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**Empirical Determinants of Household Saving: Evidence from OECD Countries**

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**Abstract**

This paper analyzes the empirical determinants of household saving using data from 21 OECD countries for 1975–95. A particular focus is the influence of the tax and social security systems on household saving. The paper therefore extends the usual set of explanatory variables used to explain household saving behavior to include variables that capture the structure of the tax system and the financing and generosity of the social security and welfare system. These variables are found to have an important impact on household saving. Accordingly, by changing the design of these systems, governments may be able to influence saving.

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### SUMMARY

This paper adds to the existing literature on the empirical determinants of saving behavior in two ways. First, it focuses on household, rather than aggregate, private saving in a cross-country framework. Second, it considers the possible impact of the tax and the social security and welfare systems on household saving behavior.

Cross-section and panel estimation techniques are applied to data from 21 OECD countries over the period 1975–95. Variables that capture the structure of the tax system and the financing and generosity of the social security and welfare system are added to the set of potential explanatory variables. The results indicate that there is an important role for public and corporate saving, growth, and demographics in influencing household saving, while some role is also found for inflation, unemployment, the real interest rate, and financial deregulation. The results also suggest that the tax and the social security and welfare systems have an important impact on household saving. Specifically, a higher reliance on direct income taxes as opposed to indirect taxes appears to be associated with lower saving, while higher government transfers to households are also associated with lower saving.

These findings suggest that public policy has an influence on the household saving decision, not only through the level of public saving itself, but also through the tax and social security systems. Consequently, the impact on household saving is one factor that needs to be considered in designing, or changing, tax and social security systems.

## I. INTRODUCTION

This paper seeks to add to the existing literature on the empirical determinants of saving behavior in two ways: by focusing on household, rather than aggregate private saving, in a cross-country framework; and by expanding the usual set of explanatory variables to allow for the possible impact of the tax structure and the social security and welfare systems on household saving behavior. We use a data set consisting of 21 OECD countries over the period 1975–95.

A number of cross-country studies have provided useful insights into the determinants of saving behavior by analyzing the widely differing experiences in saving performance between countries, as well as within countries over time. The use of cross-section and panel data techniques have a number of advantages over individual country time-series studies of saving behavior. As saving represents an intertemporal decision on the part of the household, often related to life-cycle considerations, the relatively short period for which time-series data is usually available (often less than one generation) means that the information contained in the data is unlikely to be rich enough to adequately capture the influences on lifetime saving decisions. Further, many of the variables that influence the saving decision change only slowly over time (demographics, tax structure, etc.) and, given this lack of time-series movement, are unlikely to be significant in a single country time-series regression. This problem can be overcome to some extent by including in the analysis a number of countries which have had different experiences with regard to saving, as this will enrich the information contained in the data set (also, more precise coefficient estimates will be obtained).

Most cross-country studies, however, have focused on national or aggregate private saving, rather than household saving. This is principally due to concerns about the consistency and comparability of household saving data across countries, but also to the interrelated nature of corporate and household saving decisions (with households being viewed as largely piercing the “corporate veil”). However, this focus assumes, rather than tests, the transparency of the corporate veil in the household saving decision, and does not allow for the differing motives that are likely to underlie household and corporate saving decisions.<sup>1</sup> Most fundamental household saving, *per se*, is important because this is the component of saving—rather than public or corporate saving—that economic theory tells us most about. Consequently, this paper focuses on household saving.

There has been increasing interest in the impact of public policy on household saving behavior. However, while there have been a number of individual country studies that have looked at these issues, few have used cross-country data. In this paper, we use cross-country

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<sup>1</sup>For the sample of 21 OECD countries used in this paper, the correlation coefficient between household and private saving is 0.75, suggesting that, while household saving is the primary driver of private saving, movements in other private saving is also important.

data and introduce variables that aim to capture the structure of the tax system, and the method of financing and generosity of the social security and welfare systems in each country.

The rest of the paper is organized as follows: Section II reviews recent trends in household saving in OECD countries; Section III discusses the likely determinants of household saving behavior, concentrating on the possible influence of the tax structure, and the social security and welfare systems; Section IV presents the empirical results of the cross-country and panel estimations; and Section V concludes.

## **II. TRENDS IN HOUSEHOLD SAVING IN OECD COUNTRIES**

Table 1 shows average household saving (as a percentage of household disposable income) in 21 OECD countries for the period 1975–95, and for three subperiods 1975–81, 1982–89, and 1990–95. Several observations can be made:

- Household saving differs greatly among OECD countries at any point in time.
- The average household saving rate in the 21 OECD countries declined from 13 percent during 1975–81 to just under 11 percent in 1982–89, but has remained broadly unchanged since.
- Most countries have kept their relative position within the ranking of household saving over time. For example, households in Japan and many continental European countries have remained relatively high savers, whereas those in the Scandinavian countries and the United States have remained relatively low savers. Exceptions are Australia, New Zealand, and Switzerland whose positions have changed quite significantly. While remaining near the top of the group, the saving rates in several of the high-saving countries (Ireland, Italy, Japan, and Portugal) also declined quite significantly.

## **III. DETERMINANTS OF HOUSEHOLD SAVING**

The theoretical literature suggests a variety of motives for household saving. In broad terms, these motives can be grouped into four categories: to provide resources for retirement and bequests; to finance expected large lifetime expenditures (including house purchase and education); to finance unexpected losses of income (precautionary saving); and to smooth the availability of financial resources over time to maintain a more stable consumption profile.

These saving motives, in turn, suggest a large number of variables that may influence household saving decisions. Among the most commonly used in empirical studies are: government saving, corporate saving, growth, demographics, household wealth, unemployment, real interest rate, inflation, terms of trade, and proxies for financial deregulation (see Aghevli and others (1990) and Masson and others (1995) for a more extensive discussion of the impact of these variables on saving).

The impact on household saving of some of these variables are well defined and are both theoretically and empirically consistent. For example, government saving is expected to have a negative impact on household saving and, indeed, many country studies find this to be the case, with a negative coefficient of around one-half. Further, the life-cycle hypothesis (LCH) implies that the higher the old-age dependency ratio (defined as the proportion of the population aged over 65 to the working-age population), the lower will be aggregate household saving, as these people dissave in retirement. This finding is generally supported by both econometric evidence, and by survey information which shows that the age-specific saving rate peaks toward the end of the working life and falls in retirement (although savings are not run down to zero as implied by the simple LCH).<sup>2</sup>

For some other variables, however, there remains a good deal of uncertainty about the direction of impact. The impact on saving of a change in the real interest rate, for example, is theoretically ambiguous because of opposing income and substitution effects, while, empirically, it is sometimes found to have a small positive impact on saving, but often to be insignificant. The difficulty in finding a significant impact from the real interest rate may be attributable to difficulties in specifying the relevant interest rate. Strictly speaking, the after-tax real interest rate (calculated using marginal tax rates) should be used, but it is difficult to calculate such rates accurately from the available data. The impact of growth on saving is also unclear theoretically, but empirically saving and growth are highly correlated over long time horizons as well as for many regions and stages of development, with higher rates of growth being associated with higher saving (see Schmidt-Hebbel and others, 1996).<sup>3</sup> Financial deregulation is also an important influence on household saving with an ambiguous direction of impact *a priori*: development of the financial system may increase the opportunities for, and returns to, financial saving, but it may also enhance access to credit and ease liquidity constraints faced by households and could, therefore, at least initially, lead to lower household saving (see Bayoumi, 1993).

