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Personal and Corporate Saving in South Africa

Janine Aron and John Muellbauer

Low domestic saving rates in South Africa may perpetuate a low-growth trap. The decline in government saving, a major reason for the overall decline in saving, is now being reversed. However, personal saving rates have fallen since 1993, and corporate rates since 1995, and both may decline further with lower real interest rates. It is important to understand both personal and corporate saving behavior in order to formulate policies to raise the domestic saving rate in line with the needs of economic growth. This article summarizes previous work on the household sector, emphasizing the role of financial liberalization, assets, and income expectations, and explains sectoral links and policy implications. Further, it analyzes South Africa's corporate saving rate in detail. Models are developed both for the share of profits in national income, including the roles of the terms of trade, tax effects, and the price to unit labor cost ratio, and for the share of corporate saving in profits, which is found to depend on inflation, the real interest rate, dividend taxation, and financial liberalization. Corporate saving is remarkably underresearched, given its importance in many economies. This research thus puts the saving and growth concerns of Kaldor into a modern empirical context.

Low domestic saving rates in South Africa may hinder investment-driven growth in the medium term. The ratio of gross domestic saving to gross national disposable income (GNDI) fell sharply from the early 1980s to the late 1990s, from an average of 24 percent in 1982–89 to 14 percent in 1998, and the net saving ratio (after depreciation) fell from 8 to 1 percent (see figure 1). These low gross saving rates rank poorly relative to rates in comparable emerging-market economies such as Chile. Low and falling saving rates imply increasing reliance on foreign capital inflows. Yet the sustainability of higher medium-term capital inflows is uncertain, given recent currency crises and increased risk premiums for emerging markets more generally. Real interest rates were very high in the 1990s, particu-

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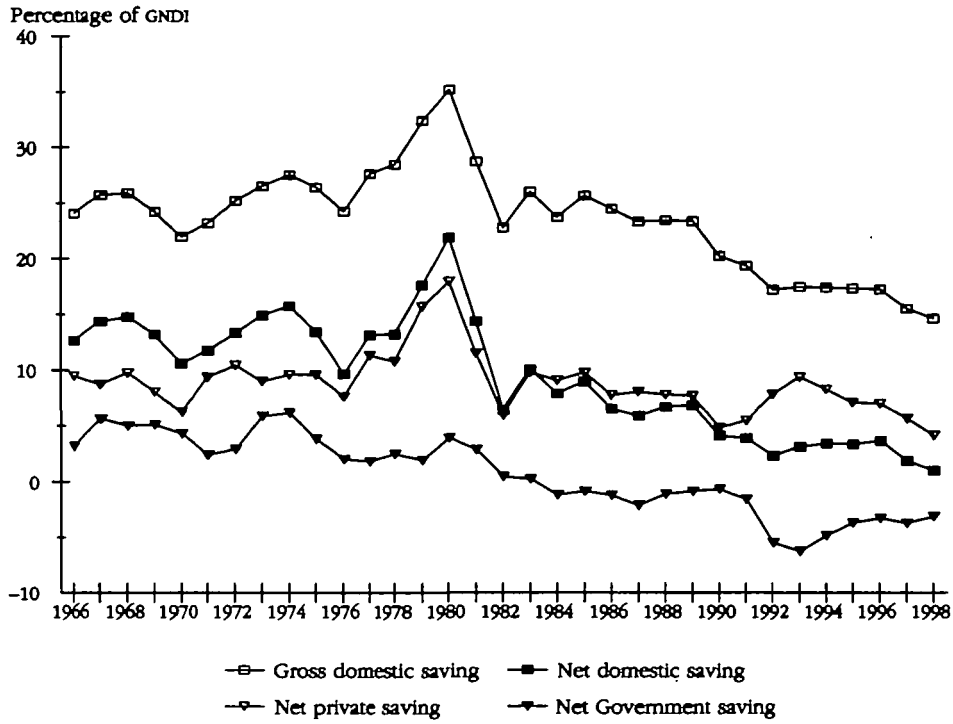
Figure 1. *Gross and Net Domestic Saving Rates as a Percentage of Gross National Disposable Income, 1966–98*

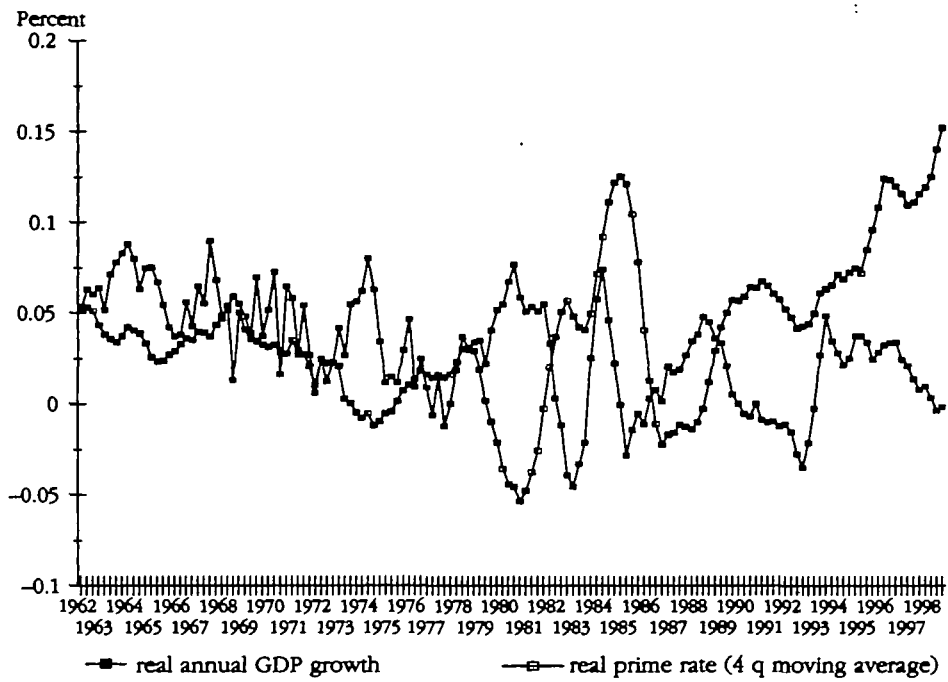


Source: Authors' calculations from the *Quarterly Bulletin*, South African Reserve Bank.

larly after the currency crises of 1996–98, when real growth fell sharply (see figure 2). The implications of low saving are even more far-reaching considering the spillover effects from growth in South Africa to growth in its impoverished neighbors. Moreover, the AIDS crisis is likely to exacerbate the pressure on saving rates in the next decade (see ING Barings 2000).

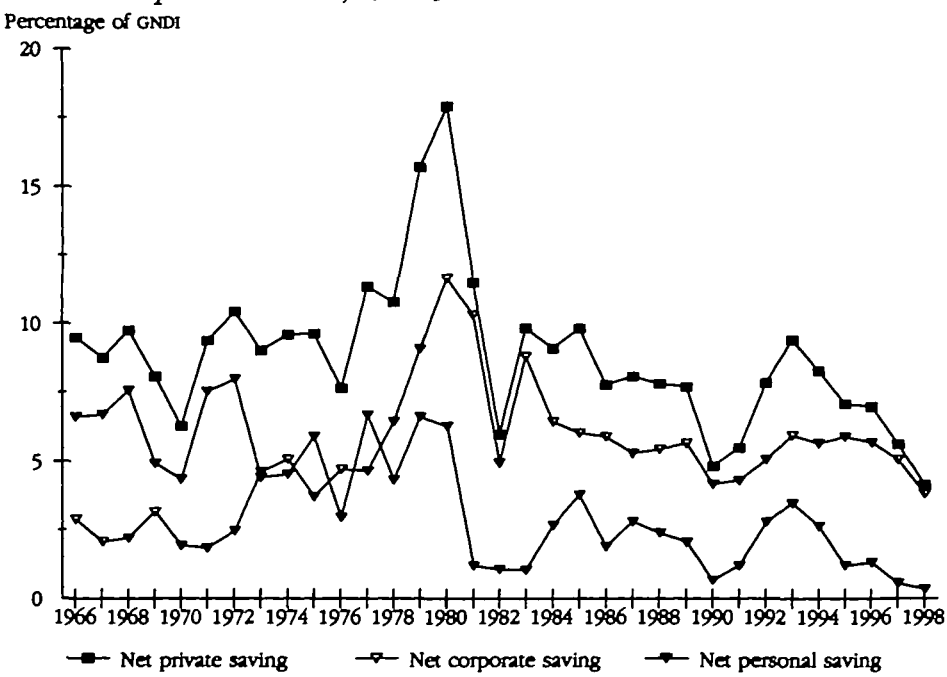
The falling government saving rate since the early 1980s is largely responsible for the decline in South Africa's domestic saving rate (figure 1). The private saving rate has been more stable, except for in the late 1970s, when gold prices rose, and in 1979–80, a period of very high gold prices from which the mining industry retained large windfall profits. Increased corporate saving sustained the level of private saving in the face of a decline in household saving, particularly in the 1980s (figure 3). Personal saving exceeded corporate saving until the mid-1970s, when corporate saving rose strongly, almost doubling as a ratio of national income by 1980–85. It remained high even after the 1979–80 gold price boom. Although government dissaving peaked in 1993, the government's improved saving performance, particularly creditable given weak growth rates, has been offset by a fall in private saving. This fall was driven by a decline in personal (or household) saving, associated with a rapid rise in credit-financed consumer spending (figure 3). Corporate saving has also weakened since 1995.

Figure 2. *Real Annual Growth and the Real Prime Interest Rate*



Source: Authors' calculations from the *Quarterly Bulletin*, South African Reserve Bank.

Figure 3. *The Composition of Net Private Saving as a Percentage of Gross National Disposable Income, 1966–98*



Source: *Quarterly Bulletin*, South African Reserve Bank.

There is little published literature on saving behavior in South Africa, which is surprising given the importance of household consumption and corporate investment in gross domestic product (GDP) and their role in the monetary policy transmission mechanism that runs from interest rate changes to output. Prinsloo (1994, 1997), Barr and Kantor (1994), and Tsikata (1998) have analyzed private saving. These authors hypothesize that the offsetting patterns of personal and corporate saving referred to above had much to do with households "piercing the corporate veil." Thus they suggest that households rationally reduced their saving to reflect the fact that when corporate saving increased in response to changed inflation and tax rates (with correspondingly reduced dividend payments), this raised the value of equities held directly by households or by pension funds on their behalf.[1] If this rise in corporate saving were completely offset by the fall in household saving, due only to piercing the veil, the compositional change in private saving would be of little policy consequence. Indeed, these authors suggest that policies aimed at improving national saving should be focused firmly on raising the government's saving rate, rather than the private saving rate.

But there are several reasons why the compositional change in private saving may not be innocuous and why the stability of private saving may be in doubt. First, several studies provide evidence suggesting that the piercing of the veil is incomplete. If households see through corporate budget constraints perfectly, dividend income should have no direct effect in a consumption model after incorporating the equity wealth effect. Poterba (1991) finds that the effect of dividend income is not zero in the Canada, United Kingdom, and United States. Second, even if households did pierce the veil, there is no guarantee that corporations would then behave in the way households desire. For example, a number of articles explain the large issue of dividends in the United Kingdom and the United States, despite unfavorable individual tax treatment, by corporate signaling or reputational devices (Bond, Chennells, and Devereux 1995 and Poterba 1987).

Third, several other factors could change relative sectoral saving ratios, with differing degrees of offset and hence differing implications for the overall private saving rate. One long-term factor implying some offset between saving rates in the two sectors is financial liberalization, which has allowed South African households to strongly raise their ratios of debt to income since the early 1980s. Household debt has its counterpart in corporate assets, particularly assets of financial corporations, which might help to account for the relatively high corporate saving rate sustained into the 1990s. Similarly, incomplete offset could result from the response of the two sectors to changing terms of trade or to a shift in government saving behavior. Still other factors, such as lower real interest rates, might move corporate and household saving in the same direction.

