set of 63 countries over the period 1958-68, also 40 percent of the variance in the

[5] The statistical package used throughout is LIMDEP.

savings ratio was explained by differences in *PCY*, and the asymptote was nearly 21 percent. From the estimate of the regression coefficient we can work out the change in S/Y from a specific change in *PCY*. Since the relation between S/Y and *PCY* is non-linear, the impact will be a function of the level of *PCY* taken. Differentiating equation (3) with respect to *PCY* gives the change in S/Y as $3665\ (1/PCY^2)$. For example, at *PCY* level *$500*, the change in S/Y for a *$100* change in *PCY* would be approximately $3665\ (1/500^2)\ 100 = 1.47$ percentage points. At *PCY* level *$1000*, the change in S/Y for the same change in *PCY* would be $3665(1/1000^2)\ 100 = 0.37$ percentage points, and so on.

Using panel data, abstracting from individual country fixed effects, 70 percent of the variation in the savings ratio is accounted for by differences in the level of *PCY*. This is very strong support for the Keynes absolute income hypothesis, provided the non-linearity of the relationship is allowed for. The linear relation is much weaker in the cross section with only 17 percent of the variance explained, and slightly weaker in the panel with 60 percent of the variance explained.[5]

The Life Cycle Hypothesis

The life-cycle hypothesis of saving is tested in two parts: First, we take the growth of income *(G)*, and then we look at the influence of the two components of the growth of income, namely the growth of *PCY (GPCY)* and population growth *(POPG)*. In Table 3, these variables are considered alone (equations (5) and (6) in the cross section and equations (9) and (10) in the panel), and also when combined with *PCY* (equations (7) and (8) in the cross section and equation (11) and (12) in the panel).

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[5] The linear specification of *PCY* becomes much weaker in the panel when other variables are considered.

<< Table 3 about here >>

It can be said straight away that both in the cross section and in the panel data results there is strong support for the life-cycle hypothesis of saving whether the growth of income or the growth of *PCY* is taken. Equation (5) shows that the growth of income by itself is a significant determinant of differences in the savings ratio but not as powerful as the level of *PCY*. It retains its significance when combined with the level of *PCY* (equation 7). Splitting the growth of output into its two components shows the growth of *PCY* is significant, but the effect of population growth is negative (but insignificant) (equation 6). The cross section results suggest that allowing for differences in the level of *PCY*, a one percentage point difference in the growth rate is associated with a *1.5* percentage point difference in S/Y. The panel results suggest a smaller impact but nonetheless significant. The growth of *PCY* retains its significance when combined with the level of *PCY* (equation 8). The panel data results show much stronger effects of growth, and population growth is now significantly positive (equations (10) and (12)). Given these strong positive effects of population growth, we have not explored further the effect of the dependency ratio on the savings ratio.

Income Distribution

To consider the effect of the income distribution on the savings ratio, we took the ratio of income received by the top 10 percent of income earners. Observations were obtained for 39 countries, but in none of the equations estimated was the income distribution variable statistically significant.

The Real Interest Rate

To test the significance of the real interest rate (*R*) we take a sample of 22 countries for which consistent and reliable data are available and a panel of 396 observations. When

considered by itself, the variable is positive but insignificant in the cross section, but significantly negative in the panel (equations (13) and (15)). When the interest rate variable is combined with *PCY*, the sign is consistently negative (equations (14) and (16)). The same is true when the growth of income and other variables are added to the equations (not reported here). Two possible explanations for the negative relationship suggest themselves. The first is the standard theoretical possibility that the positive income effect of high real interest rates offsets the negative substitution effect. The second possibility is that high real interest rates are associated with a higher ratio of foreign capital inflows to GDP which in accounting terms shows up as a lower domestic savings ratio if a part of the capital inflows is consumed. Whatever the explanation, there is no support here for the view that high real interest rates raise the domestic savings ratio.

