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Life cycles, oil cycles, or financial reforms? The growth in private savings rates in Indonesia.

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Abstract: What goes steady with private savings? This paper investigates reasons for the sustained growth in private savings in Indonesia since 1970, in a period characterized by economic growth, demographic changes, terms of trade movements, and financial liberalization. The main finding is that predictions from a simple life cycle model do well inasmuch as the remarkable growth in private savings rates is associated with a fall in the dependency ratio. This suggests that a reduction in the number of children relative to working age population has alleviated household budget constraints, thereby boosting savings rates.

1. Introduction.

What drives capital accumulation is a core issue in economic theory as well as in empirical research. This paper looks at the sustained growth in private savings rates in Indonesia in the last twenty-five years. Whereas Indonesian private savings rates in the beginning of the 1970s were considerably lower than in other Southeast Asian countries, they have steadily increased and converged, and had in fact more than doubled by the beginning of the 1990s. The present study seeks to find what might explain this transition.

The last years have seen a resurgence of interest in the causes and effects of saving behavior. Primarily, this follows on the observation that savings rates differ markedly, across countries and over time, among both developed and developing countries, and also on the apparent link between high saving rates and long run economic growth (Aghevli *et al.*, 1990, Edwards, 1995, Elmeskov *et al.*, 1991, Masson *et al.*, 1995). Despite the abundant theoretical and empirical literature, the relationship between savings and growth remains surprisingly indeterminate. Traditional models of saving based on consumption smoothing along the lines of life cycle and permanent income hypotheses typically predict savings by income growth, but assign different and opposite roles to future and current income. Empirical research has not nailed down the direction

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of causality. On the one hand, diverging savings rates have been put forth as explanations for differences in economic growth (see e.g. Modigliani, 1970, World Bank, 1993). Frequently cited examples are several East and Southeast Asian economies which have combined rapid economic growth with high and increasing savings rates. Their performances are contrasted to low or falling savings rates in a number of slow growing OECD countries, and to the relatively low rates of savings in poorer African countries. On the other hand, there is evidence of reverse causality in that high growth rates induce high savings rates whereas the opposite does not hold (Carroll and Weil, 1994).

In analyzing savings performance, focus turns to the role of private savings. First, because public and private savings deserve separate analyses - although both are influenced by changes in the economic environment, they are not subject to identical considerations and constraints, and also influence one another. Moreover, it is recognized that domestic sources of private capital need to be mobilized and channeled through the financial system in order to provide investment capital. These considerations have largely prompted the financial sector reforms which in the last decades have swept through many developing countries as an integral part of economic reform programs.

The empirical literature on the determinants of private savings is vast and quite inconclusive, but some important findings can be summarized as follows. In support of life cycle models, several cross country studies indicate, first, a high correlation between income growth and private savings rates, and second, that demographic variables, reflecting the age structure of the population, influence savings rates by influencing the number of savers relative to dissavers (e.g. Edwards, 1995, Higgins and Williamsson, 1996, Lahiri, 1989, Rossi, 1989, and Modigliani, 1970). Third, there is a link between transitory terms of trade shocks and changes in private savings rates, suggesting that savings are procyclical in this respect (Fry, 1986, Ostry and Reinhart, 1992). Fourth, government savings tend to crowd out private savings, but the offset is less than one for one (Edwards, 1995, Masson *et al.*, 1995, Corsetti *et al.*, 1992). However, the net effect of real interest rates and the degree of financial development remains uncertain (Corsetti *et al*., 1992, Ostry and Reinhart, 1992). These variables' ambiguous influence on savings is consistent with theoretical predictions.

Within Southeast Asia, the development of private savings in Indonesia is a case apart. First, after a period of political turmoil and economic disrupt in the 1960s, Indonesia entered the 1970s with per capita income levels among the lowest in the world. In little more than a decade, however, Indonesia moved into the group of lower middle-income countries. This change was, if not entirely due to, so at least strongly associated with the improvement in terms of trade. A petroleum economy, Indonesia experienced rapid increases in foreign exchange and government revenue. The initially low income levels were accompanied by low rates of private savings, relative to other

Southeast Asian countries. However, in the last twenty-five years, private savings have steadily increased, with more than a doubling of net private savings as share of private disposable income between the early 1970s to the early 1990s. By the mid 1990s, Indonesian private savings rates reached levels comparable to those of other Southeast Asian countries. Whereas Indonesian per capita income growth performance is not conspicuous by (the admittedly high) Southeast Asian standards, the growth of Indonesian private savings rates clearly is (see table 1.1).

< table 1.1. about here >

The steady growth in private savings rates has taken place in a period marked by important structural changes, all of which may be expected to have strong implications for savings rates. First, Indonesia has undergone a transition from a very poor to a middle income country. Simultaneously, the age distribution of the population has successively become less tilted towards children, suggesting that falling birth rates have helped alleviating households' budget constraints. Also, the 1970s and 1980s have been characterized by considerable swings in international commodity prices, affecting both public and private income and wealth. Finally, wide-ranging financial reforms began in 1983, with the liberalization of interest rates and abolishment of credit ceilings. The Indonesian financial sector has been substantially transformed, thus alleviating both borrowing and savings constraints.

Previous studies of Indonesian savings are scarce, despite the unusual rise, and the conclusions incoherent. In a study of Asian private savings rates, Lahiri (1989) finds that income growth explains Indonesian private savings, whereas changes in the population age structure have no lasting effects. This result contrasts the study of the life cycle hypothesis' relevance in the ASEAN countries by Faruquee and Husain (1995), where the increase in working age population relative to the total has a strong and positive impact, whereas income growth rates do not.[1] In an evaluation of Indonesian financial development, Erquiaga (1987) finds no evidence of any influence from either income level or growth on domestic savings. In contrast, the increase in real deposit rates are shown to have a positive impact.[2]

The purpose of the present study is to explore why Indonesian private savings rates have increased in the last twenty-five years. In doing so, a standard theoretical and

[1] The discrepancies may partly stem from the use of different sample periods: the former study included the highly unstable years between 1960-1970. Also, Lahiri did find a short run impact of changes in dependency rates. However, this differenced variable is flawed by construction. See appendix one.