In addition to these factors, the structure of the tax and social security and welfare systems are likely to have an impact on each of the saving motives highlighted above. The following paragraphs elaborate on this.

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<sup>2</sup>For most of the G-7 countries, the cohort aged 55–59 years has the highest saving rate. The exception is Italy, where the cohort aged 65–69 years displays the highest saving rate (Poterba, 1994).

<sup>3</sup>The LCH suggests that higher income growth would, for a given saving rate in each group, raise aggregate saving by increasing the incomes of those in work relative to those not working. However, it is also possible for saving rates within the working population to decline if workers anticipate higher future income and thus increase their current consumption. At an empirical level, Carroll and Weil (1993) find growth to Granger-cause saving, but saving not to Granger-cause growth.

The structure of the tax system may influence saving both by changing lifetime wealth and by affecting the rate of return on saving. While under any form of taxation lifetime consumption possibilities are reduced, a consumption or expenditure tax leaves unaltered the relative price of present and future consumption because the tax applies to both. The same holds true for an income tax with capital income exempt from taxation. However, if capital income is taxed, as common in most countries,<sup>4</sup> the price of future relative to present consumption increases, and this distorts the intertemporal resource allocation decision by effectively taxing saving twice—once on the income from which the saving is made, and once on the return on savings. Even if the supply of saving is little affected by the rate of return, the intertemporal inefficiency resulting from the distortion of relative prices due to “double taxation” of saving remains (see Boadway and Wildasin, 1994). This problem is aggravated in the presence of inflation when the tax system is not indexed and taxes nominal returns (see Feldstein, 1978). For example, an increase in expected inflation matched by an equal increase in the nominal interest rate will lower the after-tax real rate. However, this higher nominal return is compensation for inflation and does not represent income in a strict sense and should not be taxed.

There are two further reasons why income taxes may be detrimental to saving at a macroeconomic level. First, since income taxes are generally progressive, high-income households—generally the high savers—are affected more.<sup>5</sup> Second, the working-age population—which comprises the high-saving age groups—pay the bulk of direct taxes; indirect taxes, in contrast, are more evenly distributed across income and age groups. Of course, there are good equity reasons for this progressivity in the tax system, and it is difficult to make an argument for changing it in order to promote saving.

The tax structure differs considerably among OECD countries. In Australia, Canada, New Zealand, and the United States there is a heavy reliance on direct taxes, with more than one-half of general government revenue being raised through this source in the latter two countries. The position is significantly different in many European and Scandinavian countries, where less than one-third of tax revenue is raised from direct taxes (Chart 1).

The coverage and generosity of the social security and welfare systems, as well as certain other government “in-kind” transfers, may influence household saving in a number of ways. Governments typically provide a range of benefit payments that cushion individuals from potential income losses (for example, unemployment), from large unanticipated expendi-

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<sup>4</sup>Although most tax systems have concessions that remove the double taxation on some types of saving.

<sup>5</sup>Information from household surveys provided in Poterba (1994) shows that household saving rates are strongly progressive. For example, in the highest-income quintile they are 17 percent in Canada and Germany, 24 percent in the United Kingdom, and 42 percent in Japan, in the lowest-income quintile they are close to zero, and even negative in Canada and Germany.

tures (for example, health expenditures), or reduce the need for private asset accumulation for retirement. Benefits, such as unemployment or welfare benefits, can substitute for precautionary private saving. Given that a number of studies have found a significant proportion of household saving to be of a precautionary nature (for example, Skinner, 1988), changes in these benefits could have a significant impact on the level of household saving. Further, governments provide substantial assistance to households through the free or subsidized provision of goods and services—"in-kind" benefits—such as education, health care, and public housing. Such benefits lower the need for personal saving to cover expenditures in these areas.

Public pension benefits can substitute for private provision as long as the expected benefits, net of contributions, have a positive present value. The introduction or extension of public pension schemes could thus lower household saving (the wealth effect)—however, if they lead to earlier retirement (the retirement effect) or increase awareness of the need to provide for old-age resources, they may actually lead to higher saving. Existing empirical evidence on the impact of public pensions on household saving has generally been inconclusive. Feldstein (1980) argued that public pension schemes have a negative impact on private saving, but his findings have been disputed on empirical and theoretical grounds (for example, Koskela and Viren, 1983), while others (for example, Kopits and Gotur, 1980) have found social security arrangements to generally boost saving.

The overall impact of the social security and welfare systems on individual saving behavior is likely to be dependent on a number of features of the systems including: the value of the benefit payments (the higher the replacement ratio—defined as the entitlement as a percentage of previous earnings—the less incentive there is for private provision); the length of time over which payments are available; the certainty with which people regard the future payment of such benefits; and the general availability of such payments, that is, the extent of "means-testing."

In addition to the expenditure characteristics of the social security system, the financing of the system may also affect household saving. The system can be financed either from specific social security contributions or from general tax revenue. While social security contributions are generally levied as a fixed proportion of income, income tax rates are generally progressive. Further, compulsory contributions generally begin at very low income levels and are capped at high incomes; by contrast, income taxes generally exempt very low incomes and are not capped at high incomes. Therefore, tax financing shifts the financing burden toward higher-income earners relative to contribution financing. Since low-income households have been found to save little, and saving rates rise strongly with incomes, a higher reliance on tax financing may lower aggregate household saving. For these reasons, household saving is likely to be influenced by both gross and net government transfers to households (the latter defined as gross transfers less social security contributions). Gross transfers matter because they measure the generosity of the system, which affects the incentives to save. Net transfers are important because they measure the financing of the system, and affect saving through distributional channels.

There are important differences in both the generosity and financing of the social security and welfare systems across countries. In most industrial countries, the main purpose of the social security system is income maintenance. Benefit payments are financed mainly through specific contributions, are conditional on establishing a contribution history, are usually based on some average (from a few years to a lifetime) of past earnings, and are not means-tested. This setup applies to most European countries. However, the social welfare systems in Australia and New Zealand are different. Their primary focus is poverty alleviation, they are financed from government tax revenue, and receipt of a welfare or pension payment is conditional on a range of qualifying conditions being met (a “means” test).