<< Table 4 about here >>

Financial Variables

There are several variables that it is possible to take to test the hypothesis that the willingness to save depends on the degree of financial sophistication of economies. Here we have explored the role of four variables: money and quasi money as a percentage of GDP (*M2*); domestic credit provided by the banking system as a percentage of GDP (*BC*); money and quasi money growth (*mg*), and quasi-liquid liabilities as a percentage of GDP (*QLL*). We take 59 countries and 1770 panel observations. The *M2*, *BC* and *mg* variables all give either insignificant or fragile results. Really strong and robust results emerge when quasi liquid liabilities of the banking system are taken as the indicator of financial deepening and the willingness to save. The formal definition of quasi-liquid liabilities is: ‘time and saving deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase arrangements, travellers cheques, foreign currency time deposits, commercial

paper and shares of mutual funds or market funds held by residents'[6].

<< Table 5 about here >>

Both in the cross section of 62 countries and in the panel estimates there is a strong relation between the savings ratio and the *QLL* ratio alone (equations (17) and (21)). The variable stays robust when *PCY*, growth, the growth of *PCY* and population growth are added to the equations. Over 50 percent of the variance in the savings ratio is accounted for by these variables in the cross section and over 70 percent in the panel. All the results show that a one percentage point difference in the *QLL* ratio is associated with a difference in S/Y of between 0.1 and 0.2 percentage points, whether or not allowance is made for other variables.

Inflation

The rate of inflation (π) in this study is measured by the rate of change of the GDP deflator. We first examine the relation between the savings ratio and inflation using a linear specification and then non-linearly using a quadratic function (π^2). The cross section results show no significant positive or negative relation for a sample of 55 countries (not reported here), but the panel results reveal a significant positive but non-linear relation between savings and inflation using 1595 observations. Equation (25) shows a surprisingly strong result, and solving for the rate of inflation which maximises the savings ratio gives a very low rate of 1.36 percent. When other variables are added in equations (26), (27) and (28), the inflation variable(s) remain robust. Equation (28) which includes *PCY*, life cycle variables and the quasi-liquid liabilities ratio now explains 75 percent of the variance in the savings ratio.

<< Table 6 about here >>

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[6] Taken from the World Development Indicators 1998, issued by the World Bank.

Compulsory Saving

The effect of the tax ratio variable (*TR*) is consistently negative both in the cross section results for 23 countries, and in the panel data results using 552 observations. We report here only the panel estimates. It appears that the more governments tax as a proportion of GDP, the lower the overall savings ratio. The coefficient on *TR* is significantly negative by itself in equation (29), and remains robustly negative when other significant independent variables are added to the equations. All the results show that a one percentage point difference in the tax ratio is associated (negatively) with a difference in the savings ratio of between 0.5 and 1.0 percentage point. This negative effect of the tax ratio is open to three interpretations. Firstly, high tax ratios could be discouraging personal and private saving. Secondly, and related, high tax ratios could be a reflection of the extent of redistribution policies which make precautionary private savings less necessary. Thirdly, higher tax ratios could go hand in hand with higher budget deficits on current account. Taxation is used to finance deficits but never adequately. The strength of this result surprises us.

<< Table 7 about here>>

7. Conclusions and Policy Implications

In this study we have reverted to conventional theories of the determination of saving in an attempt to explain differences in the domestic savings ratio across a wide cross section of countries, taking advantage of panel data from the World Bank. Herein lies one of the study's strengths. We are able to account for up to 75 percent of the difference in the savings ratio between countries in terms of the level of *PCY*, the growth of *PCY*, population growth, the quasi-liquid liabilities ratio, inflation, and the tax ratio (see, for example, equations (28) or

(34)).[7] In contrast to the most recent study by Edwards (1996), we rehabilitate the Keynesian absolute income hypothesis, and give theoretical reasons why it is important to enter the *PCY* variable non-linearly. The life cycle hypothesis of saving has strong support, and so does the financial deepening hypothesis measured by the ratio of quasi-liquid liabilities to GDP. We are surprised by the robustness of the non-linear relation between inflation and savings and the negative effect of the tax ratio on the savings ratio. These are new results. The policy implications of our analysis are fairly clear-cut, but not so easy to act on directly. A rise in *PCY*, which should bring about a rise in the savings ratio automatically, is a function of many factors not under the direct influence of policy-makers. The major determinant of the level of *PCY* is labour productivity which depends on investment per worker and technical progress. How to raise the level of investment (which is not the same as saving) and to enhance technical dynamism is the big challenge facing virtually all developing economies. Investment will be promoted by a stable macroeconomic environment, and through the creation of financial institutions willing to lend. Our results show that the degree of financial deepening clearly matters for saving, and governments have a role to play here in providing the right regulatory and legal framework in which the banking system can operate safely and efficiently. The growth of income and growth of *PCY* are also important determinants of saving, and again will be a function of investment and technical dynamism. Inflation (or the inflation tax) appears to play a role in raising the domestic savings ratio, but it would be clearly unwise to recommend more inflation in most developing countries. Equally, however, it would seem to be a mistake from the evidence here for governments to attempt to squeeze inflation out of the system entirely. It is also difficult to recommend reductions in the tax ratio when most developing countries need all the tax they can raise to finance basic expenditure.