[2] Unfortunately, Erquiaga's study is limited to the years between 1971-1983.

methodological framework is applied to Indonesian national data. The paper is organized as follows. The second section outlines a simple neoclassical model to account for the long run development of aggregate savings rates, with an emphasis on the influence of demographic factors and economic growth on savings rates. Extensions and amendments to the basic framework are discussed. The third section is devoted to empirical analysis, using cointegration and error correction techniques to test the theoretical framework presented. A main finding is that the long run increase in private savings rates is associated with the fall in the dependency ratio, as predicted by the model, but that per capita income growth has no separate influence on private savings. In addition, government savings affect private savings negatively. Neither changes in income growth rates nor demographic changes influence the short run dynamics of savings. In support of the Harberger-Metzler-Laursen effect, however, fluctuations in terms of trade do. The fourth section concludes.

A case study of this nature has advantages and disadvantages. An in-depth one country study makes it possible to consolidate the most recent data available from national sources in a consistent framework, in cases where more general sources of data typically used in cross-country studies usually are characterized by rough estimates at best or missing observations at worst. However, in this case, what is gained in focus is lost regarding generality on the one hand and robustness of the results on the other. In particular, the short times series put boundaries to the econometric analysis and the power of the results.

2. Life cycle savings and dependency ratios.

This section consolidates some theoretical findings relevant for the study of savings from a long run standpoint. The benchmark is a simple neoclassical overlapping generations model. A main idea of the life cycle perspective used is that working people are savers and children and retired people are dissavers. While people are working, they use their income to provide for their own consumption as well as their children's, and are also saving to provide for their retirement period. Some possible extensions and amendments to the model, with particular relevance to underdeveloped economies, are also discussed below.

2.1. The model.

The set-up is as follows.[3] At time *t*, the size of a generation of working-age is N_t, and population growth is given by n_t. For simplicity, there is no uncertainty, and the economy is closed. Each individual is supported by her parents during her childhood, works in order to support herself and her children in the second period of her life, and is then retired in the third and last period of her life. Accordingly, the economy's labor force consists of the second period generation, and there is no other third period source of income than the returns to savings. Three generations are concurrently alive in the economy, so aggregate savings will be equal to the total savings of the working generation less the total dissavings of the old generation. At each point in time, we have that

$$S_t = s_t N_t - s_{t-1} N_{t-1} \tag{2.1}$$

S_t is aggregate savings in the economy, s_t is the level of per capita savings of the working generation, and s_{t-1} is the equivalent of the old generation. From (2.1), it is clear that intergenerational heterogeneity, in terms of relative size, fertility or average income, will influence aggregate savings.

Individual savings are easily derived from the intertemporal budget constraint:

$$s_t = \frac{c_{2t+1}}{1+r_{t+1}} = w_t - c_{1t} - (1+n_t)c_{0t} \tag{2.2}$$

where c_{1t} and c_{2t+1} are the individual's own consumption in period t and $t+1$ respectively, and c_{0t} are the children's consumption in period t, w_t is (labor) income in period t, and r_{t+1} is the net return on income saved from period t to period $t+1$.

Two generations depend on the working generation for their consumption: the children, who are supported by their parents, and the old and retired, who buy consumption goods with their savings. We can define the young dependency ratio at time t as

$$\frac{N_{t+1}}{N_t} = 1 + n_t \tag{2.3}$$

and the old dependency ratio as

[3] The model draws on life cycle models in general and Higgins and Williamsson (1996) in particular. See their paper for a full-fledged model of dependency rates and life cycle savings in open and closed economies.

$$\frac{N_{t-1}}{N_t} = \frac{1}{1+n_{t-1}} \tag{2.4}$$

The total dependency ratio is simply the sum of the two.

An individual of working age at time *t* will choose savings levels so as to maximize her life time utility, which depends positively on the consumption of her children while they are still too young to earn their own living as well as on her own consumption. Consider the most elementary set-up, with an intertemporally separable life time utility and logarithmic instantaneous utility functions, and with a production side characterized by Cobb-Douglas technology and perfect competition. On these assumptions, we arrive at the following expression for the aggregate savings rate in the economy:

$$\frac{S_t}{Y_t} = \beta(1-\alpha)\left\{\frac{1}{1+\beta+\gamma(1+n_t)} - \frac{\left(\frac{1}{1+n_{t-1}}\right)\left(\frac{y_{t-1}}{y_t}\right)}{(1+\beta+\gamma(1+n_{t-1}))}\right\} \tag{2.5}$$

Y_t is aggregate output, and y_t is per worker output at time *t*. The constants refer to the output elasticity of capital (α) and to the individual's relative preferences for future consumption (β) and children's utility, i.e. degree of altruism (γ).[4]

Equation (2.5) has the following implications for the aggregate savings rate in this economy. First, per worker income growth will unambiguously have a positive effect. Second, changes in the demographic structure will change the savings rate. Since the latter is decreasing in n_t and increasing in n_{t-1}, it is decreasing in both the old and young dependency ratio. The intuition is the following. Population growth implies a larger number of children relative to workers, which strains the budgets of the working generation and lowers savings. However, as these children enter the labor force, they are a positive factor to the aggregate savings rate - they reduce the old dependency ratio. Unless population growth remains high or increases, the young dependency ratio will also fall. The lower the dependency ratios, the higher the number of savers relative to the number of dissavers in the economy. Similarly, an increase in per worker income from one period to another implies that the working-cum-saving generation is wealthier than the preceding one. Even if the saving and the dissaving individuals have the same propensities to save, the new generation will be saving out of a higher income than the dissaving one, which renders aggregate savings positive.

[4] Note that with logarithmic utility functions, the income and substitution effects from the interest rate on savings cancel out.

It is easy to see from equation (2.5) that an increase in the growth rate will have a positive effect on savings, but that the change will be less than one for one. Equally, the first derivatives of the young and old dependency ratios are both unambiguously negative with an absolute value less than one.

Since the model brings out the importance of demographics, it can illustrate the effects of a demographic transition. An economy in a development stage characterized by high fertility rates and falling infant mortality is burdened by a high share of young children, which will lower the average household's ability to save out of current income. A population structure tilted towards the very young will therefore tend to depress domestic savings, until the economy enters the next stage of the demographic transition and population growth falls.

2.2. Extensions.

The above set-up is simple and discernible but restrictive. In particular, the analysis of saving behavior in poorer countries may require several amendments to the original neoclassical model.[5] For example, underdeveloped factor and/or output markets, undiversified production structure and low income levels, may complicate the savings decision. Institutional features, e.g. design of social security systems, taxation schemes, insurance and financial market development, will differ along an economy's development path, which in turn will be reflected in savings decisions. Some implications are discussed below.