A large increase in both gross and net social security and welfare transfers to households is apparent in many OECD countries since the 1970s (Chart 2). The increase in gross transfers indicates that a growing share of resources are being channeled through the public sector for income maintenance. While some of the overall increase is due to demographic factors and the rise in unemployment, it is also due to the increase in the comprehensiveness and generosity of the welfare system. Net transfers have also risen, indicating that contributions were insufficient to meet expenditures, and transfers were increasingly financed from general tax revenue.

While gross transfers in the continental European countries are significantly higher than in other countries, in terms of net transfers the situation is reversed as those countries with high gross transfers also have high social security contribution rates. In Australia and New Zealand, where social welfare spending is made directly from general revenues, net transfers to households (as a percent of GDP) are the highest in the OECD and the difference between gross and net transfers is small.

#### IV. DATA ANALYSIS, ESTIMATION ISSUES, AND ESTIMATION RESULTS

The sample used in the estimation work that follows is annual data from 1975 to 1995 for the 21 OECD countries listed in Table 1. The dependent variable in the regressions is the ratio of household saving to GDP (*HSave*).<sup>6</sup> The set of explanatory variables is as follows (the exact definitions and the data sources are in the Annex).<sup>7</sup>

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<sup>6</sup>GDP, rather than household disposable income, is used as the denominator in the regressions to try to minimize the possible correlations between the tax structure and the social security and welfare systems and the dependent variable.

<sup>7</sup>Data on household wealth could not be obtained for many of the countries in the sample and was therefore not included as a regressor. A number of other variables were also included in the specification, but did not show up significantly in either the cross-section or the panel regressions. These variables were: the total and the young dependency ratio (people under 15 and above 64 years of age, and people under 15 years of age, respectively, in relation to

(continued...)

|   |   |
|---|---|
| <i>PubSav:</i>                          | the ratio of the general government surplus to GDP (as a proxy for public saving)   |
| <i>CorpSav:</i>                         | the ratio of corporate saving to GDP  |
| <i>IncLev:</i>                          | the level of income per capita in country <i>i</i> relative to the United States measured in items of purchasing power  |
| <i>IncGrow:</i>                         | the growth rate of household disposable income  |
| <i>Unemp:</i>                           | the unemployment rate   |
| <i>Realr:</i>                           | the real interest rate defined as the 3-month interest rate less actual inflation;  |
| <i>Inf:</i>                             | the inflation rate  |
| <i>OldDep:</i>                          | the ratio of people aged 65 and over to the working-age population  |
| <i>DirTax</i> and<br><i>InTax:</i>      | the shares of direct and indirect taxes in general government tax revenue   |
| <i>Transfer:</i>                        | government transfers to the household sector, both in gross terms ( <i>Grosstrans</i> ) and net of social security contributions paid by households ( <i>Nettrans</i> ) |
| <i>ConsCredit</i><br>and <i>Ccards:</i> | the ratios of outstanding consumer debt to GDP and the number of outstanding credit cards per capita, as proxies for financial deregulation. <sup>8</sup>               |

Two important issues to consider in the measurement of household saving over time and across countries are:<sup>9</sup> the demarcation between household and corporate saving in the national accounts; and the impact of inflation on measured saving. Regarding the first, under the *System of National Accounts* (1993, p. 105ff.), the household sector is defined to include unincorporated enterprises. However, the distinction between households and corporates is not always clear-cut. Whereas incorporated family businesses are included in the corporate sector, unincorporated businesses that are distinct entities are included in the household sector. Such definitional issues may cause problems in allocating income and saving across the different sectors in the economy, and these problems may vary between countries. Further, any changes in the incentives to incorporate over time (for example, for tax purposes), or between different countries, may also affect the split between household and corporate saving. While it is not possible to make adjustments to the data to account for these effects, they are likely to get picked up in the regressions presented in the next section in the coefficient on corporate saving. Second, sectoral measures of saving (and indeed national saving if the

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<sup>7</sup>(...continued)

the working-age population); various unemployment replacement rates (data taken from OECD Economic Surveys, Australia, 1997); different components of government expenditure; and changes in the terms of trade.

<sup>8</sup>These proxies for financial deregulation were only available for a limited sample (1980–95 for 18 countries).

<sup>9</sup>See Elmeskov and others (1991) for an extensive discussion of issues relating to the definition and measurement of saving.

country is a significant net debtor) are affected by inflation. The household sector is usually a net holder of corporate and public debt. With inflation, the household sector incurs capital losses on these holdings; these are not measured in the national accounts and, therefore, the income and saving of the household sector is overstated during periods of inflation. With the corporate sector generally being a net debtor, the inflation effect is reversed, and this can be a source of a negative correlation between household and corporate saving.

The means and the average standard deviations of the dependent and explanatory variables over time are shown in Table 2. While some variables are relatively similar across countries and vary mostly over time, other variables differ greatly among countries, but are relatively constant over time. A formal analysis of the cross-country and time-series variation of the variables as a percent of the total variation is contained in Table 3. This analysis splits the total variation of a given variable,  $x_{it}$  (where  $i$  and  $t$  are time and country indices, respectively, and  $T$  is the number of periods), into its two components as follows:

$$(1) \quad \sum_i \sum_t (x_{it} - x_{iT})^2 = \sum_i T(x_{iT} - x_{IT})^2 + \sum_i \sum_t (x_{it} - x_{iT})^2$$

Total variation = cross-country variation + variation over time

where  $x_{IT}$  is the grand mean over countries and time, and  $x_{iT}$  is the time average for country  $i$ . As can be seen, for household saving the majority of the total variation is due to cross-country variation, with only a relatively small proportion coming from variation over time. Of the explanatory variables, growth, inflation, and real interest rate are predominantly time-series variables, varying little across countries. The tax structure and the old-age dependency ratio are at the other end of the spectrum, varying predominantly across countries, but changing little over time. Interestingly, net and gross transfers behave somewhat differently: while the time-series component of the total variation of gross transfers is close to 30 percent, it is less than 15 percent for net transfers. This is because, while gross transfers increased significantly in many countries, social security contribution rates were also raised and, as a result, net transfers have increased less than gross transfers.

### A. Cross-Section Estimates

This subsection seeks to explain the differences in household saving across countries. To do this, five sets of regressions were estimated: averages over the full-time horizon (1975–95), over three sub-periods (1975–81, 1982–89, 1990–95), and a pooled regression where the three subperiods were stacked (to yield 63 observations).