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[7] Although population growth is 'fragile'.

By far the strongest determinants of savings performance are living standards and the growth of income. This should not be a controversial conclusion, but one that has not been so fully documented in recent years.

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Table 1

The Average Domestic Savings Ratio for 62 Countries over the Period 1967-1995

Country	Savings Ratio %	Per Capita Income US$
1. Algeria	33.5	2472
2. Argentina	23.0	3599
3. Benin	2.9	344
4. Brazil	21.7	1737
5. Borkina Faso	2.0	235
6. Cameroon	19.5	841
7. Canada	23.0	13324
8. Central African Rep	2.4	458
9. Chile	20.2	1623
10. Colombia	19.6	1020
11. Congo Dem. Rep.	10.8	239
12. Congo Rep.	20.3	907
13. Costa Rica	19.5	1608
14. Cote d'Ivoire	22.0	1023
15. Denmark	20.8	17519
16. Dominican Rep	15.9	760
17. Ecuador	20.6	1064
18. Egypt	13.1	671
19. El Salvador	9.8	950
20. Fiji	17.5	1689
21. Finland	25.7	14947
22. Gambia	3.6	266
23. Ghana	7.0	427
24. Guatemala	11.5	889
25. Guyana	19.1	517
26. Honduras	16.6	881
27. Israel	22.7	17252
28. India	19.5	296
29. Jamaica	19.6	1431
30. Japan	33.5	17161
31. Kenya	20.0	344
32. Korea	27.1	2521
33. Madagascar	3.8	285
34. Malawi	9.8	152
35. Malaysia	31.5	1746
36. Mauritania	11.9	516
37. Mauritius	20.2	1516
38. Mexico	21.3	1720
39. Morocco	14.9	749
40. Nepal	9.2	167
41. Nicaragua	7.6	1432
42. Niger	6.3	403
43. Nigeria	20.0	309

44. Pakistan	10.2	279
45. Paraguay	17.8	872
46. Peru	21.0	319
47. Philippines	21.1	588
48. Rwanda	1.6	294
49. Saudi Arabia	41.4	7181
50. Senegal	6.0	685
51. Sierra Leone	4.8	232
52. Singapore	35.8	6842
53. South Africa	27.0	2572
54. Thailand	26.3	862
55. Togo	18.1	398
56. Trinidad and Tobago	28.5	4016
57. Tunisia	23.6	1104
58. Turkey	15.3	1443
59. USA	17.9	17106
60. Uruguay	16.7	2284
61. Venezuela	30.0	2940
62. Zambia	22.5	371

Source: World Development Indicators, 1998.

Table 2

Absolute Income Hypothesis

Cross Section:

$$S/Y = 23.97 - 3665.37(Y/P)^{-1} \qquad (3)$$
$$\quad (18.2) \quad (6.3)$$

$R^2 = 0.40^*$ Obs = 62

Panel with fixed effects:

$$S/Y = 27.73 - 5936.36(Y/P)^{-1} \qquad (4)$$
$$\quad (41.6) \quad (15.2)$$

$R^2 = 0.70^*$ Obs = 1798

Table 3

Life Cycle Hypothesis

Cross Section:

$$S/Y = 10.25 + 2.11(G) \quad (5)$$
$$(4.5)\ \ (3.8)$$
$R^2 = 0.20^*$ Obs = 62

$$S/Y = 18.31 + 2.14(GPCY) - 1.54(POPG) \quad (6)$$
$$(5.8)\ \ (4.4)\ \ (1.2)$$
$R^2 = 0.33^*$ Obs = 61

$$S/Y = 17.86 - 3243.20(Y/P)^{-1} + 1.49(G) \quad (7)$$
$$(8.0)\ \ (5.8)\ \ (3.3)$$
$R^2 = 0.49^*$ Obs = 62

$$S/Y = 19.02 - 2779.83(Y/P)^{-1} + 1.61(GPCY) + 0.51(POPG) \quad (8)$$
$$(6.9)\ \ (4.6)\ \ (3.7)\ \ (0.5)$$
$R^2 = 0.51^*$ Obs = 61