In the absence of bequest motives or similar transfers between generations for altruistic - or other - reasons, the aggregate of savings over the life cycle will be zero. For each individual, and equivalently each generation, what is saved early in life is consumed later on. However, neglecting intergenerational income and consumption links may be particularly erroneous in economies where households typically are large and encompass several generations. The assumption of strong bequest motives, or, equivalently, infinite horizons, will in its own constitute a strong motive for saving.[6] Similarly, the working generation may provide for their retired parents. Altruistic children of working age might then support the consumption of the old generation, and save less for their own retirement, envisaging that they in turn will be taken care of by their children. In the latter case, population growth may in fact be endogenous to the saving decision. That is,

[5] For comprehensive surveys and discussions of savings and developing countries, see Deaton (1989, 1992), and Gersowitz (1988).

[6] It is straightforward to show that with parents who remain entirely altruistic throughout life, the OLG model collapses into a model of an infinitely lived representative agent.

children are an asset in the households' savings portfolio, and the cost of children's consumption during childhood will pay off in the form of a secured old age.[7]

In the presence of (some degree of) Ricardian equivalence, government savings may affect private savings negatively. The RE theorem will rest on several assumptions. For example, that taxation is shifted in time, whereas government expenditure and resource allocation remain unchanged, and that any tax burden, although intertemporally replaced, will fall on the same long-lived individuals, and will therefore not change the intertemporal budget constraint.[8] Since the OLG model introduces heterogeneity by age, Ricardian Equivalence can not hold completely if the tax burden is shifted between generations, or if government transfers are reallocated from young to old or vice versa.

The three-period model is aimed at illustrating "low frequency" income smoothing, and second-period income equals total and permanent income. Income growth is intergenerational, never intragenerational. Hence, the model falls short of accounting for different effects of temporary or short-run changes in economic conditions, relative to permanent changes. Nevertheless, income fluctuations may be substantial in economies with an undiversified production structure, if they are dependent on a few export products which are subject to sharp swings in international prices. According to the permanent income hypothesis, savings should indeed by more sensitive to income increases which are perceived as temporary than those which are permanent. Equally, an anticipated increase in future income, implying an increase in life-time income, should lower current savings. This argument has been extended to the impact of terms of trade fluctuations on national savings (see e.g. Razin and Svensson, 1983, and Persson and Svensson, 1985), the assumption being that terms of trade have a strong impact on real income and wealth and thereby have implications for savings (the Harberger-Laursen-Metzler effect).

The disincentive effect from anticipated future income growth raises questions regarding the effects of financial liberalization and financial deepening (see e.g. Ogaki, Ostry and Reinhart, 1996). A liquidity constrained individual envisaging future income growth would find it optimal to borrow against that future income. However,

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[7] See e.g. Hammer (1986) and Horn (1994), on endogenous population growth and savings.

[8] The Ricardian Equivalence Theorem states that, for any given path of government consumption, households should not change their consumption path in response to a change in the timing of taxes (Barro, 1974). More specifically, a decrease (increase) in government savings, corresponding to an increase in government debt, is perceived as an indication of higher (lower) future taxes to finance future repayments of the debt, and hence of higher (lower) need for individual savings in the present. If Ricardian equivalence holds perfectly, changes in government savings will therefore be fully offset by changes in private savings, leaving aggregate national savings unchanged.

imperfections in the capital market, which bar the access to borrowing instruments, may prevent her from doing so. Necessary investments will then have to be financed by own savings, which raises the need for individual thrift. If credit markets are characterized by rationing and interest rate ceilings, it may be impossible or indeed suboptimal for the individual to save in the manner the life cycle hypothesis predicts. Hence, a large number of financial saving instruments and better access to financial markets might raise savings. However, if consumers earlier have had limited access to credit, and financial reforms and financial deepening also open up for borrowing, the effect may be the reverse. Individuals who expect higher income in the future may wish to borrow against that future income, and financial development and reform render this deal possible by alleviating liquidity constraints. In addition, the effect on savings from real interest rates increases following from interest rate liberalization is ambiguous, since the income and substitution effects from an increase in the returns to savings work in opposite directions.

The standard model describes a perfectly certain world, while in reality the degree of uncertainty and risk attitudes will matter for savings behavior. How important the effects from uncertainty are will partly depend on the availability of insurance. Importantly, at low income levels, uncertainty may pose a particularly serious threat to consumption levels. If risk aversion is higher the lower the consumption level, the savings decision will be linked to per capita income levels (and not only growth). In countries where the primary sector is dominant, the fact that agricultural income depends on an intrinsically unpredictable element - climate - will make risk attitudes at low income levels particularly significant in saving behavior. Increased risk regarding future income, represented by a mean preserving spread, may therefore give rise to precautionary savings (see Deaton, 1992). The relation to income levels is not necessarily linear. At low income levels, mere subsistence requirements may lead to high consumption rates and hence very low savings. Although some tradeoff between consumption in the present and the future would be desirable, for precautionary reasons or for intertemporal consumption smoothing, it may be physically impossible to sacrifice present needs. Hence, we might expect a change in savings propensities and elasticities as an economy rises above the absolute poverty line.[9]

[9] For example, in a recent cross country study, Ogaki, Ostry, and Reinhart (1996) find that the interest rate sensitivity of saving rises with income.

3. Empirical Analysis.

This section draws on the above theoretical framework to test hypotheses of what determines the development of aggregate savings rates. A brief discussion of the methodology and the data is followed by an account of the estimations.

3.1. Methodology.

The empirical analysis is based on an error correction specification.[10] The intuition behind the cointegration and error correction method is that although many variables exhibit stochastic trends, we may expect some of them to drift together in a stationary relationship. Empirical analysis will in such cases require a methodology which can both separate and relate transitory influences and long run determinants. Moreover, standard OLS estimation yields parameter estimates and standard errors valid for conventional hypothesis testing on the assumption that the variables have stationary means and variances. Whereas differencing the variables will resolve these difficulties, such a model may be mis specified, since it disregards any information regarding a long run equilibrium. In view of the upward trend in Indonesian savings rates, the issue of stationarity is important. However, the availability of data is limited, reflected in a low number of observations. This hampers the validity of the cointegration and error correction model, and must be kept in mind when interpreting the results.