The equation estimated is a standard household saving equation with additional variables added to capture the structure of the tax system, the social security and welfare systems, and to proxy financial deregulation.

$$(2) \quad Hsave_i = \alpha + \beta_1 PubSav_i + \beta_2 CorpSav_i + \beta_3 IncLev_i + \beta_4 IncGrow_i \\ + \beta_5 Unemp_i + \beta_6 Realr_i + \beta_7 Inf_i + \beta_8 OldDep_i + \beta_9 DirTax_i \\ + \beta_{10} Intax_i + \beta_{11} Transfer_i + \beta_{12} ConsCredit_i + \epsilon_i$$

with  $i = 1..21$  ( $i = 1..63$  in the pooled regression),

where  $i$  is the country index.

It is possible that household saving is determined simultaneously with some of the explanatory variables in the regression, particularly the income level, income growth, public saving, and corporate saving. If such an endogeneity problem exists, the coefficient estimates will be biased and inconsistent. Unfortunately, in cross-section estimation it is usually difficult to address this issue because of a lack of appropriate instruments. In the regressions for the 1982–89 and 1990–95 subperiods, observations from the previous subperiod could be used as instruments. However, while the income level and income growth variables were reasonably correlated across subperiods, making them potential instruments, those for public and corporate saving were not, making the lags of these inappropriate instruments. Consequently, the regressions for the 1982–89 and 1990–95 subperiods were estimated using instrumental variables (instruments used were the income level and income growth from the previous subperiod), but OLS was used for the other periods. The estimation results are given in Table 4 (which does not report variables that were insignificant in all the regressions).

The best fit is obtained for the average over the whole time period (1975–95), although the results are relatively stable across four of the five regressions.<sup>10</sup> The exception is the 1990–95 subperiod when the fit of the equation and the significance of several of the regressors declines sharply.<sup>11</sup> The results indicate the following:

- the ratio of direct taxes to total government revenue has a negative and significant impact on household saving, while the ratio of indirect taxes has no significant impact. The ratio of direct-to-indirect taxes was also found to be negative and significant in the regressions.<sup>12</sup>

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<sup>10</sup>In all the regressions, a White test was used to test for heteroscedasticity. The results indicated that homoscedasticity could not be rejected.

<sup>11</sup>This is similar to the results reported by Masson and others (1995) who suggest it may be due to the increased integration of domestic and international financial markets which has reduced the linkages between saving, investment, and growth, and between private and government saving.

<sup>12</sup>Several studies have found that indirect taxes are not positively correlated with saving. The finding here, and in the panel estimation, is consistent with this, but suggests that, to the extent they allow a decline in direct taxes, saving would increase.

- net government transfers to the household sector are negative and significant, with the coefficient indicating quite a large impact. However, there is no consistent correlation between gross transfers and household saving in the cross-section regressions.<sup>13</sup>
- households adjust their saving in response to changes in both public and corporate saving. The offset to changes in public saving is significantly higher than generally found in time-series studies (about 0.5) and, in several of the regressions, full Ricardian equivalence cannot be rejected. The coefficient on corporate saving of 0.4–0.7 indicates that households partially pierce the corporate veil and offset higher savings in corporations through lower own saving.
- income growth positively affects household saving, while the negative coefficient on the level of per capita income relative to the United States points to a convergence effect, with households in less prosperous countries tending to save more than their counterparts in richer countries.
- unemployment is detrimental to saving, suggesting that the impact from lower incomes dominates the positive effect from the increased need for precautionary saving.
- a standard demographic impact is found, with a higher old-age dependency ratio being associated with lower household saving. The young-dependency and overall-dependency ratios were also tested, but were not found to be significant.
- inflation and the real interest rate were not found to be significant in explaining cross-country variations in household saving. This is probably due to the fact that, on average, these two variables vary little across most of the countries in the sample. On a more limited sample, the proxies for financial deregulation were found to be negatively correlated with household saving, but not significant in a consistent manner (results not reported).

## **B. Panel Estimations**

In this subsection, both the cross-country and time-series information in the data are exploited through panel estimations. A fixed-effects specification is used, which allows for

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<sup>13</sup>Unemployment benefit replacement ratios and pension replacement rates were also tried on a more limited sample as proxies for the generosity of the social security and welfare systems. However, the results were too sensitive to changes in the equation specification to yield any robust conclusions.

country-specific intercepts and assumes that any omitted variables are country specific and constant over time. The general form of the model to be estimated is:

$$y_{it} = \alpha I + \beta'x_{it} + u_{it} \quad i = 1..N, \quad t = 1..T$$

where  $y_{it}$  is the matrix of the dependent variable,  $\alpha$  the country specific intercept term,  $I$  the unit matrix,  $\beta$  a vector of coefficients,  $x_{it}$  the matrix of explanatory variables, and  $u_{it}$  an error term.<sup>14</sup>

Four issues need to be considered in the estimation: stationarity, heteroscedasticity, autocorrelation, and endogeneity. In our framework, many of the variables are expressed in ratios which are bound between zero and unity, and can therefore be considered stationary in the long run. On the basis of formal tests, unit roots were rejected in all but a few country variables. While it might be expected that heteroscedasticity would be low given the relative homogeneity of the sample, tests reject homoscedasticity for some of the specifications, and the White-adjusted covariance matrix is therefore applied in the reported results. Autocorrelation also arises in some of the specifications, and an autocorrelation adjustment is included in the results table. As discussed earlier, it is possible that some of the explanatory variables are endogenous. The usual approach to this problem is to use instrumental variables, although, in this case, the variables to be used as instruments (the first lag of growth, public, and corporate saving) are predetermined, rather than strictly exogenous, so the problem with inconsistent estimates remains as a fixed effects model is used. This problem could be addressed by estimating in first-differences and using predetermined instruments. However, there is then a problem of finding appropriate instruments as there is only very weak correlation between the first-difference of growth, public saving, and corporate saving and their respective lag, indicating that the lag is not an appropriate instrument.

Six sets of results are presented in Table 5: a general equation; a restricted equation (dropping the insignificant variables); the restricted equation reestimated using instrumental variables; the restricted equation adjusted for heteroscedasticity; the restricted equation adjusted for implicit autocorrelation (adjustment used is of the Prais-Winston type<sup>15</sup>); the restricted equation estimated in first-differences; and the restricted model reestimated with aggregate private saving as the dependent variable (in which case corporate saving is excluded as an explanatory variable).

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<sup>14</sup>The OLS assumption of a common intercept was tested and rejected on the basis of a simple F-test in the reported regressions that follow.

<sup>15</sup>With this adjustment, the dependent variable,  $y$ , becomes  $(1-pL)y$ , where  $p$  is the estimated autocorrelation coefficient and  $L$  is the lag operator. The explanatory variables are adjusted in the same manner.