Panel with fixed effects:

$$S/Y = 16.76 + 0.31(G) \quad (9)$$
$$(87.6)\ \ (9.8)$$
$R^2 = 0.71^*$ Obs = 1798

$$S/Y = 13.84 + 0.19(GPCY) + 1.51(POPG) \quad (10)$$
$$(25.5)\ \ (6.9)\ \ (6.5)$$
$R^2 = 0.68^*$ Obs = 1769

$$S/Y = 25.95 - 5361.02(Y/P)^{-1} + 0.23(G) \quad (11)$$
$$(37.1)\ \ (13.1)\ \ (7.4)$$
$R^2 = 0.71^*$ Obs = 1798

$$S/Y = 23.25 - 5382.37(Y/P)^{-1} + 0.12(GPCY) + 1.39(POPG) \quad (12)$$
$$(28.6)\ \ (14.8)\ \ (4.6)\ \ (6.4)$$
$R^2 = 0.72^*$ Obs = 1769

Table 4

Real Interest Rate

Cross Section:

$$S/Y = 19.1 + 0.15(R) \quad (13)$$
$$(7.2)\ (0.5)$$

$R^2 = 0.01$ Obs = 22

$$S/Y = 27.48 - 5257.59(Y/P)^{-1} - 0.29(R) \quad (14)$$
$$(9.0)\quad (3.7)\quad (1.1)$$

$R^2 = 0.12$ Obs = 22

Panel with fixed effects:

$$S/Y = 20.50 - 0.13(R) \quad (15)$$
$$(78.2)\ (5.1)$$

$R^2 = 0.83$* Obs = 396

$$S/Y = 25.59 - 4311.81(Y/P)^{-1} - 0.13(R) \quad (16)$$
$$(17.8)\quad (3.6)\quad (5.1)$$

$R^2 = 0.84$* Obs = 396

Table 5

Quasi-Liquid Liabilities

Cross Section:

$$S/Y = 13.33 + 0.24(QLL) \quad (17)$$
$$(9.9) \quad (4.9)$$

$R^2 = 0.29^*$ Obs = 62

$$S/Y = 19.85 - 2861.70(Y/P)^{-1} + 0.14(QLL) \quad (18)$$
$$(11.1) \quad (4.8) \quad (3.1)$$

$R^2 = 0.48^*$ Obs = 62

$$S/Y = 16.20 - 2740.24(Y/P)^{-1} + 0.11(QLL) + 1.14(G) \quad (19)$$
$$(7.1) \quad (4.7) \quad (2.4) \quad (2.4)$$

$R^2 = 0.53^*$ Obs = 62

$$S/Y = 10.25 - 2982.3(Y/P)^{-1} + 0.17(QLL) + 0.90(GPCY) + 3.48(POPG) \quad (20)$$
$$(3.1) \quad (5.1) \quad (3.1) \quad (1.8) \quad (3.1)$$

$R^2 = 0.57^*$ Obs = 62

Panel with fixed effects:

$$S/Y = 17.52 + 0.18(QLL) \quad (21)$$
$$(97.6) \quad (4.1)$$

$R^2 = 0.66^*$ Obs = 1798

$$S/Y = 27.31 - 5848.73(Y/P)^{-1} + 0.14(QLL) \quad (22)$$
$$(40.3) \quad (14.9) \quad (3.3)$$

$R^2 = 0.70^*$ Obs = 1798

$$S/Y = 25.49 - 5261.36(Y/P)^{-1} + 0.15(QLL) + 0.23(G) \quad (23)$$
$$(35.9) \quad (13.4) \quad (3.5) \quad (7.5)$$