Far from being irrelevant to the question of raising national saving, therefore, the changing composition of private saving could have multiple causes and merit

1. See David and Scadding (1974) for an early discussion of piercing the veil or, in the authors' terms, the "ultrarationality" of households.

specific policy responses. Thus a rigorous empirical examination of the factors driving household saving and the factors driving corporate saving is warranted. In this article we explore the determinants of private saving in South Africa, separately examining personal and corporate saving behavior from the late 1960s to 1997. In each case we subject the corporate veil hypothesis to more rigorous empirical testing than has been conducted thus far.

We examine the observed decline in personal saving in South Africa, drawing on Aron and Muellbauer (2000a), which estimates a quarterly consumption function for South African households. Prior to this study, the most comprehensive consumption function came from the model of the South African Reserve Bank, which separately models four components of consumption: durables, nondurables, semidurables, and services (Pretorius and Knox 1995). However, this model excludes relative prices, assets, debt, proxies for expectations, and measures of financial liberalization. These are important omissions. Because of fluctuations in asset prices and changes in financial liberalization, omitting these variables can lead to huge forecasting errors (as in the United Kingdom in the 1980s; see Muellbauer and Murphy 1995). It is not surprising that the South African Reserve Bank omitted asset stock variables, since it does not construct these measures. However, the omission makes it impossible to test rigorously whether households pierce the corporate veil.

Aron and Muellbauer (2000a) remedy some of these problems. Income forecasts are generated from a separate income-forecasting model; an innovative indicator for financial liberalization is derived, which is closely linked to institutional changes; and wealth estimates are constructed, given the absence of official data (details are given in Muellbauer and Aron 1999).

The general issue of corporate saving is highly underresearched, and not only in developing countries. It receives less than one page in Deaton's (1999) comprehensive survey. There is no generally agreed theory of corporate finance to parallel the intertemporal models of households. Two of the few empirical analyses of aggregate corporate retention rates are by Poterba (1987, 1991). Our analysis extends his treatment by articulating several of the underlying economic mechanisms. Moreover, because the share of national income that is corporate profits can be quite variable, unlike Poterba, we model the profit share separately in order to derive corporate saving as a share of national income. We therefore incorporate one of the neglected key insights of Kaldor's (1957) growth model. Kaldor argues that since the propensity to save out of corporate profits is higher than the propensity to save out of labor income, the private sector saving rate out of national income depends on the share of profits in national income. However, unlike Kaldor, we endogenize the sectoral saving propensities and address intersectoral links.

There is a large literature on the effects of financial deregulation on saving, investment, and growth (see the survey by Fry 1995: ch. 8). Our analysis of the overall effects of financial liberalization on private saving in South Africa contributes to this literature, although it should be noted that South Africa has long

had a sophisticated financial system and has never experienced financial repression on the scale seen in many developing countries.

Finally, our research throws light on the monetary transmission mechanism in South Africa, highlighting some of the policy dilemmas faced by the South African Reserve Bank.

I. Data Issues and Regime Shifts

South Africa is a dualistic economy, with a highly unequal income distribution. Its income-based Gini coefficient is 0.61, calculated using 1993 household survey data, making it second in inequality only to Brazil among middle-income countries (Klasen 1997). Gini measures of the inequality of earnings among urban employed men are about 0.5 for both 1980 and 1993, suggesting little decline in inequality, although racial discrimination lessened (Moll 1998).

With such unequal income and expenditure distributions, the bulk of aggregate saving will be accounted for by the most affluent households.[2] In this article we thus model aggregate behavior focusing on the formal part of the economy, which has the dominant economic weight. Doing so neglects welfare issues connected with the saving of poorer households, important in its own right, but which the national aggregates cannot address.[3]

South Africa has a large urban unemployed class, in contrast with many countries in Sub-Saharan Africa. Recent research based on different measures of unemployment in South Africa suggests, using a broad definition of unemployment, a range from 30 to 40 percent (Kingdon and Knight 2000). Clearly, it is difficult to measure the unemployment rate in a meaningful sense. High unemployment, frequently used as a measure of income uncertainty in countries with lower unemployment, is unlikely to have much of an influence on the saving behavior in the formal part of the economy and hence on aggregate saving behavior in South Africa (controlling for income, interest rates, and other variables). In South Africa's highly segmented labor market, it makes sense instead to proxy income uncertainty with formal sector indicators of labor market tightness, such as capacity utilization.

The South African economy has suffered many political shocks and discontinuities, as well as terms of trade shocks. International trade and financial sanctions, foreign disinvestment, capital flight and emigration during the apartheid era, and their subsequent reversal (to some extent) during the 1990s have greatly influenced macroeconomic outcomes and policy. There also have been important changes in domestic regimes, notably in the exchange rate and monetary policy regimes, and in financial regulation.

2. Based on a comprehensive socioeconomic survey conducted in 1993, the upper 30 percent of households in South Africa in the distribution of household expenditures, making up 21 percent of the population, accounted for 75 percent of the country's expenditures (World Bank research quoted in RDP Office 1995).

3. With data revisions in the early 1990s, the South African Reserve Bank attempted to incorporate more of the informal sector and service economy into GDP data. Revisions since June 1999 (after the period modeled in this article) have continued this process.

Such shifts have required creative modeling of regime breaks. For instance, we employ stochastic trends in income expectations models, which help to capture changes in income growth trends linked to political events. Further, using detailed institutional changes, we construct indicators for crucial shifts in the monetary policy regime in the 1980s and for financial liberalization in the 1980s and 1990s. Shifts in monetary policy play an important role in our income-forecasting models in capturing shifts in the influence of interest rates. Financial liberalization has important effects in our household and corporate saving models. The main impact of financial liberalization in South Africa's already sophisticated financial sector, through more competitive markets, was on saving and spending in the formal sector, rather than on bringing financial services to poor black households. The real interest rate was largely positive during 1960–98 (see figure 2), and the main consequence of financial liberalization has been more easily obtained credit and more easily collateralized, and thus more spendable, illiquid assets. However, under the apartheid system in South Africa, rural and urban black households had highly constrained access to formal saving and credit opportunities.

With incomplete or less than comprehensive data, we construct data, where possible; but in some instances the lack of data constrains the possible analysis. For example, in the absence of published data on stocks of personal assets (mostly available only on a flow basis and often at book rather than market value), we construct the first series for a range of personal assets at market value (see Muellbauer and Aron 1999). These wealth effects prove very important in personal saving.

We are, however, unable to construct asset series for unincorporated businesses and directly held foreign assets. Our efforts to capture the effects of income distribution using ratios of black formal sector wages to white formal sector wages failed, perhaps because of the weaknesses of these data, especially in the 1990s. Time-series data on the age distribution are not available, although it would have been useful to test for demographic effects by age of formal sector savers. Similarly, the figures on international migration are poor. But to the extent that recent emigrants have been among the higher savers, their leaving may have reduced the saving ratio and possibly also wealth holdings in South Africa.

II. Modeling Personal Saving

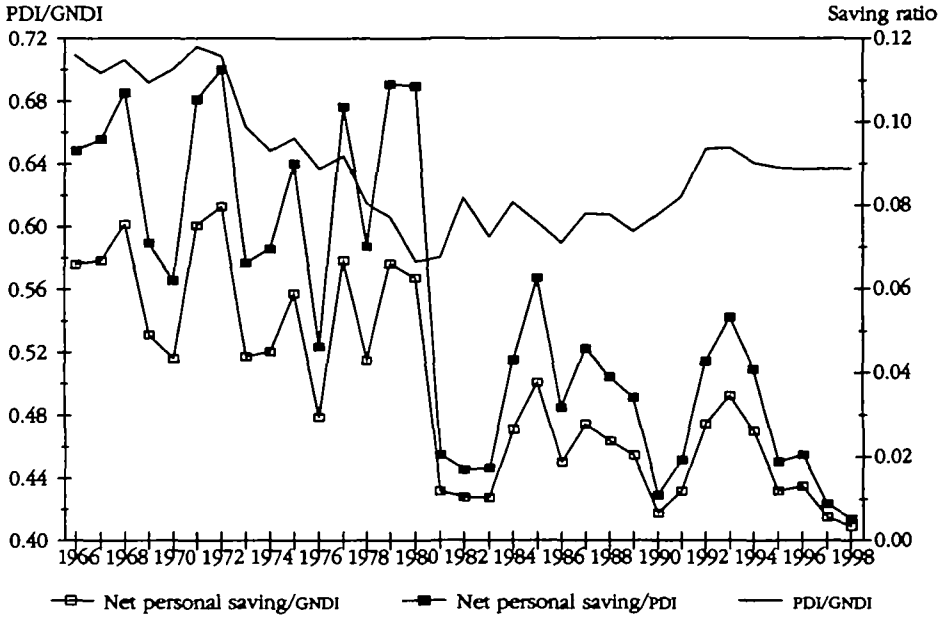
The approach we adopt is to split the ratio of personal saving to national income into two ratios: the ratio of personal saving (S) to personal disposable income (PDI) and the ratio of PDI to gross national disposable income ($GNDI$).[4] Thus

$$S/GNDI = s \cdot (PDI/GNDI) \tag{1}$$

where s is the personal saving ratio S/PDI.

4. Personal saving in the national accounts is conventionally defined as personal disposable income minus consumer expenditures. Consumer expenditures include expenditures on consumer durables, but not on the acquisition of owner-occupied housing, which is treated as part of saving.

Figure 4. *Net Personal Saving Relative to Personal Disposable and Gross National Disposable Income, 1966–98*



Source: Authors' calculations from the *Quarterly Bulletin*, South African Reserve Bank.

The share of *PDI* in *GNDI* is inversely correlated with the share of profits, given that labor income is a large component of *PDI* (figure 4). We do not model this ratio formally, but it also depends on personal tax rates, income transferred to individuals from the government, and self-employment and personal property income.

We can now link the saving ratio, s, to the consumption function. Since s is a small number, it can be approximated as

$$s \approx -\log(1-s) = -\log(C/PDI) \tag{2}$$

where C is consumer expenditures in current prices. The models we discuss for the log of consumption can therefore be translated easily into models of the ratio of personal saving to gross national disposable income.

Theoretical Issues

The canonical rational expectations permanent-income hypothesis, as derived by Hall (1978), has both a Euler and a "solved-out" representation. Under a number of simplifying assumptions,[5] Hall derived a martingale property for the intertemporal efficiency condition on consumption, or the Euler equation:

$$c_t = c_{t-1} + \varepsilon_t \tag{3}$$

5. These include the absence of credit restrictions, quadratic utility and certainty equivalence, rational expectations, intertemporally additive preferences implying the absence of habits, a constant real interest rate equal to the rate of subjective time preference, and behavior equal to that of an infinitely lived household. Much research since Hall (1978) has been concerned with relaxing such assumptions.

where c_t is consumption measured in constant prices and ε_t is a stochastic variable, not predictable from information available in $t - 1$, which captures news about permanent income. Equation 3 embodies the extreme consumption-smoothing implication of the rational expectations permanent-income hypothesis, since at $t - 1$, the consumer plans future consumption levels to be the same as the current level.

Solving this efficiency condition and its equivalents for all future periods gives the solved-out form of the consumption function:

$$c_t = rA_{t-1} + E_t y_t^p \tag{4}$$

where y_t^p is permanent nonproperty income (consisting of employment income after taxes, and transfers from the government), r is the real rate of return, and A_{t-1} is the stock of real assets at the end of the previous period.[6]

To make the solved-out form empirically useful requires at least one more equation, namely an income-forecasting model, which relates permanent nonproperty income to observable variables. The solved-out model has a number of advantages relative to the more fashionable Euler equation. First, it is directly relevant for policy analysis—for instance, to analyze the effects of a tax reform (using the income forecasting model), which could alter the profile of future household income.