Most of the results from the cross-section analysis carry through to the panel estimation, and the results are also fairly robust across the different specifications of the panel itself:

- the ratio of direct taxes to total government revenue is again found to have a significant negative impact on saving, while the indirect tax ratio is insignificant.
- in contrast to the cross-section results, gross transfers are significant in the panel, but net transfers have no significant impact on household saving. A possible interpretation of this difference between the cross-section and panel results is that, whereas over a short time horizon (captured in the panel), households respond to changes in transfers as they affect their current incomes, over the longer term, households realize that they have to finance the additional payments through higher contributions, and only react to the net amount.
- households act to offset changes in public and corporate saving, but the offset coefficients (of about 0.4 and 0.15, respectively) are much smaller than in the cross-section analysis. Given that the coefficient on public saving in the regression for aggregate private saving is very close to that for household saving, this implies that the link between government saving and corporate saving is small.
- income growth has a strong positive influence on household saving.
- the old-age dependency ratio is negatively correlated with household saving.
- the real interest rate is significant in some specifications.
- inflation is positively related to household saving, probably proxying for measurement biases in national account measures of saving caused by the inflation component in nominal interest payments.<sup>16</sup>
- the ratio of outstanding consumer debt to GDP is negative and significant in the more limited sample (Table 5, last columns).<sup>17</sup>

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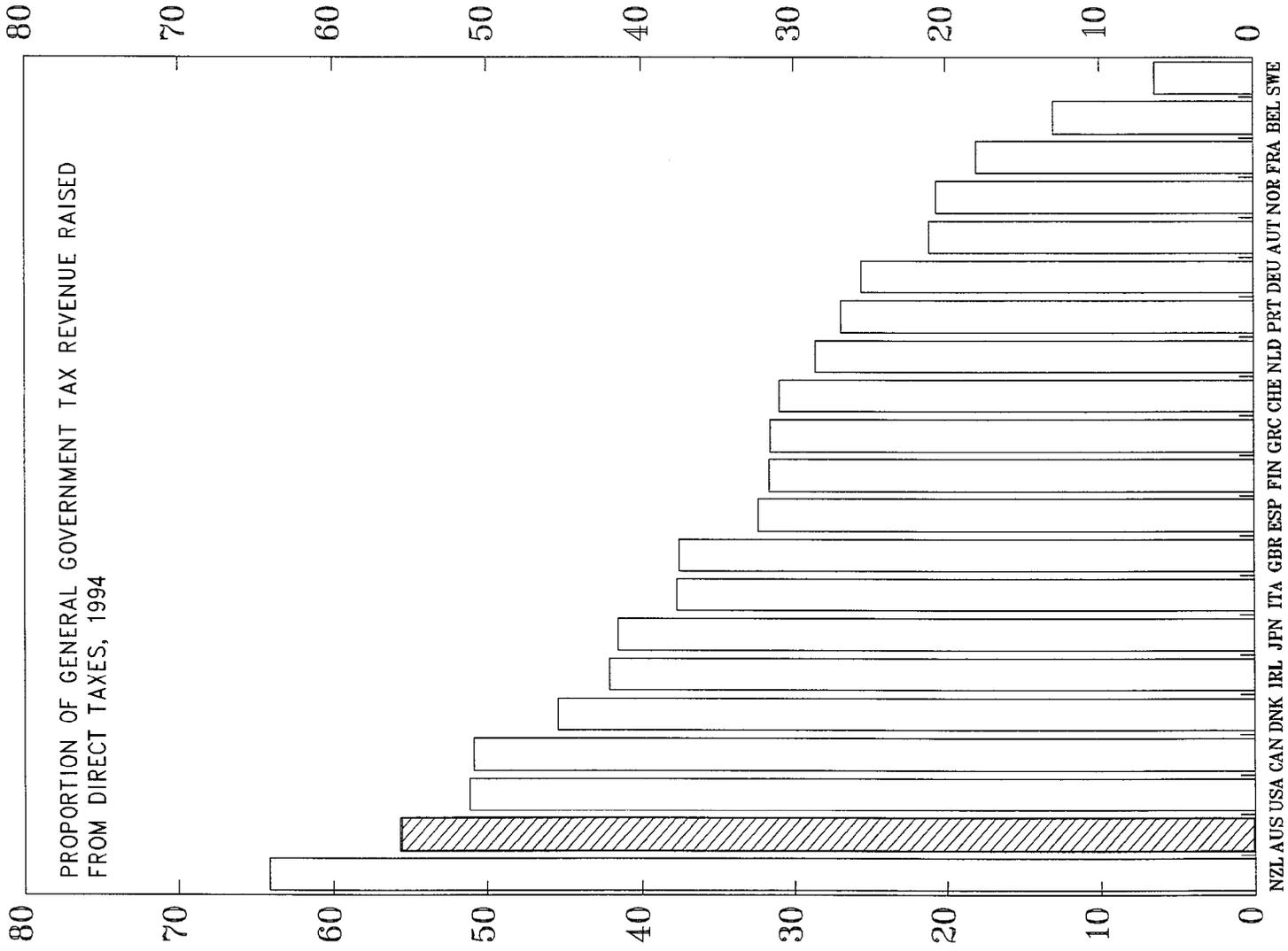
<sup>16</sup>In the regression for private saving, inflation is insignificant. This difference between the results for household and private saving is likely due to the fact that while the household sector is usually a net lender, this is not necessarily the case for the private sector as a whole.

<sup>17</sup>Including consumer credit significantly reduces the size of the fixed-effect dummy for Australia, the United Kingdom, and the United States, suggesting that some important information is added by the inclusion of this variable for these countries.

## V. CONCLUSIONS

This paper has used data from a number of industrial countries to investigate the determinants of household saving. The empirical results indicate that public and corporate saving, growth, and demographics are all important determinants of household saving, while some role was also found for inflation, unemployment, the real interest rate, and financial deregulation. A particular focus of the paper has been the impact of public policy on household saving behavior. In the estimation work, variables that capture the structure of the tax system and the financing and generosity of the social security and welfare systems were found to be important determinants of household saving. Specifically, a higher reliance on direct income taxes as opposed to indirect taxes appears to be associated with lower household saving, while higher government transfers to households are associated with lower saving. These findings suggest that public policy has an influence of the household saving decision, not only through the level of public saving itself, but also through the tax and social security systems. The impact on saving is one factor that needs to be considered in designing or changing tax and social security systems.