$R^2 = 0.71^*$ Obs = 1798

$$S/Y = 22.42 - 5019.1(Y/P)^{-1} + 0.23(QLL) + 0.20(GPCY) + 1.03(POPG) \quad (24)$$
$$(24.9) \quad (12.5) \quad (4.0) \quad (6.2) \quad (5.7)$$

$R^2 = 0.72^*$ Obs = 1736

Table 6

Inflation

Panel with fixed effects:

$$S/Y = 17.72 + 0.95(\pi) - 0.35(\pi^2) \quad (25)$$
$$(98.2) \quad (2.3) \quad (2.1)$$

$R^2 = 0.68^*$ Obs = 1595

$$S/Y = 29.97 - 7569.55(Y/P)^{-1} + 0.13(\pi) - 0.47(\pi^2) \quad (26)$$
$$(37.3) \quad (15.6) \quad (3.6) \quad (3.1)$$

$R^2 = 0.72^*$ Obs = 1595

$$S/Y = 26.62 - 6653.59(Y/P)^{-1} + 0.15(\pi) - 0.53(\pi^2) + 0.25(G) + 0.40(QLL) \quad (27)$$
$$(27.2) \quad (13.5) \quad (4.0) \quad (3.6) \quad (7.8) \quad (2.3)$$

$R^2 = 0.74^*$ Obs = 1595

$$S/Y = 23.68 - 6397.3(Y/P)^{-1} + 0.15(\pi) - 0.54(\pi^2) + 0.22(GPCY) + 1.34(POPG) + 0.43(QLL)$$
$$(20.3) \quad (12.7) \quad (4.1) \quad (3.7) \quad (6.6) \quad (5.8) \quad (2.4)$$
$R^2 = 0.75^*$ Obs = 1540 (28)

Table 7

Tax Ratio

Panel with fixed effects:

$$S/Y = \underset{(94.8)}{21.91} - \underset{(3.0)}{0.76}(TR) \qquad (29)$$

$R^2 = 0.65^*$ Obs = 552

$$S/Y = \underset{(28.5)}{32.64} - \underset{(9.3)}{11066.51}(Y/P)^{-1} - \underset{(2.4)}{0.56}(TR) \qquad (30)$$

$R^2 = 0.71^*$ Obs = 552

$$S/Y = \underset{(15.9)}{24.68} - \underset{(7.0)}{8193.00}(Y/P)^{-1} - \underset{(3.8)}{0.86}(TR) + \underset{(4.7)}{0.25}(G) + \underset{(5.9)}{0.14}(QLL) \qquad (31)$$

$R^2 = 0.74^*$ Obs = 552

$$S/Y = \underset{(13.3)}{25.70} - \underset{(6.7)}{8128.99}(Y/P)^{-1} - \underset{(2.9)}{0.70}(TR) + \underset{(4.7)}{0.25}(GPCY) - \underset{(0.3)}{0.23}(POPG) + \underset{(5.5)}{0.14}(QLL)$$

$R^2 = 0.74^*$ Obs = 529 (32)

$$S/Y = \underset{(16.2)}{25.14} - \underset{(7.7)}{9123.92}(Y/P)^{-1} - \underset{(3.9)}{0.86}(TR) + \underset{(5.4)}{0.29}(G) + \underset{(6.0)}{0.14}(QLL) + \underset{(2.7)}{0.80}(\pi) - \underset{(2.0)}{0.97}(\pi^2)$$

$R^2 = 0.75^*$ Obs = 552 (33)

$$S/Y = \underset{(13.5)}{26.04} - \underset{(7.4)}{9054.80}(Y/P)^{-1} - \underset{(3.0)}{0.71}(TR) + \underset{(5.4)}{0.30}(GPCY) - \underset{(0.2)}{0.12}(POPG) + \underset{(5.6)}{0.14}(QLL) + \underset{(2.6)}{0.77}(\pi) - \underset{(1.9)}{0.94}(\pi^2) \qquad (34)$$