Second, the solved-out consumption function does not throw away important long-run information from the consumption, income, and asset data (see the cointegration literature, such as Davidson and others 1978, Engle and Granger 1987, and Banerjee and others 1993). The Euler approach does not use asset data, while differencing makes consumption and income stationary, where they are typically nonstationary. Third, although the solved-out approach is clearly more demanding in terms of the information and modeling effort required, the approximations needed to obtain policy-relevant consumption functions (described in the next section) are no more extreme than those popularly made in the Euler equation approach—by, for example, Hall and Mishkin (1982) and Campbell and Mankiw (1989, 1991)—to incorporate credit constraints or myopia.

Derivation of a Basic Solved-out Consumption Function

We set out an empirical methodology for estimating the consumption function, drawing on the theoretical literature, but, which is important, introducing income forecasts, estimates of wealth—distinguishing between liquid and illiquid assets—and an indicator of financial liberalization (for more details see Aron and Muellbauer 2000a). At the micro-level, a solved-out consumption function is the solution to an intertemporal utility maximization problem, the classic case being the canonical rational expectations permanent-income hypothesis in equation 4. A log-linearization of equation 4 makes $\log(c/y)$ a linear function of the asset-to-

6. Nonproperty income is the theoretically relevant measure of income and excludes interest income, rents, and returns on equities and stocks.

income ratio (A/y) and of log (y^p/y), where we can proxy for y^p/y with forecasts of the income growth rate. Introducing habits or adjustment costs implies a partial adjustment model.

Extending the model from point to probabilistic income expectations introduces a measure of income uncertainty, θ_t, as well as a measure of expected income growth, $E_t \Delta \log y^{ma}_{t+1}$, which is a weighted moving average of forward-looking growth rates. Further, if real interest rates are variable, theory suggests that the real interest rate r_t will enter the model. Incorporating these three additional variables, a simple linearization gives the following generalization of the canonical rational expectations permanent-income hypothesis model of equation 4:

$$(5)\quad \Delta \log c_t \approx \beta[\alpha_0 - \alpha_1 r_t - \alpha_2 \theta_t + \log y_t + \alpha_3 E_t \Delta \log y^{ma}_{t+1} + \gamma A_{t-1}/y_t - \log c_{t-1}] + \varepsilon_t$$

where β measures the speed of adjustment. Making the same assumptions as Campbell and Mankiw (1989, 1991) to incorporate credit-constrained behavior by households can be shown to result in an equation for aggregate consumption that is a generalization of equation 5, containing an additional income growth term, $\Delta \log y_t$.

Although consumption theory puts great weight on income expectations, explicit empirical models of the income-forecasting process are rare in consumption modeling. The Lucas critique (Lucas 1976, 1981) argues that conventional reduced-form econometric models break down when policy rules change since agents' expectations-generating functions change. He concludes that the models are of little use for policy analysis. One solution is to address the critique directly, by building an income-forecasting model that recognizes the importance of policy feedback rules and is sensitive to possible shifts in these rules.

The aggregation of assets into a single quantity, A, in equation 5 is an oversimplification. We argue that wealth effects differ according to the liquidity characteristics of different types of wealth. Households usually hold a balance of assets—liquid assets, which can be converted easily into expenditures when needed, and illiquid assets, which typically yield higher rates of return. This suggests that we should associate different weights reflecting different propensities to spend with different types of assets and debt.[7]

Housing, pension funds, and life insurance funds are at the illiquid end of the spectrum.[8] Pension wealth is likely to have a delayed impact on consumption. Contractual saving contribution rates often respond with considerable lags to changes in the asset values of such pension funds, suggesting that we should test for longer lags on consumption.

7. Several studies, such as Patterson (1984), allow different weights on liquid and illiquid assets, whereas others, such as Zellner, Huang, and Chau (1965) and Hendry and von Ungern Sternberg (1981), include the effects of liquid assets alone.

8. Housing wealth is a special case because housing has consumption as well as wealth value (housing services also appear in the utility function). Thus an increase in the real price of housing has both an income and a substitution effect on consumption, partly offsetting the wealth effect. See Miles (1994) and, for a simple derivation, Muellbauer and Lattimore (1995).

Another factor, financial liberalization, theoretically has consequences for the liquidity characteristics of different assets and might be expected to affect consumption directly and indirectly. Although the implications of financial liberalization have aroused interest, controversy, and a growing literature (such as Bayoumi 1993a, 1993b; Schmidt-Hebbel and Servén 1997; Bandiera and others 2000; and Honohan 1999), the applied analysis of these implications in the consumption literature has not been entirely satisfactory. The difficulty has been to find an indicator of credit market deregulation with which to model the direct and interaction effects of financial liberalization.

These effects are as follows. First, financial deregulation is likely to raise the propensity to spend directly by reducing the required deposit needed to buy a house (see Jappelli and Pagano 1994 and Deaton 1999: 53–54). Second, financial deregulation is likely to increase the "spendability" weights on illiquid assets, since both housing collateral and, to a lesser extent, pension collateral could be used for borrowing and hence for spending. Third, financial liberalization should reduce the proportion of credit-constrained households. With the increase in households that are not credit-constrained, the real interest rate and expected real income growth will have a greater effect on aggregate consumption. However, the effect of uncertainty on consumption may weaken if consumers anticipate that they can borrow more easily in the event of a negative income shock. Finally, financial liberalization and income distribution may interact as access to credit is extended at lower income levels.

Income Expectations

In Aron and Muellbauer (2000a) we generate forecasts of personal disposable nonproperty income from an income-forecasting model that includes interest rates, capacity utilization, the government budget deficit, and the Johannesburg Stock Exchange (JSE) share price index expressed in real terms. The model accounts for important regime shifts: it is estimated using a stochastic trend based on Koopman and others (1995), thereby capturing the decline in the growth rate in the 1980s as trade and financial sanctions and political difficulties increased. Using dummy indicators constructed by altering statutory liquidity ratios for commercial banks in the 1980s, the model also captures the changing sensitivity of income growth to interest rates as the monetary policy regime changes. By incorporating important regime shifts in the model, the resulting consumption function should be fairly immune to the Lucas critique.

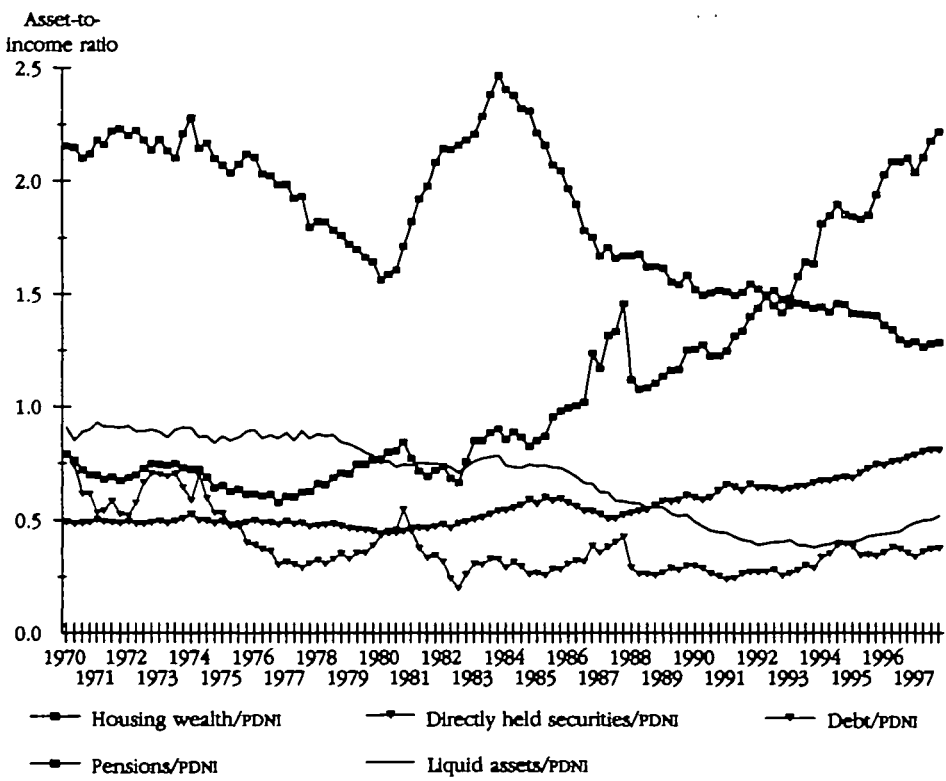
The model suggests that government deficits have persistent negative effects on subsequent income growth. These effects could reflect typical concerns for budget deficits followed by higher taxes or lower government expenditures, but these deficits may also signal political shocks. In the past political unrest was often followed by higher social or military expenditures, which thus may serve as a proxy for a direct negative effect on growth through falling investment. This generates a link between personal and government saving rates, which was missing in previous work.

Nominal rises in interest rates and levels of real rates have strong negative effects on subsequent growth. The shift toward more market-oriented monetary policy in the 1980s appears to have weakened the influence of changes in nominal rates. Before the shift, high liquidity ratios and other quantitative methods of controlling credit growth were correlated with changes in nominal rates, exaggerating the apparent influence of interest rates on growth. After the shift, firms and households could refinance more easily, so that higher interest rates had a weaker effect on expenditures. However, although the coefficients on interest rates are lower, the greater volatility of interest rates in the market regime means that the proportion of the variance of growth explained by interest rates remains high. Changes in capacity utilization, proxying changes in labor market tightness, have the expected positive effects on nonproperty income. Finally, the JSE index, sensitive to changes in the price of gold and other minerals, captures the positive effect that improving terms of trade have on income.

Wealth Effects

The estimates of illiquid and liquid personal wealth used in the consumption model were constructed in Muellbauer and Aron (1999); see figure 5. The house-

Figure 5. *Debt and Liquid and Illiquid Assets Relative to Personal Disposable Nonproperty Income, 1970–97*



Source: Muellbauer and Aron (1999).

hold liquid assets ratio seems to have been relatively stable in the 1970s. In the 1980s, however, there was a large fall in households' holdings of liquid assets relative to nonproperty income. This coincided with both a drop in the personal saving ratio, as implied by the income and expenditure accounts, and a switch to saving in pension and retirement funds offering superior returns to those on liquid assets.

Pension wealth has grown relative to income since the 1980s, despite the fall in the personal saving ratio, and has greatly exceeded the growth of debt.[9] Yet although pension wealth is now the single biggest asset, its growth has been offset to a considerable degree by the decline of housing wealth relative to income. The wealth measures in our model will be understated because we omit foreign assets accumulated illegally during the era of exchange controls on domestic residents. Similarly, our measures of household assets do not include assets of unincorporated businesses, except for their inclusion in private housing stocks. For further discussion, see Muellbauer and Aron (1999).

Financial Liberalization

The government initiated financial liberalization following the de Kock Commission reports (1978, 1985), which advocated a more market-oriented monetary policy. Interest and credit controls were removed in 1980, and banks' liquidity ratios were reduced substantially between 1983 and 1985. Competition rose in the mortgage market following the 1986 Building Societies Act and amendments to it in 1987–88. Demutualization and takeovers in 1989–90 consolidated the stronger competition in the credit market. In the 1990s pensions were increasingly used to provide additional collateral for housing loans, while beginning in 1995 special mortgage accounts (access bond accounts) allowed households to borrow and pay back flexibly from these accounts up to an agreed limit set by the value of their housing collateral. After the 1994 elections more black South Africans obtained formal employment, particularly in the public sector, gaining access to credit that they previously would have been denied.[10] Exchange controls on nonresidents were eliminated in early 1995: large nonresident capital inflows from mid-1994 induced a temporary endogenous financial liberalization. Finally, exchange controls on domestic residents, in existence since before the 1960s, were partially relaxed after 1997.