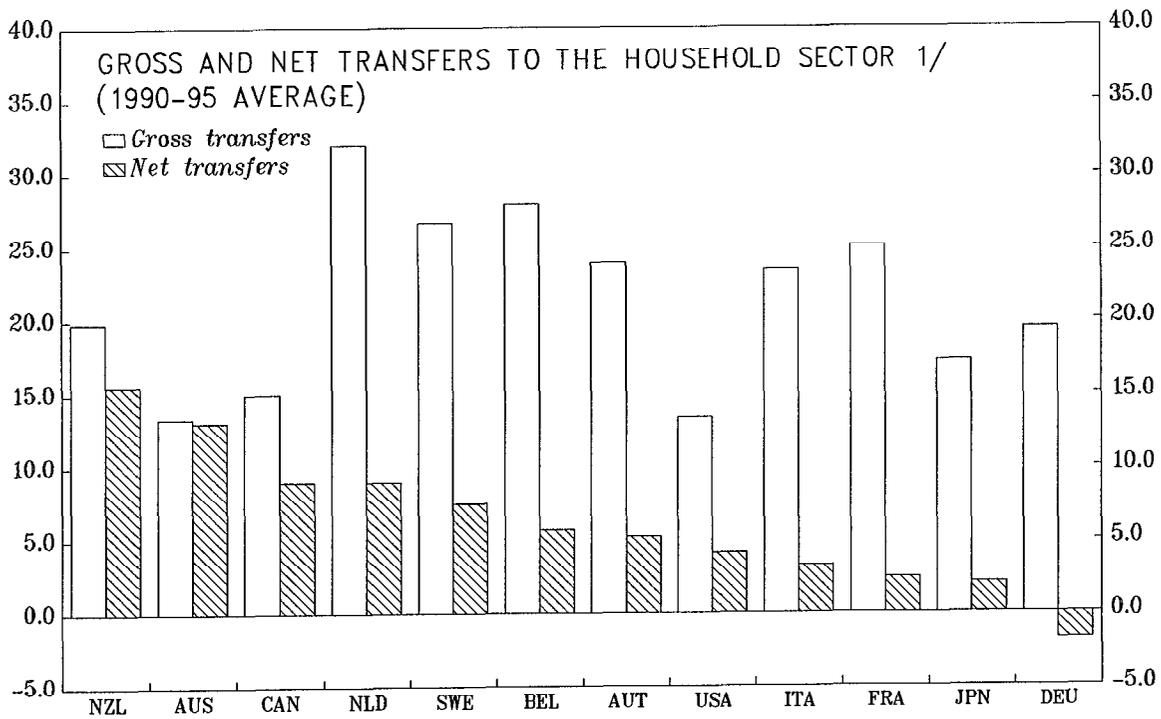
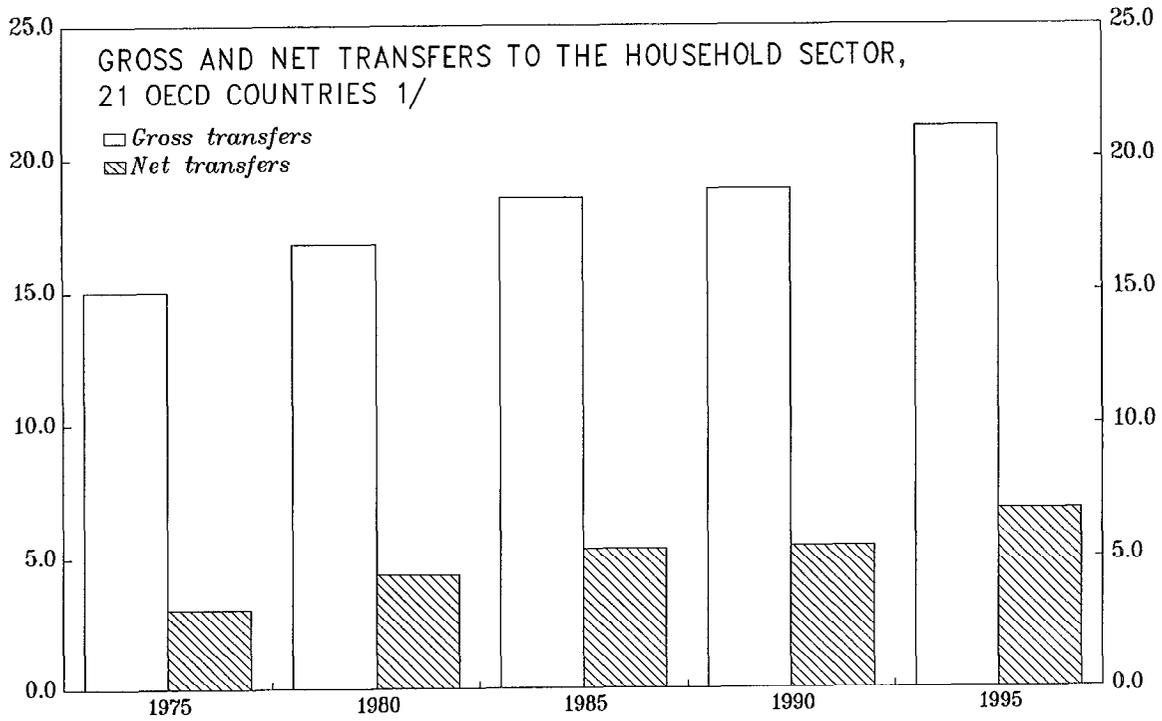
### TAX STRUCTURE IN 21 OECD COUNTRIES (in percent of GDP)



Source: International Monetary Fund, Government Finance Statistics.

CHART 2  
AUSTRALIA

TRANSFERS IN THE OECD  
(In percent of GDP)



Source: OECD Analytical Database.

1/ Net transfers, defined as gross transfers net of social security contributions paid by households, indicate the amount of transfers financed from general tax revenues.

Table 1. Household Saving Rates in OECD Countries

(In percent of disposable income, averages)