$R^2 = 0.75^*$ Obs = 529

Figure 1

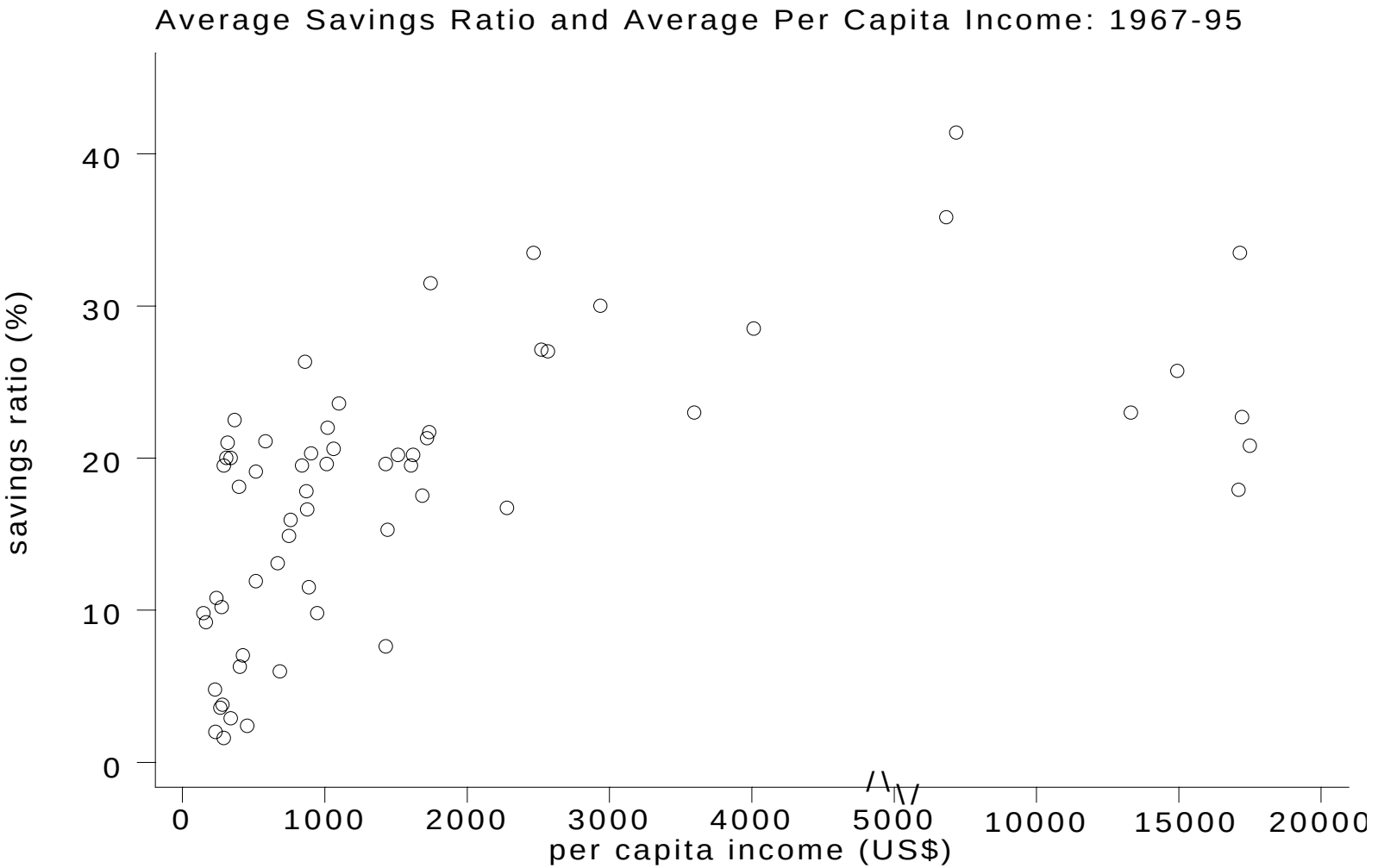
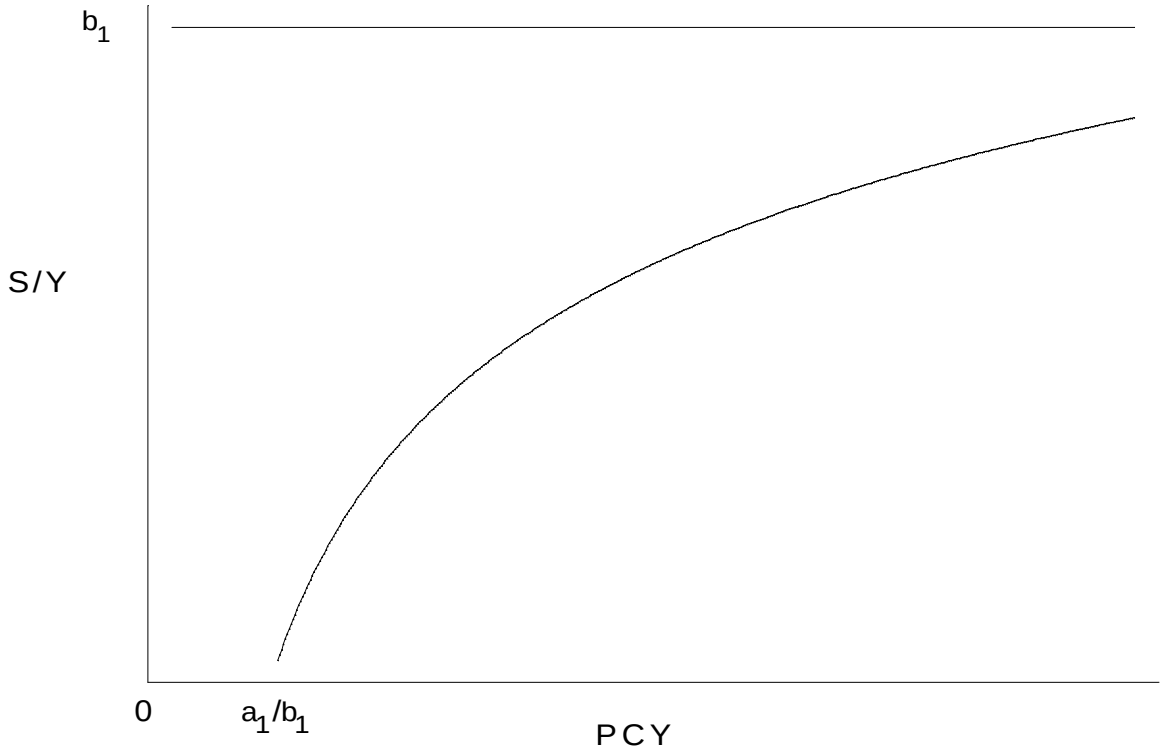