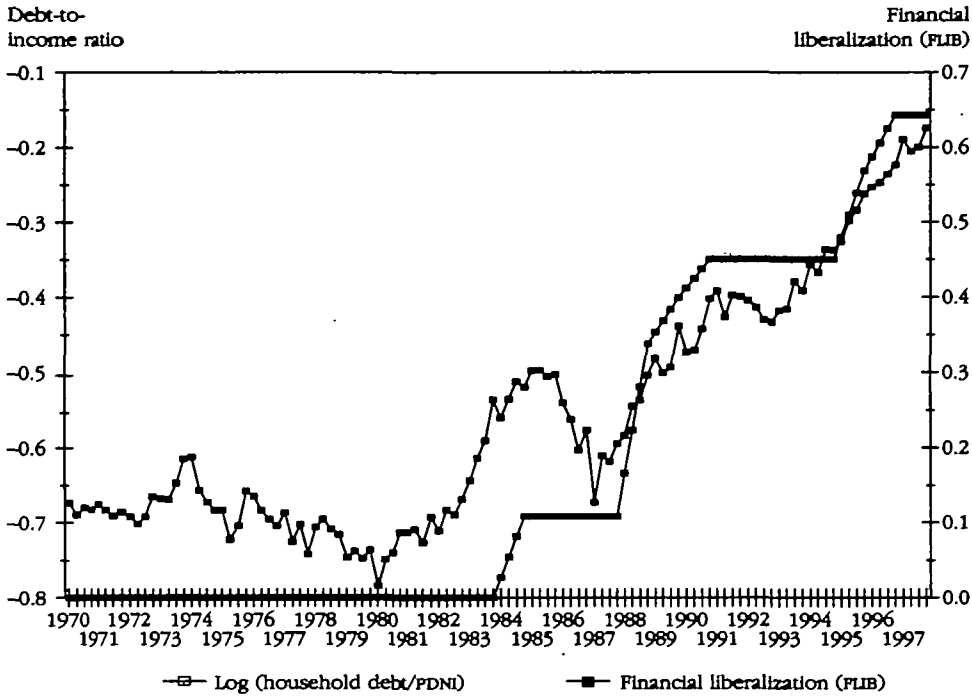
Financial liberalization had a major impact on the ratio of consumption to income, but it had an even larger effect on the ratio of debt to income.[11] An

9. Three of the factors behind this growth are the relaxation of restrictions on official pension funds (that is, for government employees), which had prevented their holding of equities (Mouton Report 1992), the improvement in the returns on government and parastatal bonds with the deregulation of interest rates after 1980 and the decline of inflation in the 1990s, and relaxation of prescribed holdings of government bonds for all pension funds.

10. However, total formal employment continued to decline.

11. Bayoumi (1993a, 1993b) and Sarno and Taylor (1998) use the ratio of debt to income as an indicator of financial liberalization, although the ratio also depends on factors such as income, asset levels, and interest rates.

Figure 6. *Household Debt to Personal Disposable Nonproperty Income and Financial Liberalization, 1970–97*



Source: Aron and Muellbauer (2000a).

innovation in Aron and Muellbauer (2000a) is to treat financial liberalization as an unobservable indicator entering both household debt and consumption equations. The indicator, *FLIB*, is proxied by a linear spline function, and the parameters of this function are estimated jointly with the consumption and debt equations (subject to cross-equation restrictions on the coefficients in the spline function). The estimated parameters for *FLIB* in the model reflect the key institutional changes in credit markets. Our estimated indicator shows strong rises in 1984, 1988, and 1995, with more moderate increases in 1989, 1990, and 1996 (figure 6). It is noteworthy that both the consumption function and debt equation are subject to major structural breaks (failing Chow tests) when allowance is not made for financial liberalization.

In the consumption equation the most important role of *FLIB* is its direct effect on the average propensity to consume, in part related to the lower mortgage deposits that banks require of home buyers.[12] Further, a proxy for income uncertainty has a weaker effect on consumption when interacted with *FLIB* (that is, the precautionary role of income uncertainty declines with financial liberalization).

12. We also interact *FLIB* with housing assets, expecting to find that housing wealth is effectively more spendable with liberalization. However, the coefficient is hard to pin down accurately, probably because the ratio of housing assets to income has been so trend-like since 1983 (see figure 5).

In the debt equation the direct effect of *FLIB* on the ratio of debt to income is significant. But this effect is dominated by the interaction effects of *FLIB* with asset-to-income ratios: debt increases as the collateral weight of housing assets rises with liberalization.[13] However, there is a small offset: the size of liquid assets has less effect on the volume of debt with financial liberalization, probably because mortgage lenders are less constrained by the personal sector's liquid deposits.

Personal Saving

As shown in equation 2, the personal saving ratio is close to log(*C/PDI*). Since our consumption function is formulated in terms of log(*C/PDNI*), where *PDNI* is personal disposable nonproperty income, we use the following conversion to get from our consumption function to the personal saving rate:

$$s \cong -\log(C/PDNI) - \log(PDNI/PDI). \tag{6}$$

Our quarterly consumption model applies the extended version of equation 5 for 1970–97, using our own income forecasts, our own liquid and illiquid asset variables, and our own indicator of financial liberalization (Aron and Muellbauer 2000a). We summarize first the long-run results from this model and then discuss three further implications for saving from the full model. The long-run solution—in terms of nonstationary variables integrated of order 1 [I(1)]—is:

$$\begin{aligned}\log(C/PDNI) = {} & \text{constant} + 0.33\, FLIB + 0.073 \log(PDI/PDNI) + 0.147\, RLADB \\ & + 0.068\, (RHA + RIFA + RPAMA) - 0.25\, RPRIMEMA.\end{aligned} \tag{7}$$

Although self-employment income is part of the theoretical definition of nonproperty income, these data are not separately available in the national accounts. We correct for this by including log(*PDI/PDNI*) as a proxy for self-employment income.[14] The asset variables *RLADB*, *RHA*, and *RIFA* are, respectively, the ratio of liquid assets minus debt to current *PDNI*, the ratio of gross housing assets to current *PDNI*, and the ratio of directly held, illiquid financial assets (at the end of the previous quarter) to current *PDNI*. *RPAMA* measures pension and insurance company assets owned by the personal sector, expressed as the moving average of the previous four quarters, again relative to current *PDNI*. The longer lag reflects the delays by which pension and insurance funds adjust contribution rates to changing asset values. *RPRIMEMA* is the four-

13. In most other countries housing booms have followed significant financial liberalization, thereby compounding the rise in debt. In South Africa, however, the declining personal saving ratio and rising debt-to-income ratio due to financial liberalization were accompanied by a falling ratio of house prices to income after the gold boom of the early 1980s. Possible reasons include poor growth, high real interest rates, and emigration.

14. Note that log(*PDI/PDNI*) = log(1 + property income/*PDNI*) ≈ property income/*PDNI*. We assume that self-employment income (a major component of property income in other countries) is highly correlated with property income in South Africa.

quarter moving average of the real interest rate using the prime rate charged by banks.[15]

Following equation 6 the long-run solution for the personal saving ratio is then derived as

$$(8) \quad s = \text{constant} - 0.33\, FLIB + 0.927 \log(PDI/PDNI) - 0.147\, RLADB - 0.068\, (RHA + RIFA + RPAMA) + 0.25\, RPRIMEMA.$$

The long-run saving ratio emphasizes the role of wealth effects and financial liberalization, factors typically neglected in conventional analyses. There are two wealth effects. Liquid assets minus debt appear to be about twice as spendable as illiquid assets, the components of which have similar degrees of spendability.[16] We illustrate equation 8 by plotting *s* against all five explanatory components weighted by their parameter estimates (figure 7). This clarifies longer-term trends and shows how short-run movements in *s* are dominated by the volatility of property income (reflected in *PDI/PDNI*).

Our model emphasizes the important and complex role of financial liberalization. Financial liberalization has a huge effect on the personal saving ratio (figure 7). Our model suggests that between 1983 and 1997, financial liberalization directly reduced the personal saving ratio by around 21 percent (for given *PDI/PDNI*, ratios of assets to income, and real interest rates). Since the average ratio of *PDI* to gross national disposable income between 1983 and 1997 was 0.62 (see figure 4), this would imply a fall of 12.5 percentage points in the ratio of personal saving to gross national disposable income.

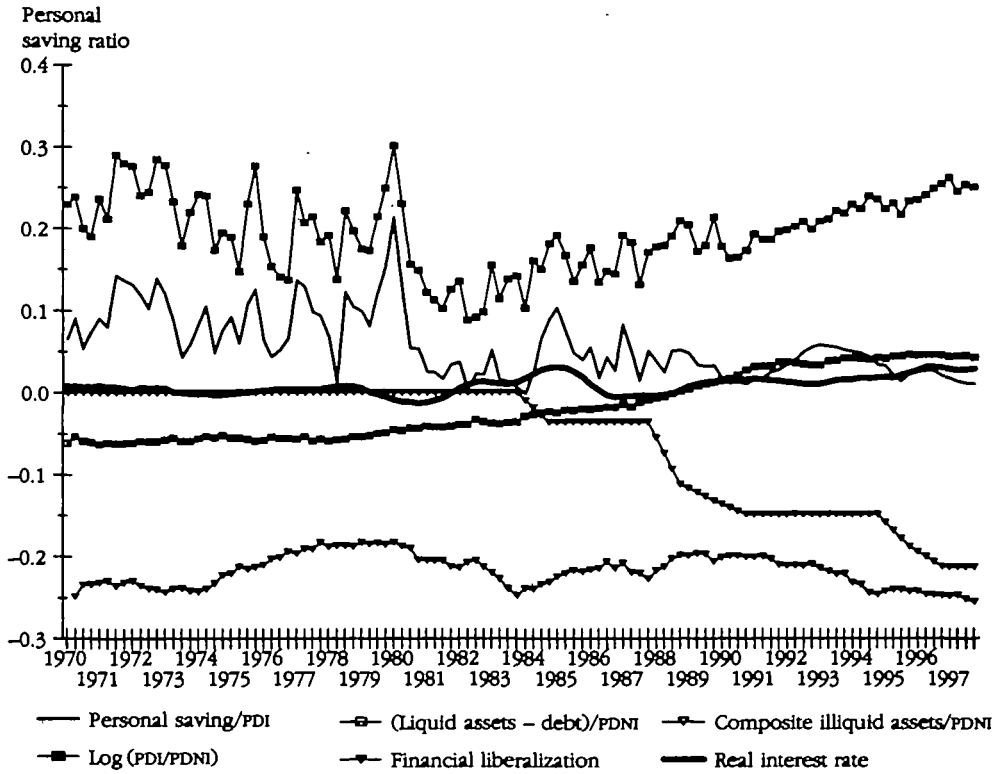
However, important offsetting factors cushioned the fall in the saving ratios (figure 7). Some of these factors were influenced by financial liberalization itself: implying that our partial equilibrium calculation overstates the general equilibrium effects. The full general equilibrium picture of the effect of financial liberalization on *s* and on *S/GDNI* includes complex, indirect effects working through interest rates, income ratios, and portfolios of assets and debt. More comprehensive models are needed to quantify these effects. The largest offsetting factor in figure 7 is the rise in *PDI/PDNI*, where increased property income and self-employment income in the unincorporated business sector, relative to formal labor income, increased saving. One of the factors likely to have contributed to the relative rise of *PDI* is increased access to credit, because of the stimulus to unincorporated enterprise.

The fall in liquid assets minus debt is the second largest offsetting factor (figure 7). This trend was strongly influenced by financial liberalization, which allowed households to hold more debt and fewer liquid assets relative to income (by the late 1980s household debt exceeded liquid assets). Such a deterioration in households' net liquid asset position tends to increase saving.