The analysis proceeds in two steps.[11] First, to find an estimate of the long run average relationship, I run an OLS regression on the variables in levels. The following equation is estimated:

$$\frac{S_t}{Y_t} - \beta' \mathrm{X_t} = u_t \qquad (3.1)$$

where $\frac{S_t}{Y_t}$ is the private saving rate at time *t*, $\mathrm{X_t}$ is a vector of variables expected to be linked to savings rates, β is a parameter vector, and u_t is an error term, reflecting the influence of transitory noise on the equilibrium saving rate. The stability of the long

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[10] For an overview of the cointegration methodology, see e.g. Cuthbertsson *et. al*. 1992, or Faruquee and Husain (1995).

[11] A complete and more correct method to test for cointegration includes unit root tests for order of integration of all variables in equation (3.1). Results from D-F unit root tests can be found in appendix 2. Again, in view of the limited number of observations, the unit root methodology is problematic. However, the second step of the E-G procedure consists of running standard OLS regressions, albeit with procedures for hypothesis testing which account for nonstationary series. I start from there.

run relationship is tested on the estimated error term. If $\hat{u}_t$ is stationary over the sample period, this suggest a long run stable, or equilibrium, cointegrating relationship between X_t and $\frac{S_t}{Y_t}$. With nonstationary variables, the estimated β and the respective standard errors should be corrected before the usual tests of significance are undertaken

Equation (2.5) in section 2.1. provided strong candidates for X_t: income growth and dependency ratios. I also initially include variables to control for government savings, terms of trade, and financial development.[12]

The information provided from estimating the long run equilibrium equation (3.1) is then used for the short run dynamics, which in a general form equation can be described as:

$$\Delta \frac{S_t}{Y_t} = \alpha_0 + \alpha_1 \left(\frac{S_{t-1}}{Y_{t-1}} - \hat{\beta}' X_{t-1} \right) + \alpha_3' \Delta X_t + V_t + v_t \qquad (3.2)$$

where Δ indicates first differences. The bracketed term is in fact the lagged estimated error term, i.e. $\hat{u}_{t-1}$, from the long run equilibrium equation, X_t as before the vector of long run explanatory variables, and V_t a vector of (stationary) variables which may affect the movements of savings rates in the short run. Since all variables in (3.2) including $\hat{u}_t$ are stationary by construction or otherwise, standard OLS regressions and inference methods can be used. If the estimated long run relationship is indeed a stable one, the coefficient α_1 should be negative. Other things equal, a positive (negative) deviation from the long run equilibrium in any one period, represented by u_t , should be corrected in the subsequent period by a reduction (increase) in the dependent variable, so as to revert to the original stable relationship.

3.2. The data.[13]

Constructing an accurate time series for Indonesian private savings entails several difficulties. First, figures for private savings are derived as a residual from other macroeconomic aggregates via the national income identities. Hence, there can be a multitude of measurement errors from each aggregate included in the calculation. Second, there are alternative methods for deriving private savings from aggregate macro data, which yield identical series in theory but rarely so in practice. Here, we calculate

[12] Note that for the cointegrating equation to be balanced and yield a stationary error term, all variables must be integrated of the same order.

[13] A description of the sources of data as well as a correlation matrix is provided in appendix one.

private saving from private disposable income and private consumption rather than via the current account and investment (see table 3.1.).[14]

< table 3.1. about here >

Further, none of the national accounts based definitions of private savings account for the difference between private corporate savings and household savings. This might present a distortion in the empirical testing of saving behavior based exclusively on hypotheses of household incentives. Whether or not it does, depends on how household members perceive retained corporate earnings. If corporate income and saving are considered part of household disposable income by the household members, the private sector is indeed equal to the household sector, since the latter are the owners of private firms. The aggregate figure for private saving is then appropriate to use. However, if household members do not "see through the corporate veil" in the above sense, or if market imperfections prevent them from incorporating firm profits into private disposable income, hypothesis testing of household behavior on an aggregate including corporate profits may be misleading.

The development of net private savings rates over the last 25 years is depicted in figures 1 (the actual series) and 2 (three-year centered moving average series). Two features stand out. First, Indonesian private savings rates display an upward trend, evident in both the original and the smoothed series. Second, there is one year, 1982, in which the private savings rate actually turns negative. An examination of the figures indicates that the low level of savings in 1982 was due to a rise in direct taxation, which was not compensated for by a comparable rise in national income, or a fall in private consumption levels (c.f. table 3.1).[15] Overall, however, private savings have increased rapidly, with more than a doubling of net private savings as share of private disposable income from the beginning of the 1970s to the beginning of the 1990s.

The dependency ratio (DEPEND), i.e. the percentage of children and old people relative to people of working age, is used to capture the demographic development.[16]

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[14] Since depreciation is deducted, we focus on net savings rates rather than gross savings rates. For analytical purposes, however, the difference should not be very important.

[15] The fall in savings rates is noticeable irrespective of the method to derive private savings, and irrespective of whether current or constant data are used.

[16] Other studies, such as Faruquee and Husain (1995) and Lahiri (1989) use working age population as share of total population as their demographic variable. However, our variable is directly derived from the theoretical framework. The advantage is that the estimated parameter value can be compared to the magnitude predicted by the model.

This definition refers to total potential labor force rather than active labor force. Individuals are defined as children when below the age of 15, and of working age when between and including the ages of 15 and 64.[17] As a time series, this variable is impaired by the fact that there are no annual data on the age composition of the population, and the series obtained is by construction smooth, as figure 3 shows. However, it is unreasonable to expect the underlying unobservable data series to display markedly different dynamics. In other words, it is, improbable that the demographic variable should fluctuate violently in the short run.

The long run development of the dependency ratio is evidence of demographic shifts. The last twenty-five years have seen a considerable drop in this ratio. Importantly, this development is mainly due to a fall in the young dependency ratio (YOUNGDEP) - the number of children relative to working people has been substantially reduced. Whereas the old dependency ratio (OLDDEP) hardly has changed over the period, its order of magnitude is insignificant relative to that of the young dependency ratio and it has little influence on the development of the total dependency ratio.

Real growth rates of per capita private disposable income, calculated as annual percentage changes, are displayed in figure 4 (GROWTH). These growth figures are not remarkable compared to other Southeast Asian countries (c.f. table 1.1), but are quite impressive in relation to developing countries in general. However, and significantly, we see no clear upward trend in the growth rates, indicating no obvious covariation with savings rates.