Average Savings Ratio and Average Per Capita Income: 1967-95
savings ratio (%)
0
10
20
30
40
0
1000
2000
3000
4000
5000
10000
15000
20000
per capita income (US$)

Figure 2



APPENDIX

This appendix discusses variable definitions, where the data source is the World Bank CD (World Development Indicators, 1998).

Gross domestic savings (% of GDP)
Gross domestic savings are the difference between GDP and total consumption.

Tax revenue (% of GDP)
Tax revenue comprises compulsory, unrequited, nonrepayable receipts for public purposes collected by central governments. It includes interest collected on tax arrears and penalties collected on nonpayment or late payments of taxes and is shown net of refunds and other corrective transactions.

Real interest rate (%)
Real interest rate is the deposit interest rate less the rate of inflation measured by the GDP deflator. Deposit interest rate is the rate paid by commercial or similar banks for demand, time, or savings deposits.

Money and quasi money (M2) as % of GDP
Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government.

Inflation, GDP deflator (annual %)
Inflation as measured by the annual growth rate of the GDP implicit deflator. GDP implicit deflator measures the average annual rate of price change in the economy as a whole.

Real GDP
Real GDP is estimated using data for GDP at market prices (constant 1987 US$). Dollar figures for GDP are converted from domestic currencies using 1987 official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used.

Quasi-liquid liabilities (% of GDP)
Quasi-liquid liabilities are the sum of currency and deposits in the central bank (M0), plus time and savings deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase agreements, plus travellers' checks, foreign currency time deposits, commercial paper, and shares of mutual funds or market funds held by residents. They equal the M3 money supply less transferable deposits and electronic currency (M1).

Distribution of income
Distribution of income measures the percentage share of income received by the richest 10 percent of population.

Population
Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. Refugees not permanently settled in the country of asylum are generally considered to be part of the population of their country of origin.

Domestic credit provided by banking sector (% of GDP)

Domestic credit provided by the banking sector includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions where data are available (including institutions that do not accept transferable deposits but do incur such liabilities as time and savings deposits). Examples of other banking institutions are savings and mortgage loan institutions and building and loan associations.