|                    | 1975–81<br>Average |                    | 1982–89<br>Average |                    | 1990–95<br>Average |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| 1. Italy           | 24.9               | 1. Greece          | 21.3               | 1. Greece          | 18.3               |
| 2. Portugal        | 24.4               | 2. Portugal        | 21.0               | 2. Belgium         | 18.2               |
| 3. Greece          | 22.1               | 3. Italy           | 19.8               | 3. Italy           | 18.2               |
| 4. Japan           | 20.4               | 4. Ireland         | 15.6               | 4. Portugal        | 15.7               |
| 5. Ireland         | 19.7               | 5. Belgium         | 15.5               | 5. France          | 13.6               |
| 6. France          | 18.8               | 6. Japan           | 14.9               | 6. Austria         | 13.3               |
| 7. Belgium         | 17.9               | 7. France          | 13.5               | 7. Japan           | 13.0               |
| 8. Germany         | 13.1               | 8. Netherlands     | 12.6               | 8. Netherlands     | 12.8               |
| 9. Canada          | 12.7               | 9. Canada          | 12.4               | 9. Germany         | 12.5               |
| 10. United Kingdom | 11.5               | 10. Germany        | 12.1               | 10. Switzerland    | 11.7               |
| 11. Australia      | 11.1               | 11. Spain          | 10.8               | 11. Ireland        | 11.5               |
| 12. Spain          | 10.9               | 12. Austria        | 10.3               | 12. Spain          | 11.2               |
| 13. Austria        | 10.0               | 13. United Kingdom | 9.0                | 13. United Kingdom | 10.6               |
| 14. Netherlands    | 9.8                | 14. Switzerland    | 7.5                | 14. Canada         | 8.9                |
| 15. New Zealand    | 9.5                | 15. New Zealand    | 7.4                | 15. Finland        | 7.0                |
| 16. Finland        | 8.6                | 16. Australia      | 7.3                | 16. Norway         | 6.1                |
| 17. United States  | 8.2                | 17. United States  | 6.8                | 17. United States  | 5.2                |
| 18. Norway         | 5.1                | 18. Finland        | 5.7                | 18. Sweden         | 5.1                |
| 19. Switzerland    | 4.7                | 19. Denmark        | 2.3                | 19. Denmark        | 4.8                |
| 20. Sweden         | 4.4                | 20. Norway         | 0.1                | 20. Australia      | 4.3                |
| 21. Denmark        | 3.0                | 21. Sweden         | -0.3               | 21. New Zealand    | 4.3                |

Sources: IMF, World Economic Outlook database; OECD, Analytical database.

Table 2. Main Explanatory Variables, 1975–95  
(Country and time-series averages)

|            | $\mu - \sigma$ | Mean<br>$\mu$ | $\mu + \sigma$ | Std. Deviation<br>$\sigma$ |
|------------|----------------|---------------|----------------|----------------------------|
| PubSav     | -7.9           | -3.6          | 0.7            | 4.3                        |
| CorpSav    | 10.0           | 13.5          | 17.1           | 3.5                        |
| IncLev     | 53.7           | 69.4          | 86.1           | 15.7                       |
| IncGrow    | -0.2           | 2.2           | 4.6            | 2.4                        |
| Unemp      | 2.7            | 7.0           | 11.3           | 4.3                        |
| Inf        | 1.8            | 6.9           | 12.0           | 5.1                        |
| Realr      | -0.9           | 3.0           | 6.9            | 3.9                        |
| OldDep     | 19.2           | 22.7          | 26.2           | 3.5                        |
| DirTax     | 19.8           | 34.1          | 48.5           | 14.4                       |
| InTax      | 20.4           | 31.3          | 42.2           | 10.9                       |
| Grosstrans | 10.8           | 14.9          | 18.9           | 4.0                        |
| Nettrans   | 0.7            | 5.2           | 9.7            | 4.5                        |

Sources: OECD, Analytical Database; International Monetary Fund, World Economic Outlook database; International Monetary Fund, *Government Finance Statistics*.

Table 3. Analysis of Variation: Cross-Section and Time-Series Variation  
(In percent of total variation)

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|            | Cross-section variation | Time-series variation |
|------------|-------------------------|-----------------------|
| HSave      | 83.1                    | 16.9                  |
| IncGrow    | 5.1                     | 94.9                  |
| Realr      | 11.3                    | 88.7                  |
| Inf        | 28.7                    | 71.3                  |
| PubSav     | 57.4                    | 42.6                  |
| Unemp      | 62.0                    | 38.0                  |
| CorpSav    | 68.5                    | 31.5                  |
| Grosstrans | 71.9                    | 28.1                  |
| IncLev     | 85.3                    | 14.7                  |
| InTax      | 87.8                    | 12.2                  |
| Nettrans   | 87.9                    | 12.1                  |
| OldDep     | 88.1                    | 11.9                  |
| DirTax     | 91.2                    | 8.8                   |

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Source: Authors' calculations.

Table 4. Results of Cross-Country Regressions  
Dependent Variable: HSave

|                         | 1975-95           | 1975-81           | 1982-89           | 1990-95           | 1975-95<br>(pooled) |
|-------------------------|-------------------|-------------------|-------------------|-------------------|---------------------|
| PubSav                  | -0.90**<br>(-6.9) | -0.85**<br>(-2.8) | -0.79**<br>(-5.3) | -0.44<br>(-1.2)   | -0.77**<br>(-6.9)   |
| CorpSav                 | -0.61**<br>(-5.0) | -0.69**<br>(-2.1) | -0.51**<br>(-3.5) | -0.65*<br>(-1.9)  | -0.43**<br>(-3.4)   |
| IncLev                  | -0.06**<br>(-2.4) | -0.05<br>(-0.75)  | -0.11**<br>(-3.6) | -0.04<br>(-0.6)   | -0.07**<br>(-2.8)   |
| IncGrow                 | 1.35**<br>(2.7)   | 1.57**<br>(2.0)   | 0.06<br>(0.1)     | 0.3<br>(0.5)      | 0.82**<br>(3.0)     |
| Unemployment            | -0.49**<br>(-5.0) | -0.57*<br>(-1.6)  | -0.43**<br>(-4.0) | -0.23<br>(-1.3)   | -0.3**<br>(-3.6)    |
| OldDep                  | -0.70**<br>(-5.0) | -0.70**<br>(-2.3) | -0.68**<br>(-3.8) | -0.96**<br>(2.3)  | -0.62**<br>(-4.6)   |
| DirTax                  | -0.09**<br>(-2.6) | -0.10<br>(-1.4)   | -0.05<br>(-1.2)   | -0.21**<br>(-2.2) | -0.10**<br>(-3.2)   |
| InTax                   | 0.05<br>(1.2)     | 0.06<br>(0.6)     | 0.03<br>(0.6)     | (0.01)<br>(0.1)   | -0.00<br>(-0.1)     |
| Nettrans                | -0.22**<br>(-2.5) | -0.32<br>(-1.4)   | -0.28**<br>(-2.1) | -0.1<br>(-0.6)    | -0.14*<br>(1.7)     |
| Number of observations  | 21                | 21                | 21                | 21                | 63                  |
| R <sup>2</sup>          | 0.97              | 0.88              | 0.96              | 0.78              | 0.84                |
| Adjusted R <sup>2</sup> | 0.94              | 0.76              | 0.92              | 0.58              | 0.81                |

Source: Authors' calculations.

Note: All variables in averages of the 21 OECD countries given in table 1 over the time period indicated in this table; t-statistics in brackets; the constant term is not reported throughout. \*\*(\*) indicates significance at the 5 (10) percent level.