Government savings, (GOVSAV), in figure 5, are represented by the current fiscal balance of the Indonesian central government as share of private disposable income.[18] International terms of trade are shown in figure 6. There is a very strong upward trend in the first fifteen years, followed by a decline and a stabilization in the latter years, reflecting primarily the oil price cycle over this period.

Financial deepening is represented by the development of broad money relative to private disposable income (M2). This variable provides an estimate of the increase in financial instruments in the economy.[19]The time series is depicted in figure 7. After

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[17] This is the conventional definition of working age in the empirical literature. We should note, however, that this definition implies among other things that the age of entry into the labor market is assumed to be constant.

[18] The current fiscal balance is positive throughout the period.

[19] As a regressor, however, broad money may introduce problems of simultaneity. Quasi money is composed of savings deposits, time deposits and foreign currency deposits, and is as such in itself a measure of formal savings. This raises questions of whether regressing savings on the financial deepening variable can produce unbiased coefficient estimates.

1984, the growth in broad money is more rapid than before, although the increase appears to slow down from the end of the 1980s onwards. Unsurprisingly, the financial reforms undertaken in 1983-1984 appear to have a positive effect on the financial instruments available in the formal sector. Real interest rates, finally, are shown in figure 8. The lower, often negative real interest rates in the first part of the period under study can be explained by a combination of interest rate ceilings in the pre-reform era, and high inflation rates. After 1983, interest rates were liberalized, hence the jump to substantially higher levels.

3.3. Long run determinants.

In estimating (3.1), two versions of savings rates were used in the regressions. The first is the whole series from 1970 to 1994. Original and unabridged, the error terms resulting from regressions on this series are the appropriate to use for the second step, the estimation of (3.2). In addition a smoothed saving series was used, which has been obtained by constructing a three-year centered moving average series, including one lead and one lag. This series, although invalid for the subsequent error correction mechanism, may be convenient to look at the long run issues, since it eliminates some of the transitory noise.

For both savings series, the regressions first included all variables, i.e. growth and dependency ratios as derived from the model in section 2.1, as well as government savings, terms of trade, financial deepening and interest rates. In addition, a dummy variable for 1982 was included. As previously discussed, savings rates were negative in this year, and the outlier may exert considerable influence on the regression results, without correctly reflecting the long run behavior of the system. Insignificant control variables were then sequentially eliminated.[20]

The results from the final estimations are reported in table 3.2. The first four columns are based on the original savings series, where the estimations in column I and II include a dummy variable for 1982. Column V and VI relate to the filtered series. A first and overall comment on the table is that the different regressions yield similar results: the signs and magnitudes of the estimated parameters are not very different across the columns. Second, augmented Dickey-Fuller (ADF) tests on the respective estimated error terms also indicate that the equations yield stationary error terms for all the regressions. The null-hypothesis of a unit root is rejected at the one percent level in all six cases.

[20] Regarding significance levels, see note 3 in table 3.2.

< Table 3.2. about here >

How well does the data support the savings model previously presented? The most striking result in table 3.2. is an indication that the demographic structure of the Indonesian population has indeed influenced savings. All six regressions imply that a fall in the dependency ratio is associated with an increase in private savings rates, and the results are significant on the one percent level.[21] As predicted by the model, the magnitude of the parameter is smaller than one in absolute value. Including the 1982 dummy in the regressions does reduce the parameter values, but both figures are high. Real per capita income growth, however, does not appear to have any strong impact on savings rates. The parameters are never near to be significant at the five percent significance level, irrespective of what other variables are included in the regressions. Whether the growth variable is included in the regression (columns I, III, and V), or excluded (columns II, IV, and VI) does not change the impact of the dependency ratio, nor of any other variables. Moreover, when growth is included, its coefficient value is in fact negative, which is not the expected sign.

The insignificant growth coefficient is not particularly surprising. A comparison of figures 4 and 1 does not suggest a strong relationship between savings and growth. GROWTH fluctuates more violently, and there is no clear upward trend.[22] These results are similar to those in Faruquee and Husain (1995) but differ from Lahiri (1989).

Out of the additional information variables, government savings turned out to be the most interesting. Again, the six regressions reflect similar results. The parameter values are negative and ranging between one half and two thirds in absolute value, suggesting some degree of Ricardian Equivalence in the Indonesian economy. An increase in government savings appears to crowd out private savings, although the offset is less than one for one. Indeed, the parameter estimate is very similar to previous empirical studies (Edwards, 1995, Masson *et. al*, 1995, and Corsetti *et al.*, 1992). Terms of trade, however, has an impact if and only if the 1982 dummy is included in the regression. Although its influence is positive, it is minor.

Broad money and interest rates, both of which we expect to capture some of the development of the financial markets and the impact of financial reforms, turned out insignificant in the regressions and were therefore not included in the reported regressions. This may be evidence of that financial reforms alleviate both savings and

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[21] Ibid.

[22] For a check, the original growth series was replaced by a filtered series (three year moving average). However, thus eliminating the transitory noise produced no qualitatively different results.

borrowing constraints, with an ambiguous impact on savings, and equally that the income and substitution effects of interest rates are counteractive forces. That the final word on the overall impact is inconclusive is therefore not remarkable.[23]

3.4. Error correction-short run fluctuations.

Turning to the estimation of the fluctuations of private savings rates, our findings from the long run estimations are incorporated. The results from estimating the error correction model are reported in table 3.3. These residuals stem from the regression reported in column II in table 3.2, hence income growth was not included in the first step regression.

< Table 3.3. about here >

Originally, first differences of income growth, dependency ratios, government savings, terms of trade, and interest rates, were included in the regressions, and then eliminated if conventional t-test proved them insignificant. The variables which dropped out immediately were (changes in) dependency ratios, real income growth, and real interest rates. Changes in government savings are negatively signed, as expected, and the coefficient is actually higher than the estimated long run coefficients. However, the estimated coefficient is different from zero at a ten percent level of significance only.

Whereas the impact of terms of trade on savings levels over the long run was relatively minor, changes in terms of trade do have a stronger impact on changes in private savings. In this case, the parameter value is not only of considerably higher magnitude but also more significant than in the case of long run determinants. This gives credit to the proposition that people will save a higher portion of transitory terms of trade gains than out of a permanently favorable terms of trade.