15. The real interest rate is a borderline I(1) variable on annual data, although the quarterly moving average appears to be I(0). We therefore prefer to include it in the long-run solution.

16. Illiquid assets comprise housing assets, directly held illiquid financial assets, and pension assets.

Figure 7. *Decomposition of the Personal Saving Ratio into Asset-to-Income and Relative Income Effects, Financial Liberalization, and Real Interest Rate Effects, 1970–97*



Source: Equation 8 and Aron and Muellbauer (2000a).

Financial liberalization also indirectly influenced the rise in real interest rates. With the reduction of credit rationing from the early 1980s, high interest rates were required to control credit demand. We find that a 1 percent rise in the real prime interest rate directly increases the personal saving ratio by 0.25 percent (see figure 7). Further, increased real interest rates undoubtedly helped to prevent a financial liberalization–induced boom in asset prices, which would have led to a deterioration in the saving ratio.

The long-run solution also lends insight into how monetary policy is transmitted to the personal sector. Our research emphasizes multiple transmission channels: probably even larger than the direct effect shown in equation 7 is the indirect effect working through asset prices. Theoretical considerations as well as empirical results for a range of other countries emphasize the relative importance of such indirect effects.[17] An important future avenue for research is to quantify these asset price effects for South Africa.

17. For a recent symposium on monetary policy emphasizing the asset price channel, see Federal Reserve Bank of Kansas (1999).

Three key implications for saving from the full model in Aron and Muellbauer (2000a) concern fiscal policy effects, saving and growth, and piercing the veil. The inclusion of expected income growth in the consumption model clarifies the channel through which fiscal policy is transmitted to personal saving. Our income-forecasting model suggests that a 1 percentage point reduction in the ratio of the government deficit to GDP raises personal disposable nonproperty income by around 1 percent in the long run. Since income expectations and current consumption adjust before actual current income, this would result in a short-term decline in the ratio of personal saving to gross national disposable income. In the longer term, the effect of the deficit on saving depends on how it influences the ratio of personal income to national income. The estimated model also suggests that, at given asset-to-income ratios and real interest rates, an increase in the steady-state growth rate of income has little effect on the personal saving rate. Habit formation in consumption tends to generate a positive effect of growth on saving, while if households have high growth expectations, this reduces saving (see Deaton 1999: 61 for a summary of the issues on the effect of growth on steady-state personal saving). In our model the two effects tend to cancel one another.

Finally, we followed Poterba (1991) in testing whether dividend income has no direct effect on consumption after incorporating the equity wealth effect, as is implied if the corporate veil is pierced. Dividend income is insignificant, suggesting that households perceived the tradeoff between increased dividends and lower equity prices to be almost complete and thus did not increase consumption. This result, however, is subject to possible measurement error in the proxy for after-tax dividends.[18]

III. Corporate Saving and Profits

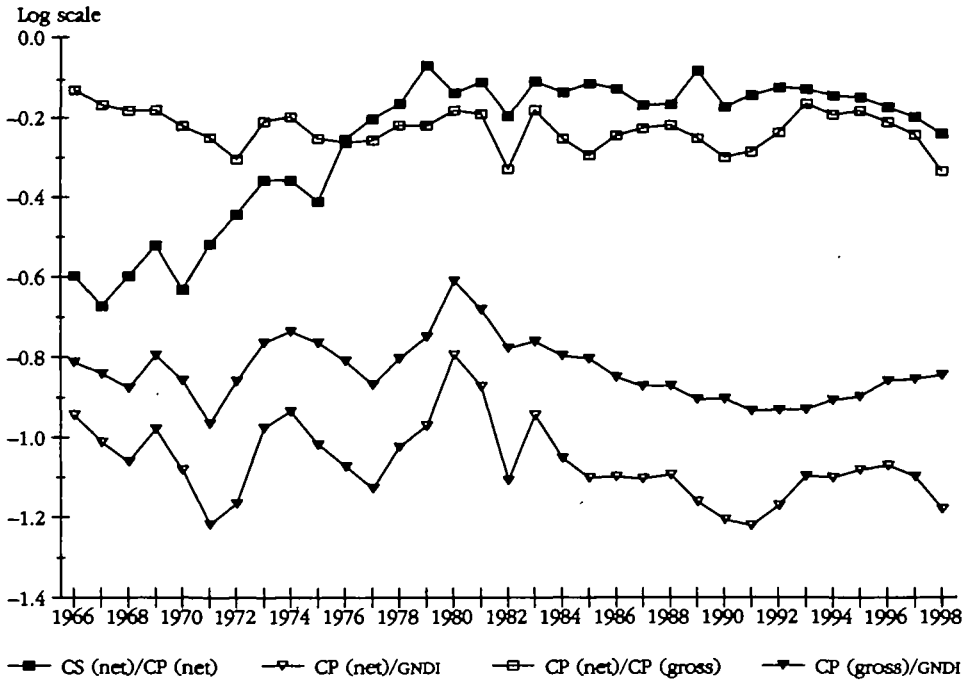
Since corporations now dominate private saving in South Africa it is important to understand the determinants of the corporate saving rate. In this article we examine the determinants of annual net corporate saving (relative to *GNDI*) from 1966 to 1997, including the role of dividend and other tax changes. The net corporate saving ratio can increase through both a rise in corporate saving relative to profits and a rise in the profit share in national income:

$$CS/GNDI = (CS/CP^{net})\,(CP^{net}/GNDI) \tag{9}$$

where CS is net corporate saving, and CP^{net} is corporate income (profits) net of tax and interest payments. There are multiple influences on each of the ratios on the right side of equation 9. In order not to conflate these influences, we model

18. Unlike in the United Kingdom and the United States, the national accounts in South Africa do not provide a separate dividend income measure. We use the JSE dividend-to-price ratio, adjusted for taxes and multiplied by estimated equity holdings. Further, the self-employment income proxy in equation 7 unfortunately also includes a small dividend component. In the consumption equation this term has a low but significant coefficient, and hence dividend income may exert some effect on consumption.

Figure 8. *The Corporate Saving Rate, Shares of Net and Gross Profits in National Income, and the Ratio of Net to Gross Profits, 1966–98*



Source: Authors' calculations from the *Quarterly Bulletin*, South African Reserve Bank.

the two ratios separately. Further, we break the second ratio, $CP^{net}/GNDI$, into $(CP^{net}/CP^{gross})\cdot(CP^{gross}/GNDI)$, and model $CP^{gross}/GNDI$, thereby separating out tax effects from the share of gross profits in income (see the section on the corporate profits equation). This type of disaggregation extends the work of Poterba (1987), who examines only saving or dividend payments out of net corporate profits.

The log of the ratio of corporate saving to net profits rises until the late 1970s (figure 8). It then fluctuates around the higher level until the early 1990s, when a declining trend appears. The ratio of net to gross profits, which largely reflects the ratio of company taxes to profits, shows little trend, but again a tendency to decline since the early 1990s. The upturn of the share of gross profits in national income in the 1990s has been more than offset in recent years by higher taxation; thus net profits to *GNDI* have fallen since 1996.

Corporate Saving Equation

The literature on corporate saving is largely policy-oriented and empirical, but it generally lacks an agreed theoretical model.[19] Poterba (1987) examines the mirror image of corporate saving, namely corporate dividend or payout equations (see also earlier work by Feldstein 1970, 1973 and King 1977), and sum-

19. The only one is an econometric study for South Africa by Tsikata (1998).

marizes some of the alternative theories and the empirical literature for the United States and the United Kingdom.[20] In the absence of an accepted theoretical model on dividend behavior, Poterba argues for an error-correction model of aggregate real dividends, in which the target dividend is a function of equity earnings (using several different measures of earnings) and a tax discrimination variable, measured as a weighted average across shareholders of the after-tax household income from a dividend payout, divided by the after-tax income associated with undistributed profits (with associated capital gains).

Such models focus on the link between net profits and the demand for payouts by shareholders (reflecting their tax position). But, as Poterba acknowledges, another influence on dividend behavior could come from the demand for retentions induced by corporate investment. If retentions offer a source of funding expected to be cheaper than equity or debt issues or bank borrowing, corporations may reduce dividend payments if they anticipate a higher cost of outside funds or greater profit-earning opportunities (see also Caggese 1999 for a recent formal model of this type of saving motive). Poterba (1987) attempts to control for this influence by including in his dividend equation the effective tax rate on corporate investment and Tobin's q, but he finds neither to be significant. In his results for the United States the tax discrimination variable hovers around the 5 percent significance level over different samples and specifications. In the United States, therefore, the relative tax burden on dividends and capital gains does appear to affect, but only weakly, the extent to which corporate earnings are distributed to shareholders.

Our measure of net corporate saving covers saving by South African financial and nonfinancial corporations as well as foreign affiliates of South African firms and is defined as net corporate income less net tax and net interest paid (a relatively small component) and less net dividends, after adjusting for depreciation and inventory valuation. Poterba (1987) discusses adjusting a related measure of net saving, defined as undistributed profits less capital consumption, for inflationary gains on corporate debt. We make no adjustment for inflation, but we do include inflation as a regressor in the corporate saving equation.

We analyze two tax effects, both associated with piercing the veil. The first is the impact of dividend taxation, which underwent several changes in the period.[21] If corporations pursued a dividend policy to maximize after-tax returns of shareholders, then Poterba's tax discrimination variable—which for South Africa, without a capital gains tax in the period estimated, is simply measured as 1 minus the dividend tax rate—will negatively affect corporate saving (see Poterba 1987). Second, without a capital gains tax, inflation is expected to affect corpo-

20. See also Bond, Chennells, and Devereux (1995) for a cross-sectional study on company dividends.

21. Between 1960 and 1990 dividends on directly held equities were effectively taxed twice: once through the corporation tax on company profits (out of which dividends are paid) and again through a dividend tax on individuals, in which one-third of dividends were untaxed, and the remaining two-thirds were taxed at the individual's marginal income tax rate. The dividend tax was temporarily abolished in 1990–93 and then replaced by a secondary dividend tax on companies.

rate saving positively. Inflation raises both nominal dividend payments and nominal share prices. This increases the benefits of retained earnings to shareholders, since only dividends are taxed.[22] However, an inflation surprise, in principle, will diminish debt and hence reduce the need to save for debt repayments.

Since corporate saving takes place largely to finance investment, when outside funds are expensive because real interest rates are high, or are difficult to obtain because access to foreign finance is denied, corporate saving should be higher. Furthermore, when expected income growth rates are high, a higher rate of saving is expected since investment will be particularly profitable (we compare results using forecast rates of income growth, from one-year-ahead real *PDNI* per capita, and real GDP per capita forecasting equations, derived, respectively, in Aron and Muellbauer 2000a, 2000b). There may also be short-run smoothing effects. In cyclical upturns and in gold price booms, when profits are temporarily high, one might expect companies to save a larger percentage of their income. Finally, we include our financial liberalization indicator, *FLIB*, to reflect the fact that household debt has its counterpart in corporate assets, particularly assets of financial corporations, and this might help to account for the relatively high corporate saving rate sustained into the 1990s.

We estimate an error-correction model of the form:

$$\Delta y_t = \alpha_0 + \Sigma_j \beta_j \Delta x_{j,t} + \beta_0 (\Sigma_j \alpha_j x_{j,t-1} - y_{t-1}) + \varepsilon_t \tag{10}$$

where y is the log of the ratio of corporate saving to profits, $\log(CS/CP^{net})$. The x variables include *RLTFLOW*, the ratio of long-term capital inflows to GDP; *TAXDISCR*, defined as 1 minus the dividend tax rate; *RPRIME*, the real prime rate of interest on borrowing; $\Delta\log(PC)$, the rate of change of consumer prices; and *FLIB*, the estimated indicator of financial liberalization. These variables are all I(1), except for the real interest rate, which is borderline I(0); see table 1. We also examine other cyclical indicators, including capacity utilization in manufacturing, the gold terms of trade, and the log of real corporate profits, as well as the forecast rates of income growth.