Table 5. Panel Regression Results. Dependent Variable: HSave. Sample: 21 Industrial Countries, 1975–95

|                         | OLS                | Fixed Effects      | Fixed Effects with Heteroskedasticity Adjustment | Fixed Effects with AR (1) Adjustment | Fixed Effects with Lagged Dependent variable | Fixed Effects with Instrumental Variables | Private saving (Fixed Effects with Heterosked. Adjustment) | Consumer credit (Fixed Effects) |
|-------------------------|--------------------|--------------------|--|--------------------------------------|--|---|--|---------------------------------|
| PubSav                  | -0.60**<br>(-16.4) | -0.37**<br>(-10.4) | -0.37**<br>(-10.5)                               | -0.37**<br>(-10.4)                   | -0.23**<br>(-7.3)                            | -0.29**<br>(-5.7)                         | -0.32**<br>(-4.7)  | -0.34**<br>(-9.0)               |
| CorpSav                 | 0.51**<br>(10.4)   | -0.14**<br>(-3.1)  | -0.14**<br>(-2.6)                                | -0.12**<br>(-2.6)                    | -0.12**<br>(-3.3)                            | -0.26**<br>(-2.9)                         |  | -0.10**<br>(-2.2)               |
| IncGrow                 | 0.28**<br>(4.5)    | 0.15**<br>(4.0)    | 0.15**<br>(4.3)                                  | 0.14**<br>(3.8)                      | 0.19**<br>(6.1)                              | 0.35**<br>(2.2)                           | 0.15**<br>(2.9)  | 0.11**<br>(2.9)                 |
| Inf                     | 0.03<br>(0.6)      | 0.16**<br>(4.8)    | 0.16**<br>(4.5)                                  | 0.16**<br>(4.3)                      | 0.12**<br>(4.0)                              | 0.21**<br>(6.4)                           | -0.38<br>(-0.8)  | 0.12**<br>(3.4)                 |
| Realr                   | 0.06<br>(1.2)      | 0.06*<br>(1.7)     | 0.16*<br>(1.7)                                   | 0.05<br>(1.5)                        | 0.03<br>(1.0)                                | 0.05<br>(1.5)                             | 0.85*<br>(1.7)   | 0.09**<br>(2.7)                 |
| OldDep                  | -0.64**<br>(-11.2) | -0.20**<br>(-2.6)  | -0.20**<br>(-2.6)                                | -0.18**<br>(-2.3)                    | -0.09<br>(-1.3)                              | -0.22**<br>(-2.7)                         | -0.22**<br>(-2.4)  | -0.36**<br>(-4.6)               |
| DirTax                  | -0.16**<br>(-11.6) | -0.09**<br>(-4.8)  | -0.09**<br>(-4.0)                                | -0.07**<br>(-3.7)                    | -0.08**<br>(-4.9)                            | -0.12**<br>(-6.1)                         | -0.11**<br>(-3.8)  | -0.07**<br>(-3.3)               |
| InTax                   | -0.01<br>(-0.6)    | -0.02<br>(-1.0)    | -0.02<br>(-1.0)                                  | -0.04<br>(-1.6)                      | -0.12<br>(-0.7)                              | -0.08<br>(-0.3)                           | 0.03<br>(0.1)  | -0.22<br>(-1.1)                 |
| Grosstrans              | -0.28**<br>(-5.4)  | -0.26**<br>(-4.2)  | -0.26**<br>(-3.7)                                | -0.26**<br>(-4.1)                    | -0.14**<br>(-2.7)                            | -0.11*<br>(-1.8)                          | -0.39**<br>(-3.4)  | -0.19**<br>(-3.0)               |
| ConsCredit (lagged)     |                    |                    |  |                                      |  |   |  | -0.03**<br>(-2.4)               |
| Constant                | 36.6**<br>(15.9)   |                    |  |                                      |  |   |  |                                 |
| HSave (lagged)          |                    |                    |  |                                      | 0.43**<br>(13.5)                             |   |  |                                 |
| Numbers of observations | 424                | 424                | 424  | 403                                  | 403  | 424                                       | 424  | 330                             |
| R2 adj:                 | 0.69               | 0.90               | 0.90   | 0.90                                 | 0.93   | 0.89                                      | 0.74   | 0.92                            |

Source: Authors' calculations.

Note: t-ratios in parantheses; \*\*(\*) indicates significance at the 5 (10) percent level.

1/ This equation (due to limited data on consumer credit) excludes Belgium, Ireland, and Portugal, and applies only to 1985–95.

### DATA DESCRIPTION AND SOURCES

The following data and sources were used: IMF, *World Economic Outlook Database* (WEO); IMF, *International Finance Statistics* (IFS); IMF, *Government Finance Statistics* (GFS); OECD, *Analytical Database* (OECD); OECD, *National Accounts*; OECD *Financial Statistics*; United Nations, *World Population Database* (UN); individual country central bank bulletins; and Visa International Inc.

Description of the variables (with the source in brackets):

|                    |   |
|--------------------|---|
| <i>Hsave:</i>      | Household saving (net), including unincorporated enterprises (OECD), except for Norway and Denmark (WEO)  |
| <i>PubSav:</i>     | Government saving approximated by surplus of the general government sector (WEO)  |
| <i>CorpSav:</i>    | Saving of the enterprise sector (OECD)  |
| <i>IncLev:</i>     | Level of per capita GDP relative to the United States (in purchasing power) (WEO)   |
| <i>IncGrow:</i>    | Growth rate of real household disposable income (OECD)  |
| <i>Infl:</i>       | Inflation rate (WEO)  |
| <i>Unemp:</i>      | Unemployment rate (WEO)   |
| <i>Realr:</i>      | Short-term interest rate less the rate of inflation (WEO; IFS)  |
| <i>OldDep:</i>     | Ratio of persons aged 65 years and above to persons aged 15–64 years (UN)   |
| <i>DirTax:</i>     | Revenue of the general government sector from taxes on incomes, profits, and capital gains of household and corporations (GFS)  |
| <i>InTax:</i>      | Revenue of the general government sector from taxes on goods and services (including sales and turnover taxes, VAT, excises, motor vehicle taxes, and taxes on specific services) (GFS) |
| <i>ConsCredit:</i> | Value of outstanding household debt for consumption purposes (OECD and various central bank bulletins)  |
| <i>Ccards:</i>     | Number of credit cards issued by Visa International Inc., per capita (Visa International Inc., CA)  |
| <i>Grosstrans:</i> | Government transfers to the household sector (mostly social security and welfare transfers) (OECD)  |
| <i>Nettrans:</i>   | Government transfers to the household sector (mostly social security and welfare transfers), net of social security contributions paid by households (OECD)                             |

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