The theoretical section of this paper focused on the long run development. This is reflected in the estimations of the short run, in that the demographic variable was insignificant. Given that the variable is very smooth and consists of several interpolations, this is hardly surprising, and in fact reassuring: the "changes" in the variable are mostly constructed and do not reflect the underlying data. Moreover, as previously argued, there is little reason to think that the demographic variable in reality should vary greatly in the short run, and hence, it should not be able to explain short run

[23] However, the money variable is very highly correlated with the demographic variable in the sample (see appendix one.). If the demographic variable is excluded from the regressions, financial deepening has a significant, positive and strong impact on the savings rate.

fluctuations. Fluctuations in income growth, further, are also completely insignificant in the regressions, a result which is perhaps more surprising.

Finally, the lagged error term from the long run relationship carries a negative sign, as we expect it to. Any deviation from the long run stable relationship is partly reversed in the subsequent period, with the speed of adjustment given by the estimated coefficient, here close to one half. However, the coefficient is not significant even at the ten percent level, and the interpretation of the results is therefore subject to considerable uncertainty.[24]

4. Conclusion.

This study is motivated by the observation that Indonesian private savings have undergone a remarkable development in the last twenty-five years, with an increase in the ratio of private savings to private disposable income which is unparalleled even among other high saving Southeast Asian countries.

The study suggests that the relationship between savings and demographic changes explain this rapid transition from a low saving to a high saving nation. Predictions from a simple life cycle model do well; the rise in private savings rates is linked to falling dependency ratios in Indonesia, mainly due to a considerable reduction in the number of children relative to working age people. The estimations thus suggest that the demographic transition in the population has boosted private savings rates by lowering the number of dissavers relative to the number of savers in the economy. There is, however, no support for the contention that high per capita income growth rates have driven savings rates. This is not surprising. Although growth rates have been high and varied, they have been relatively stationary during the period. There also appears to be some degree of Ricardian equivalence in the Indonesian economy, in that government savings affect private savings negatively. Further, terms of trade fluctuations influence the short run dynamics of savings, giving credit to the argument that savings indeed are procyclical, so that temporary changes in terms of trade are saved to a greater extent than any permanent increase.

These results are tentative, but indicate that the effects from the demographic transition on the Indonesian economy are substantial. The causality direction may not be entirely clear. Here, population changes have been taken to be exogenous from both the

[2424] The error correction coefficient is highly sensitive to the presence or absence of dummy variables for in the first step of the estimations (eq. 3.1.). When no dummy is included, the coefficient is significant and close to minus one. When dummies for both 1981 and 1982 are included, the coefficient is also significant and exceeding minus one. This underlines the fragility of the results.

empirical and the theoretical viewpoint, and the estimations dismiss any influence of either income growth or financial development. With endogenous population growth, however, it may be the case that economic development in a wide sense, including typical features like higher income levels and financial deepening, promotes transformations in the means of savings. People change from saving in the form of children, to saving in the form of financial assets. In this sense, the demographic transition is reflecting a portfolio shift, where the asset forms as opposed to the size of the savings portfolio itself change.

Appendix 1. Sources of data.

The source of the data used in the exercise are primarily Indonesian national statistics. The Indonesian national accounts have been subject to some revision in the last year, and this paper includes the latest figures published by July 1995.

Figures for gross national income, depreciation, net indirect taxes, and export and import prices, are taken from various issues of the National Income of Indonesia, published by the Central Bureau for Statistics (BPS). In the Indonesian national accounts, depreciation is calculated as a constant per centage of GDP.

Figures for government fiscal balances and tax revenues have been taken from Recent Economic Development 1995, published by the IMF, for 1989-1994, and BPS Indikator Ekonomi for 1969-1988. All government figures have been converted from fiscal year (beginning in April) to calendar years (beginning in January). Since data on consolidated public saving are not available, the figures exclude savings at lower levels of government as well as public enterprises' profits or losses

The source for the demographic data are the population censuses as reported in The Human Resources Profile of Indonesia, published by the Indonesian Planning and Development Board (1994), as well as the Projections of Indonesian Population and Labor Force, from the Demographic Institute of University of Indonesia (1994). The observations are stem from population censuses, intercensal population surveys, and population projections. Preceding and intermediary years must therefore be estimated by extra- and interpolation.

Figures for money and quasi money have been taken from the World Economic Outlook database.

Real interest rates have been calculated as nominal interest rates (the annual rate on 6 month time deposits) divided by inflation.The data for nominal interest rates come from IMF International Financial Statistics for the years 1970 to 1984, and

Indonesian Financial Statistics, published by Bank Indonesia, for 1985 onwards. 6 month deposit rates are the interest rates reported in the IFS, hence this measure has been used throughout in order to get a consistent series. Figures before 1984 are based on state banks' interest rates only, for lack of other data. From 1984 onwards, nominal interest rates have been calculated as an average of different bank categories' interest rates, weighted by their relative share of total deposits. Inflation, used to calculate real interest rates, was approximated by changes in the consumption deflator. The deflators have been retrieved from the national accounts in current and constant prices. A comparison of the GDP, GNP, consumption deflator and the CPI indicated that the differences between the deflators is relatively small, and that the choice of deflator has little impact on the real value of any series.

<Table A1.1. about here>

Appendix 2. Unit root tests.

In table A2 we give the results from unit root tests on the potential determinants of savings. We find that Indonesian private saving rates are indeed first order integrated in the sample period 1970-1994, whereas per capita income growth is stationary in levels. The unit root tests also indicate that broad money as share of PDI as well as terms of trade are non-stationary series. Broad money as a share of PDI appears in fact to be second order integrated. With government saving rates, the result is less clear cut, but the series also appears to have a unit root.

In the case of the dependency ratio, the tests indicate a unit root in favour of a trend stationary alternative in levels, and further tests indicate unit roots in first differences. However, this is likely to be a consequence of how the variable has been constructed. With breaks in the series, the Dickey-Fuller test is prone to accept a false null hypothesis, i.e. suggest (falsely) that the variable has a stochastic trend and is not stationary around a deterministic trend.

< Table A2.2 about here >

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Figure 1.

Private savings rates (% of PDI) 1970-1994.