A general-to-specific testing procedure on annual data for 1966–97 gives the parsimonious equation shown in the first column of table 2. The lag structure implies a speed of adjustment of around 0.5, meaning that half of the deviation of the lagged dependent variable from the long-run solution is corrected within one year.

Figure 9 shows the contribution to the long-run solution of the I(1) regressors weighted by their coefficients.[23] We find that the tax effects on corporate saving are indeed twofold. First, a rise in personal tax rates on dividends (a fall in tax discrimination) raises corporate saving. Second, inflation has a positive effect; that is, higher inflation encourages corporations to retain earnings, given the

22. Corporate saving may also have been encouraged by low or negative real after-tax returns on other assets, such as bonds or liquid deposits, in an inflationary environment.

23. It achieves this by plotting $(\Delta y_t + \beta_0 y_{t-1})$ in equation 10 against $(\beta_j \Delta x_{j,t} + \beta_0 \alpha_j x_{j,t-1})$ for each I(1) variable.

Table 1. *Statistics and Variable Definitions*

Variable	*Definition of variable*	*Mean*	*Standard deviation*	*Augmented Dickey-Fuller statistics*	
				I(1)	*I(2)*
Corporate saving equation (1966–97)					
$\Delta \log(CS/CP^{pect})$	Growth rate of ratio of corporate saving to GNDI	0.0287	0.1507	–7.78*	
$\text{Log}(CS/CP^{pect})$	Log of ratio of corporate saving to GNDI	–0.6074	0.4238	–2.12	–7.784*
ΔRLTFLOW	Change in ratio of long-term capital flows to GDP	0.0003	0.0051	–6.76*	
Δ RTOTFLOW	Change in ratio of total capital flows to GDP	–0.00004	0.0073	–5.67*	
TAXDISCRMA	Two-year moving average of tax discrimination, defined as 1 minus effective rate of dividend tax	0.7086	0.1126	4.55*	
FLIB	Estimated indicator of financial liberalization	0.1574	0.2210		
RPRIME	Real prime interest rate/100	0.0370	0.0425	–3.72**	–4.44*
$\Delta \log(PC)$	Inflation rate (consumption deflator)	0.1035	0.0379	–2.17	–4.92*
$\Delta^2 \log(PC)$	Acceleration of prices (consumption deflator)	0.0013	0.0179	–4.92*	
$\Delta \log[RYN(+1)]^{forcst}$	Forecast real income growth rate	0.0042	0.0312	–3.67**	
$\Delta \log[RGDP(+1)]^{forcst}$	Forecast real GDP growth rate	0.0243	0.0246	–4.34*	
Corporate profits equation (1971–97)					
$\text{Log}(CP^{gross}/GNDI)$	Log of gross profits/GNDI	–1.9178	0.1937	–1.5272	–4.37*
Log(CAPUTMA)	Log of manufacturing capacity utilization index (four-quarter moving average)	4.4098	0.0253	–7.03*	
Log(CORPTAXR)	Log of the ratio of corporate tax payments to pretax and interest corporate profits	0.4981	0.0886	–2.91	–5.0569*
RTARIF	(Tariffs + import surcharges)/value of imports	0.0720	0.0189	–1.8910	–4.73*
Log(TOTRGOLD)	Log of the real rand price of gold (deflated by import price index)	–0.0353	0.2467	–3.24**	–4.29*
Log(WPIULC)	Log ratio of wholesale price index (domestically produced output) and unit labor cost in non-agriculture sectors	–0.4303	0.1017	–3.25	–4.17*
TAXDIF	(Maximum personal rate of income tax minus corporate tax)/100	0.0844	0.0946	–1.90	–2.41
$\Delta \log(GNDI)$	Growth rate of national disposable income	0.1448	0.0412	–4.29**	–6.84*
Δ^2 (PRIME)	Acceleration in prime interest rate/100	0.0001	0.0364	–5.82*	
Δ RPRIME	Change in the real prime interest rate/100	0.0033	0.0354	–4.26*	

Table 1. *(continued)*

* Rejection at the 1 percent critical value.

** Rejection at the 5 percent critical value.

Note: For a variable X, the augmented Dickey-Fuller (1981) statistic is the t-ratio on π from the regression: $\Delta X_t = \pi X_{t-1} + \Sigma^k_{i=1} \theta_i \Delta X_{t-i} + \psi_0 + \psi_1 t + \varepsilon_t$, where k is the number of lags on the dependent variable, ψ_0 is an intercept term, and t is a trend. The kth-order augmented Dickey-Fuller statistic is reported, where k is the last significant lag of the 2 lags employed. The trend is included only if significant. For null order I (2), ΔX replaces X in the equation above. Critical values with constant, and with and without trend, are obtained from MacKinnon (1991).

Source: Authors' calculations.

lack of a capital gains tax. Thus there is supporting evidence in favor of the sector saving on behalf of households, although the inflation effect may also reflect another motive. However, it is clear from figure 9 that variations in tax discrimination cannot explain the *rise* in corporate saving, although they may have helped to sustain the level of corporate saving in the past 35 years.

The rise in inflation in the 1970s accounts for a large part of the rise in the corporate saving rate. The fall in inflation in the 1990s was offset by higher real interest rates and the liberalization of consumer credit markets, which helped to sustain corporate saving (figure 9). The fall in the dividend tax rate (rise in tax discrimination) between 1979 and 1990 would have led to a decline in corporate saving, but for the upward push from higher real interest rates and from financial liberalization. The change from 1983 to 1997 in our measure of financial liberalization for consumer credit markets raised the ratio of corporate saving to gross national disposable income by around 4 percentage points, given real interest rates, the ratio of net profits to national income, and other variables.

Three variables help to explain the short-run dynamics of the log of the corporate saving ratio (table 2). One is the forecast growth rate of real *PDNI* per capita. This variable is significant, whereas the forecast rate of real GDP per capita is not (see column 2), possibly reflecting the fact that *PDNI* is dominated by wages and salaries. A rise in *PDNI* thus signals both greater final demand and higher labor costs, capturing both an expansion and a capital-deepening motive for investment, which current corporate saving serves. We find the expected positive effect from the change in the ratio of international long-term capital inflows to GDP especially important from the 1980s to 1994 under financial sanctions.[24] There is also an indication of a negative effect on saving from an inflation surprise.

The equation has satisfactory diagnostics: there is no sign of residual autocorrelation or heteroskedasticity; it passes a Chow test for parameter stability splitting the sample halfway and Ramsey's RESET specification test. Estimates for the 1966–93 and 1966–89 samples also indicate parameter stability (columns 3 and 4). The first potential break (1966–93) captures the change of regime after democratic elections in April 1994. The second potential break (1966–89) cap-

24. Since June 1999 the South African Reserve Bank has published capital flow figures by functional type of investment rather than categorizing them as long-term or short-term. An alternative specification using total capital inflows fits less well but otherwise gives similar results (column 5 in table 2).

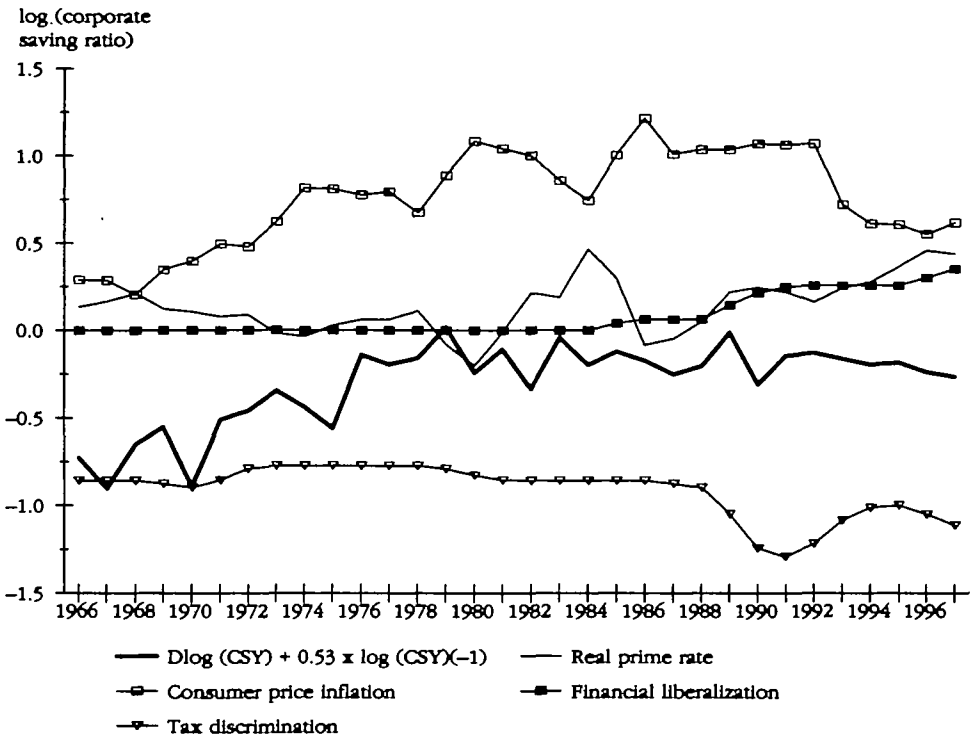
Table 2. *Corporate Saving Equation Estimates*

Dependent variable Δ *log(CS/CP^{net})*	*(1)* *1966–97*	*(2)* *1966–97*	*(3)* *1966–93*	*(4)* *1966–89*	*(5)* *1966–97*
Regressors					
Intercept	–0.38	–0.11	–0.33	–0.40	–0.42
	(1.22)	(0.31)	(0.67)	(0.46)	(1.23)
Log(CS/CP^{net}) (–1)	–0.53	–0.43	–0.50	–0.53	–0.55
	(3.58)	(2.53)	(3.09)	(2.35)	(3.34)
Δ RLTFLOW	–3.47	–3.41	–4.34	–4.25	
	(3.30)	(2.71)	(3.33)	(2.91)	
Δ RTOTFLOW					–6.99
					(2.17)
TAXDISCRMA	–1.29	–1.05	–1.23	–1.25	–1.30
	(2.71)	(2.06)	(1.78)	(1.17)	(–2.47)
FLIB(–1)	0.57	0.52	0.55	0.23	0.60
	(2.11)	(1.75)	(1.11)	(0.25)	(2.00)
RPRIME	3.80	1.59	3.53	3.87	3.63
	(2.56)	(1.13)	(2.19)	(1.87)	(2.18)
Δ log(PC)	7.30	4.68	6.75	7.39	7.66
	(3.24)	(1.89)	(2.73)	(2.00)	(3.08)
Δ^2 log(PC)	–2.97	–1.59	–3.06	–3.04	–2.93
	(2.05)	(1.10)	(–1.78)	(–1.56)	(–1.83)
Δ log[RYN(+1)]^{forcst}	3.64		3.24	3.51	3.84
	(2.29)		(1.93)	(1.65)	(2.18)
Δ log[RGDP(+1)]^{forcst}		0.98			
		(0.60)			
Diagnostics					
Standard error	0.1138	0.1250	0.1180	0.1291	0.1259
R^2	0.577	0.489	0.612	0.594	0.482
Adjusted R^2	0.430	0.311	0.448	0.377	0.302
Durbin Watson	2.20	2.27	2.16	2.17	2.26
LM1 (Lagrange multiplier test for 1st order serial correlation)	0.42	0.72	0.20	0.34	0.72
LM2 (Lagrange multiplier test for 2nd order serial correlation)	0.34	2.89	0.21	0.43	0.55
Ramsey reset test	0.02	0.40	0.03	0.21	0.10
	[0.89]	[0.53]	[0.86]	[0.86]	[0.76]
CHOW test	1.297	0.998	0.668	1.198	1.158
	[0.320]	[0.483]	[0.715]	[0.428]	[0.389]

Note: Absolute values of asymptotic *t*-ratios are in parentheses. *P*-values for Chow and Ramsey tests are in square brackets. Definitions of the variables and statistics are given in table 1. Equation 1 uses the annualized four-quarter ahead forecast real income growth rate estimated using quarterly data and a stochastic trend in STAMP 5.0 (Koopman and others 1995), while equation 2 replaces this with the forecast real GDP per capita growth rate, estimated in the same manner (see Aron and Muellbauer 2000b). Equations 3 and 4 use shorter samples, defined by particular regime breaks, to test for the parameter stability of equation 1. Equation 5 replaces the long-term flows to GDP variable in equation 1 by total flows.

Source: Authors' calculations.

Figure 9. *Decomposition of the Log Ratio of Corporate Saving into (Non-stationary) Determinants Multiplied by Their Regression Coefficients, 1966–96*



Source: Table 2, equation 1.

tures the change of monetary policy regime with the appointment of a new central bank governor, Dr. Stals, as well as the onset of political reforms after the release of Nelson Mandela in 1990. A linear combination of I(1) variables from the first column of table 2 easily passes a Dickey-Fuller stationarity test.

Corporate Profits Equation

The profits ratio in equation 9, $CP^{net}/GNDI$, is broken into two components, $(CP^{net}/CP^{gross})\cdot(CP^{gross}/GNDI)$; both are plotted in figure 8. Net profits are defined as corporate income, net of tax and interest payments. However, if tax and interest payments are regarded as items over which corporations have little control in the short run, the ratio of after-tax and after-interest profits to before-tax and before-interest profits can be regarded as given. Thus our second model concentrates on identifying the determinants of the ratio of gross corporate profits to gross national disposable income.

To derive an empirical equation for the share of profits in national disposable income, we begin with the standard analysis of a monopolistically competitive firm. This model assumes constant average and marginal costs, $AC = MC$. The share of gross profits in total revenue is

$$CP^{gross}/PY = (P - AC)Y/PY \tag{11}$$

where Y is real $GNDI$. Defining the markup, m, as the ratio of price, P, to average or marginal cost, that is, $m = P/AC$, the profit share becomes

$$CP^{gross}/PY = 1 - m^{-1}. \tag{12}$$

We approximate $\log(CP^{gross}/PY)$ by a linear function of $\log(m)$. Although m is unknown, we have price data for the main elements of P and AC, relative to a base year. Average costs are proxied by a weighted average of labor and other costs, assuming the cost share of labor to be α and the cost share of other inputs to be $(1 - \alpha)$. The markup, m, is approximated by

$$m \cong m_0 WPI/(ULC)^{\alpha}\,(WPI)^{1-\alpha} = m_0(WPI/ULC)^{\alpha} \tag{13}$$

where ULC is the index of unit labor costs, WPI is the wholesale price index for domestically produced output, and m_0 is the markup in the base year. For example, with plausible values of $\alpha = 0.6$ and $m_0 = 1.5$, equations 12 and 13 imply a coefficient around 1.2 in the regression of $\log(CP^{gross}/GNDI)$ on $\log(WPI/ULC)$.[25]

The approximation in equation 13 can be improved by including other variables. First, the gold terms of trade ($TOTRGOLD$, defined as the ratio of the rand gold price divided by an index of import prices) improves on WPI as an output price measure: gold has a small weight in the WPI but is a major source of revenue. Second, the ratio of tariffs and surcharges to imports ($RTARIF$) reflects another cost component. Third, the level of real interest rates, $RPRIME$, captures an aspect of costs for corporations holding floating debt, although since financial corporations benefit from raised interest rates, the overall effect on saving may be small.

Fourth, to capture the role of fixed costs in reducing average costs as output increases, we include capacity utilization, $CAPUT$. Finally, we note that the size of the corporate sector can vary with tax policy. We control for two effects: a measurement effect and a real effect. If personal income tax rates are high relative to corporate tax rates, individuals with a business income have an incentive to become incorporated. We define the difference between the highest personal income tax rate and the corporate tax rate as $TAXDIF$, which can be expected to raise the share of profits in national income.[26] Second, a high ratio of taxes on companies relative to profits can act as a disincentive to earn or declare profits.[27]

There are two dynamic effects. The model includes lagged $GNDI$ among the explanatory variables to reflect lags in production and lags in recording profits

25. Note that $\partial\log(CPgross/PY)/\partial\log(m) = 1/(m - 1) > 1$.

26. Recent evidence for just such an effect in the United States comes from Gordon and Slemrod (1998).

27. We measure this tax ratio as $\log(CORPTAXR) = \log[1+ (\text{tax paid/net profits})]$. By using this measure of corporate taxation, we include the influences of variations in depreciation allowances and the differing tax regimes applied to mining companies, absent from the statutory corporate tax rate. For institutional details on tax regimes and depreciation allowances in the manufacturing sector, see Tsikata (1998).

from accounting conventions. We include it as $\Delta\log(GNDI)$ on the right side in order to preserve a coefficient of 1 on $\log(GNDI)$ in the long-run solution for $\log(CP^{gross})$. Given that crises such as the 1985 debt crisis saw sharp rises in nominal interest rates, which can affect gross profits by, for example, having a negative short-term impact on sales before production responds, we also include changes in the prime rate charged by banks.

We estimate an error-correction model of the form in equation 10 for $\Delta\log(CP^{gross}/GNDI)$. The x variables classified as I(1)—see table 1—are $\log(WPI/ULC)$, $\log(TOTRGOLD)$, $RPRIME$, $TAXDIF$, $RTARIF$, and $\log(CORPTAXR)$; those classified as I(0) are $\log(CAPUT)$, $\Delta PRIME$, and $\Delta\log(GNDI)$. A general-to-specific testing procedure on annual data for 1971–97 gives the parsimonious equation shown in column 1 of table 3.[28] We could accept the hypothesis that the coefficient on $\log(CP^{gross}/GNDI)_{-1}$ was –1, thus simplifying the model to one with a levels-dependent variable. The level of the real prime rate was insignificant.

The contribution of the I(1) regressors weighted by their coefficients is shown in figure 10. Both the gold terms of trade and the ratio of wholesale prices to unit labor costs fell in the 1990s, the latter because of stronger international competition and stronger trade unions. Despite these negative effects, the profit share in national income recovered after 1994, with improved capacity utilization and lower import tariffs, a temporary fall in the ratio of company taxes to profits, and a rise in $TAXDIF$ (which reflects a compositional change with little real significance for the economy as a whole).

Turning to the I(0) regressors, the interest rate terms simplify into a negative effect from the acceleration of the prime rate. In column 2 of table 3, we replace the acceleration in the prime rate by the change in the real rate and achieve similar results.[29] Capacity utilization enters as a two-year moving average. We could also accept (but have not imposed) the hypothesis of a coefficient of –0.5 on $\Delta\log(GNDI)$. This would be equivalent to omitting this term and redefining the dependent variable as $\log(CP^{gross}/GNDIma)$, that is, scaling by the two-year moving average of national income. The coefficient on $\Delta\log(WPIULC)$, while positive, is insignificant; omitting this variable means the output price to average cost effect enters as a one-year lag. These results are consistent with lags in reporting profits or in production. The tariff and tax effects are current effects, possibly because tax and tariff rates typically are known at the beginning of the production year.

The model easily passes various specification tests for lack of residual autocorrelation, heteroskedasticity, a Chow test for stability over a mid-sample split, and Ramsay's RESET specification test. Columns 3 and 4 report estimates for 1971–93 and 1971–89 samples, which also indicate parameter stability. With six

28. We were restricted to estimates from 1971, as *ULC* data begin in this year.

29. At the suggestion of a referee, we tested to see if these interest rate effects were not largely a proxy for particular events such as the 1983–85 period of exchange rate unification and subsequent debt crisis, when interest rates were particularly volatile. Both sets of results hold up when the 1983–85 data are excluded from the sample.

Table 3. *Corporate Profits Equation Estimates*

Dependent variable $\log(CP^{gross}/GNDI)$	*(1)* *1971–97*	*(2)* *1971–97*	*(3)* *1971–93*	*(4)* *1971–89*
Regressors				
Intercept	–6.54	–8.78	–7.23	–5.82
	(4.34)	(3.85)	(5.02)	(4.16)
log(CAPUTMA)	1.26	1.75	1.40	1.32
	(3.72)	(3.37)	(4.37)	(3.64)
log(CORPTAXR)	–0.38	–0.36	–0.41	–0.49
	(3.49)	(2.47)	(4.18)	(3.03)
RTARIF	–2.77	–1.88	–2.48	–2.67
	(4.99)	(2.53)	(4.98)	(4.51)
log(TOTRGOLD)	0.56	0.58	0.57	0.56
	(13.98)	(11.26)	(15.73)	(11.72)
$\log(WPIULC)_{-1}$	1.18	1.07	1.02	0.83
	(10.21)	(7.45)	(6.59)	(3.87)
TAXDIF	0.72	0.83	0.82	0.99
	(5.39)	(4.91)	(6.37)	(4.71)
Δ log(GNDI)	–0.63	–0.88	–0.61	–0.64
	(3.12)	(2.91)	(3.41)	(3.08)
Δ^2 (PRIME)	–0.88		–0.81	–0.81)
	(4.75)		(4.81)	(4.22
Δ RPRIME		–0.80		
		(2.58)		
Diagnostics				
Standard error	0.0309	0.0396	0.0269	0.0296
R^2	0.982	0.971	0.989	0.986
Adjusted R^2	0.975	0.958	0.982	0.975
Durbin Watson	2.49	2.11	2.77	2.66
LM1 (Lagrange multiplier test for 1st order serial correlation)	2.86	0.18	2.86	2.63
LM2 (Lagrange multiplier test for 2nd order serial correlation)	2.62	0.21	3.24	6.52
Ramsey reset test	0.00	0.00	0.01	0.19
	[0.96]	[0.97]	[0.91]	[0.68]
CHOW test	0.27	0.87	1.20	0.78
	[0.97]	[0.58]	[0.44]	[0.71]

Note: Absolute values of asymptotic *t*-ratios are in parentheses. *P*-values for Chow and Ramsey tests are in square brackets. Definitions of the variables and statistics are given in table 1. Equation 2 tests robustness by replacing Δ^2 (PRIME) in equation 1 by ΔRPRIME. Equations 3 and 4 use a shorter sample, defined by particular regime breaks, to test for the parameter stability of equation 1.