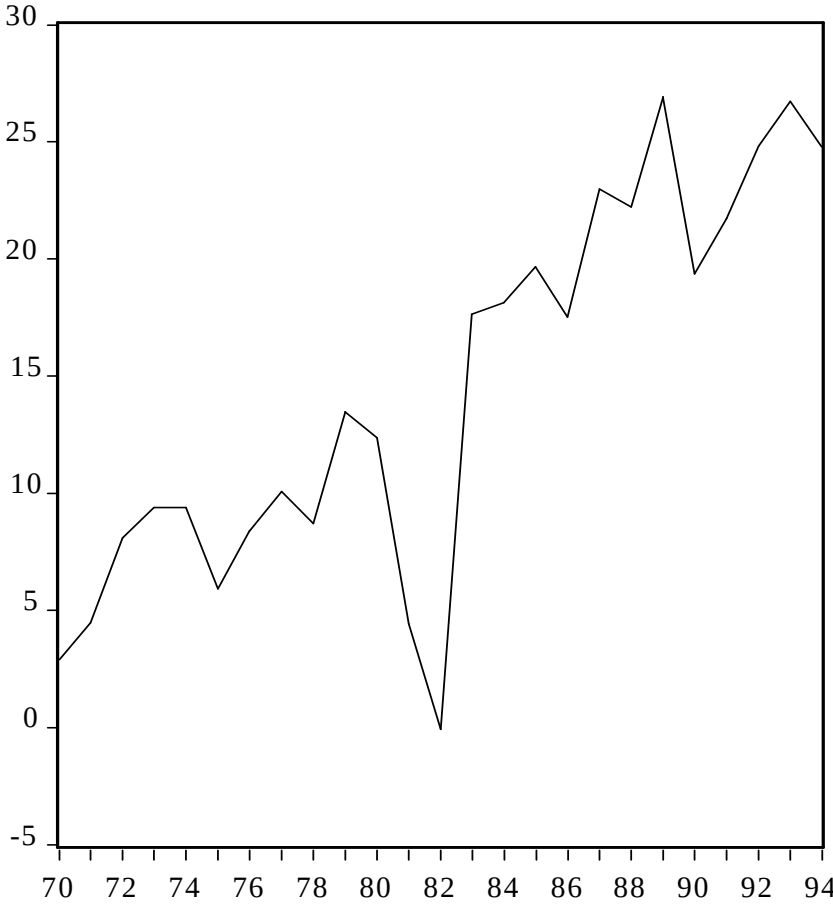

Figure 2.

Private savings rates (% of PDI), moving av., 1971-1993.

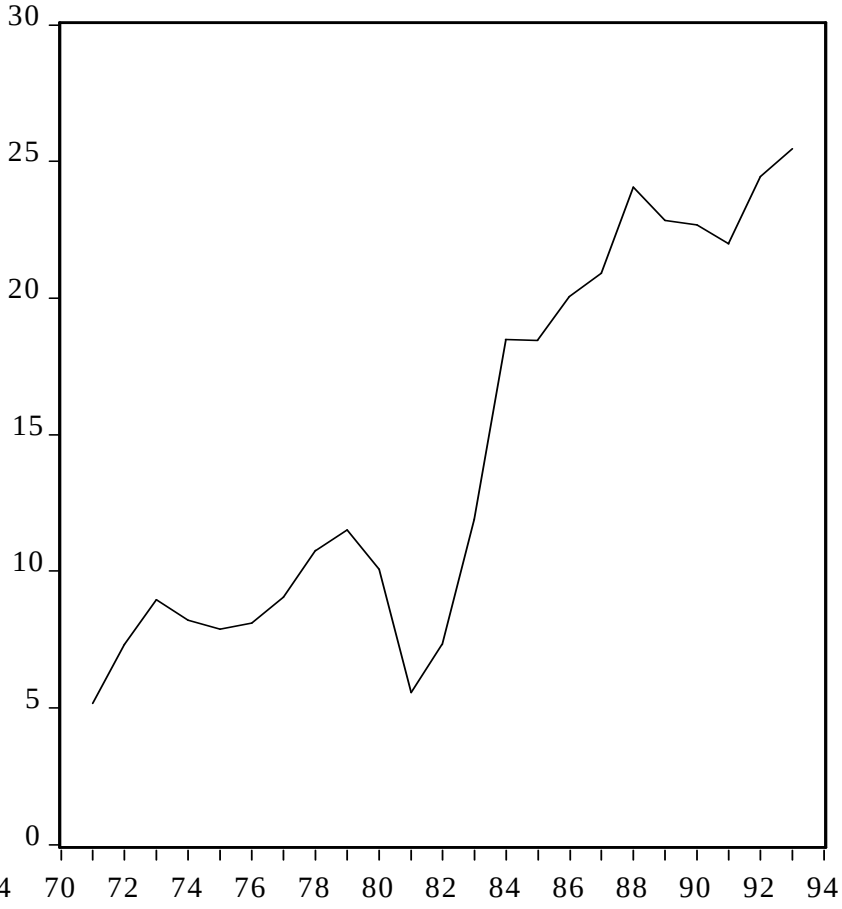

Figure 3.

Per capita private disposable income, annual growth rates (%).