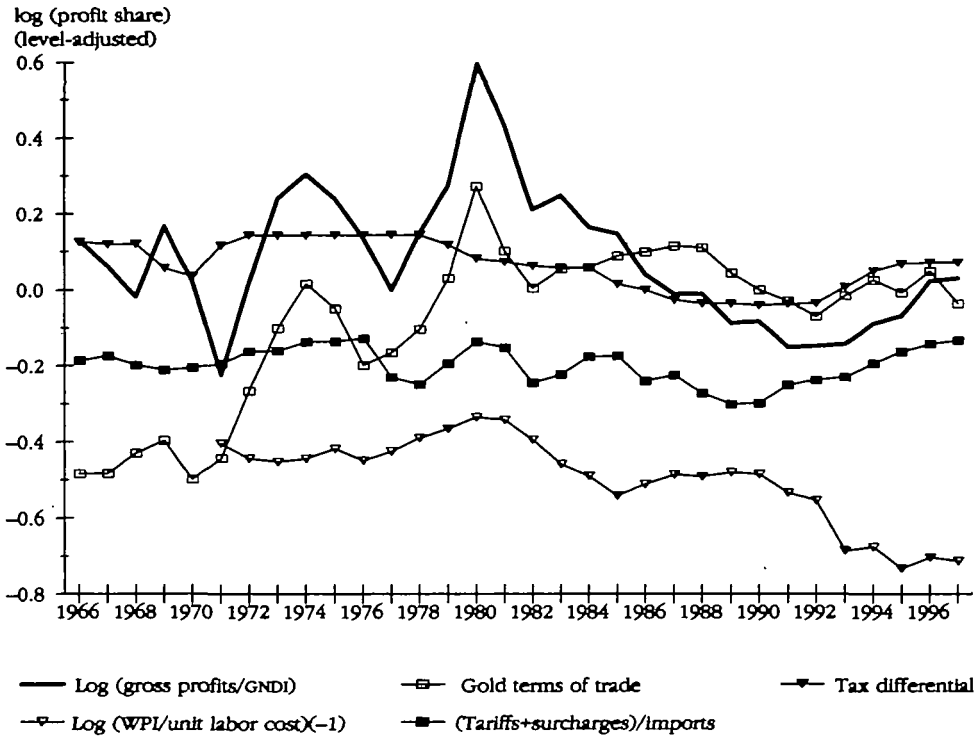
Source: Authors' calculations

I(1) variables and at most 27 observations, the Johansen procedure (for example, Johansen and Juselius 1990) lacks power. However, a linear combination of I(1) variables from table 3, column 1, easily passes a Dickey-Fuller test for stationarity.

IV. Concluding Remarks and Policy Implications

In this article we explored the determinants of private saving in South Africa, separately examining personal (or household) and corporate saving behavior from the late 1960s to 1997 and emphasizing links between them.

Figure 10. *Decomposition of the Log Profit Share into the Main (Nonstationary) Determinants Multiplied by Their Regression Coefficients, 1966–96*



Source: Table 3, equation 1.

We examined personal saving behavior using a quarterly solved-out consumption function for households. This allowed a fuller treatment of a range of extensions and approximations to theoretical behavior than is usual with simple saving functions. Particular innovations were the inclusion of asset effects, financial liberalization, and income expectations, in addition to the more usual determinants of consumption.

The main conclusions from this model are fourfold. First, much of the rise in the ratio of consumption to income has been the result of financial liberalization, in part because of reduced down payments for housing purchases. However, the general equilibrium reductions in personal saving due to financial liberalization are substantially smaller than the partial equilibrium effects. This is because financial liberalization also raised real interest rates, caused household debt to rise relative to liquid assets, and raised unincorporated business income relative to labor income, all of which tend to raise personal saving rates. Second, real interest rates have significant direct negative effects on consumption, presumably because of the mix of substitution, income, and user-cost-of-durables effects predicted by economic theory. The estimates throw important light on the monetary

transmission mechanism, showing that there are multiple channels through which interest rates affect consumption expenditures. In addition to the direct effect, a rise in the real interest rate appears to have even larger indirect effects through asset prices, income, and income expectations. Without official data on the stock of wealth, these apparently large asset effects have not been measured previously.

Third, the inclusion of expected income growth clarifies the channel through which fiscal policy is transmitted to personal saving, generating links between personal and government saving rates. This approach is missing in previous work. Fourth, the model suggests that the effect of a permanently higher growth rate on the personal saving ratio in South Africa is likely to be small, given real interest rates and asset-to-income ratios.

There is a striking paucity of literature on corporate saving behavior, both in general and specific to South Africa. We examined the determinants of annual net corporate saving relative to national income (*GNDI*) by disaggregating this ratio into three components and investigating separately the determinants of net corporate saving relative to net corporate income (or profits) and gross corporate profits relative to *GNDI*. The third component, the ratio of net to gross profits, is taken as given, being largely outside the control of firms. The profit share equation has two groups of determinants. One consists of the components of the price to average cost markup: the share of pretax profits in national income rises with the ratio of wholesale prices to unit labor costs, the gold terms of trade, and capacity utilization (capturing a lower share of fixed costs), but falls with import tariffs, a cost component (see figure 10). The other consists of two tax effects: a rise in the difference between the highest tax rate on individuals and the corporate tax rate raises the profit share, while a rise in the ratio of company taxes to profits has the opposite effect. The first of these tax effects largely reflects the incentives of businesses to incorporate when tax rates on corporations are lower than those on private individuals. The second suggests that higher tax rates on corporations tend to stifle profit-earning activities.

The main results from the corporate saving equation are that the rise in the inflation rate between the late 1960s and late 1980s was an important factor in explaining the rise in the share of corporate saving in net profits; whereas with the decline of inflation in the 1990s, the corporate saving rate was bolstered by high real interest rates and liberalization of consumer credit markets. Changes in personal tax rates on dividends play no role in explaining the rise in the corporate saving rate out of net profits, but they help to account for some decline in the 1990s (see figure 9).

From these two models, and the log ratio of net to gross profits, we derive a model for the log ratio of corporate saving out of national income, consistent with the corporate saving rate shown in figure 3. For example, we can now understand the 1980 peak to be the result of the peak in the share of profits associated with the gold price boom and not the result of any significant rise in the propensity to save out of profits.

There are important links between household and corporate saving. A key question is whether the well-known stability of private saving can be attributed

fully to households piercing the corporate veil. We tested this hypothesis for both the personal and corporate saving models and found evidence of piercing the veil in both cases: household expenditures appear to respond to the value of equities rather than to after-tax dividend payments, whereas the corporate tax rate is influenced by the personal dividend tax rate and by inflation.

However, the significant role of inflation in explaining the secular rise in the corporate saving rate out of net profits is explained only partly by corporations serving the tax needs of their shareholders. Other reasons include poor returns on alternative assets in an inflationary environment. Moreover, the role of changing dividend taxation should not be exaggerated quite apart from the fact that, as we have seen, its variations cannot explain the secular rise in the corporate saving rate. From the mid-1980s, most equities held on behalf of individuals were held by pension funds and thus were tax-exempt.[30] The above tests do not indicate the extent of sectoral offset. However, even if households saw through the corporate budget constraint perfectly, piercing the veil turns out to be only one factor in explaining these sectoral shifts.

Our personal and corporate sector saving models both show clearly the importance of many other economic factors besides piercing the veil that change sectoral saving behavior. These fall into two types. First, there are factors that move household and corporate saving rates out of national income in opposite directions, with differing degrees of offset. Perhaps most obviously, the shares of corporate profits and of personal disposable income in national income are negatively correlated (see figures 4 and 10). Factors behind this negative correlation are gold booms and other causes of the procyclical pattern of profit shares and the strengthening of union power, which raises labor's share and lowers the profit share. To the extent that there is some stability in the sectoral saving ratios out of sectoral income, the two sectoral saving ratios out of national income will be negatively correlated.

There are also factors that can move household and corporate saving rates out of their respective sectoral incomes in opposite directions. The most important of these is financial liberalization. Although there are general equilibrium effects that make it complicated to quantify the degree of offset, our results suggest that financial liberalization reduced personal saving far more than it raised corporate saving. Inflation surprises lower corporate saving and increase measured household saving (through wealth effects and measured disposable income, since measured interest income rises with higher nominal interest rates).

Second, there are other factors that cause a positive correlation between the two saving rates out of sectoral income: both increasing or both decreasing. Higher real interest rates positively affect both corporate and personal saving rates, given income and growth. Other factors can be ambiguous. A rise in government saving reduces the personal saving rate out of personal income by

30. Pensions paid out to individuals are subject to income tax. However, pensions are paid in part as a tax-free sum, while income is received at a time when other income is low or nonexistent, so that low marginal tax rates will tend to apply. After 1996 a change in legislation provided for direct taxation of pension fund income (Katz Commission 1996).

raising income expectations (which we modeled separately), given current income, and also to the extent that it lowers real interest rates. The income expectations effect of a rise in government saving on the corporate saving rate is in the opposite direction, although the real interest rate effect is in the same direction as for households.

The net effect of all these factors suggested by our models is thus more complex than the simple story of piercing the veil. This view suggests that there are good reasons to be concerned not only with reducing government dissaving but also about the compositional change in private saving and the decline in both private saving ratios from 1995.

Our models represent a significant advance on earlier partial equilibrium models of saving. However, to examine the general equilibrium effects for monetary transmission implications, these richer partial models should be included in larger models, in particular to trace through the real interest rate effects working through asset price changes for bonds, housing, and equities. Such work should also address risk premiums more explicitly than we have been able to do.

There have been extensive debates on the effects of financial liberalization on private saving. Our results concur with findings in the empirical survey in Fry (1995: ch. 8): if financial liberalization increases the availability of consumer credit, private saving tends to decline.

Policy changes in the new millennium that bear on saving behavior in South Africa include the introduction of capital gains taxation on securities directly held by households. The regime announced is stringent, with minimal allowances and no inflation indexing. Since we cannot reject the hypothesis that the corporate veil is pierced, our models predict little impact on total private saving; they suggest some increase in personal saving, with a reduction in corporate saving (since corporate retentions resulting in taxable capital gains for households will now be less attractive to households). An important change is the transition toward inflation targeting and the decision to issue inflation-indexed bonds. These moves aim to improve the transparency and stability of policy, dampen inflationary expectations, and reduce risk premiums, thus lowering real interest rates.

The fall in the corporate saving ratio since 1995, despite rises in the real interest rate, appears consistent with our model (see figure 9 and, for the history of the real interest rate, figure 2). However, if real interest rates are to fall, our partial equilibrium models suggest that both personal and corporate saving rates out of (higher) sectoral incomes will fall still further. Taking further system feedbacks into account, the asset price effects of lower interest rates will reinforce the fall in personal saving, whereas the effect of a higher growth rate on personal saving is probably fairly small (for given ratios of assets to income). For corporations, however, the growth effects on saving from lower interest rates are likely to be larger, and computing their size has great policy relevance. Encouraging corporate saving would seem to be particularly important if the sustainability of foreign saving remains uncertain because of the volatility of capital inflows, if government saving improves only slowly, and if household saving remains low.

Even without embedding our models in a full macroeconometric model, we can draw some policy conclusions—supplementing these models by simple hypotheses about, for example, the effect on asset prices of higher interest rates. One possible measure related to our model concerns prudential regulation limiting the degree to which companies can take on short-term foreign debt. Another concerns corporate taxation and depreciation allowances, where more generous treatment encourages investment and enables companies to earn more profit. Since corporations have much higher saving rates than households, this should raise the private saving rate out of national income.

Returning to personal saving, it is clear that despite the direct and indirect effects of high real interest rates in the 1990s, net household saving has fallen to very low levels, mainly because of financial liberalization. The South African financial system encourages personal borrowing to an excessive degree—in the sense that the high interest rates considered necessary to restrain consumer credit and spending also restrained investment and economic growth in the 1990s. Attention should be given to tightening prudential controls, to allow for the possibility of macroeconomic risk or a shock to the financial system, for instance, through a major fall in asset values. Prudential controls not only should stabilize the financial system but also should keep individual default rates reasonably low, particularly for new consumers, many of whom may have little experience in risk management. One possible move would be to impose higher risk weights for mortgage loans with high loan-to-value ratios. Another area for tightening regulations concerns the use of pensions for housing collateral. Although current regulations may have implications for reducing the housing deficit, forcing income risk, pension risk, and housing risk to be correlated violates the general notion of spreading risk. Housing policies that encourage the rental sector would help to reduce overborrowing by young, middle-income households.

Apart from encouraging prudent lending by the financial sector, there may be a role for tax incentives to encourage household saving. Although we have not investigated a separate role for the rate of return on assets, as opposed to the borrowing rate, our evidence is at least consistent with the idea that extending the generous tax treatment of pensions to some other saving products would raise the personal saving rate. Such schemes may help to install a long-term culture of saving, although it is fair to say that empirical evidence for the United States has not found large aggregate saving effects (see, for example, Hubbard and Skinner 1996 and other articles in this volume).

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