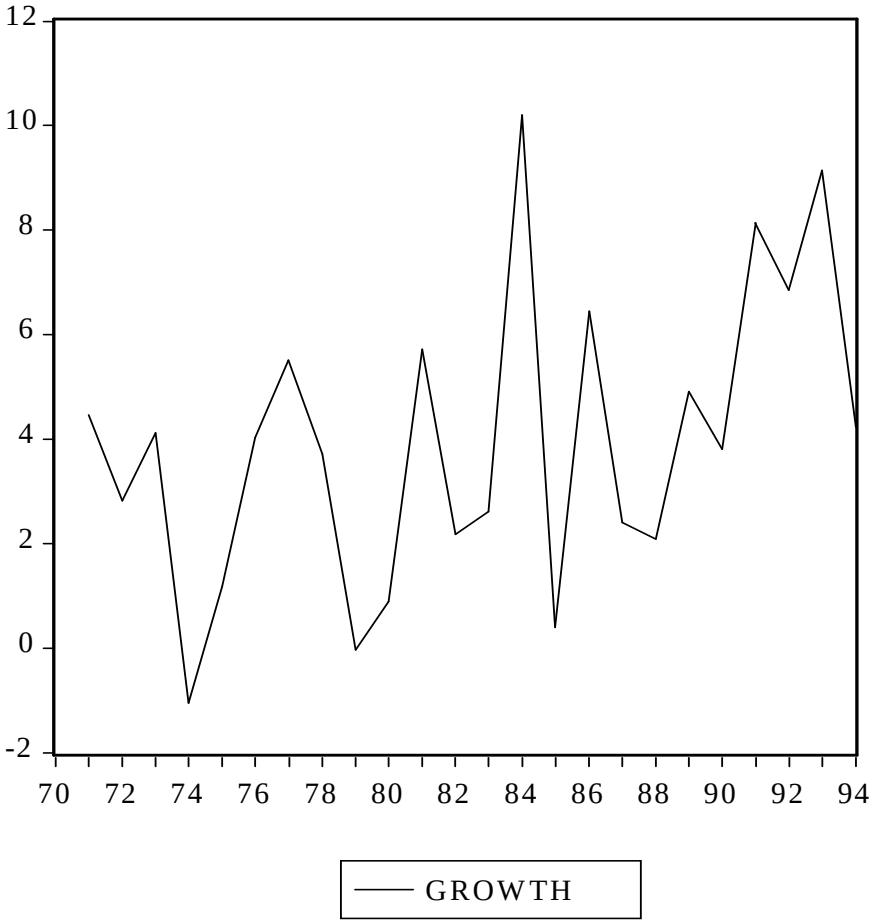

Figure 4.

Dependency ratios (% of working age population).

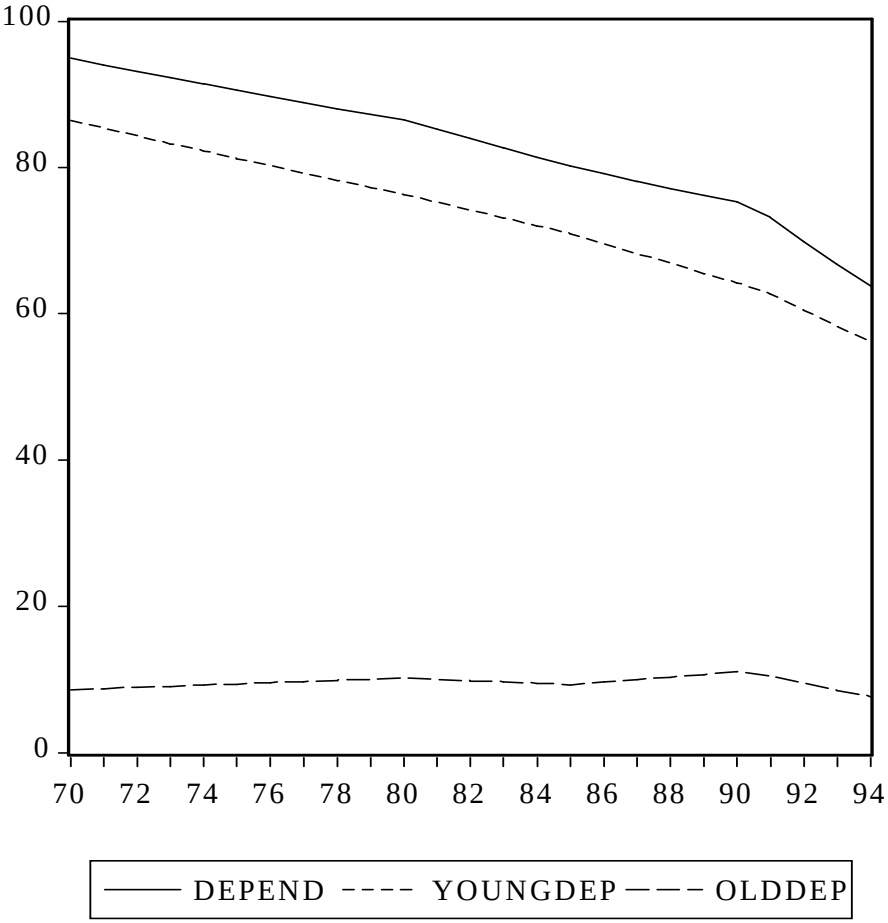

Figure 3.

Dependency ratios (% of working age population).

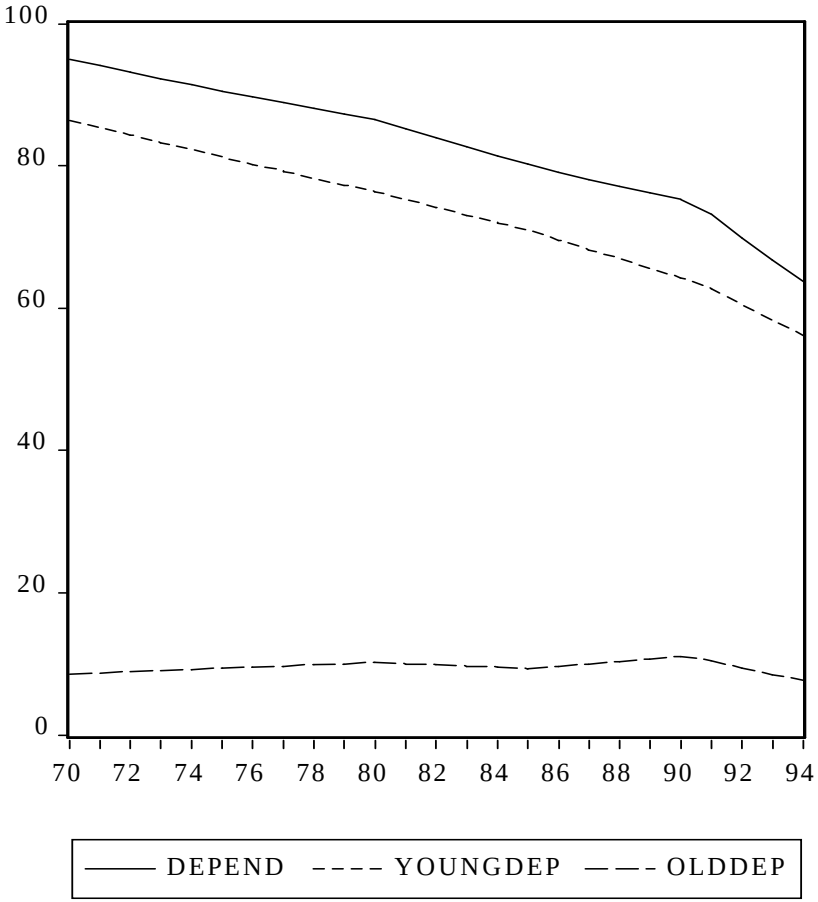

Figure 4.

Per capita private disposable income, annual growth rates (%).

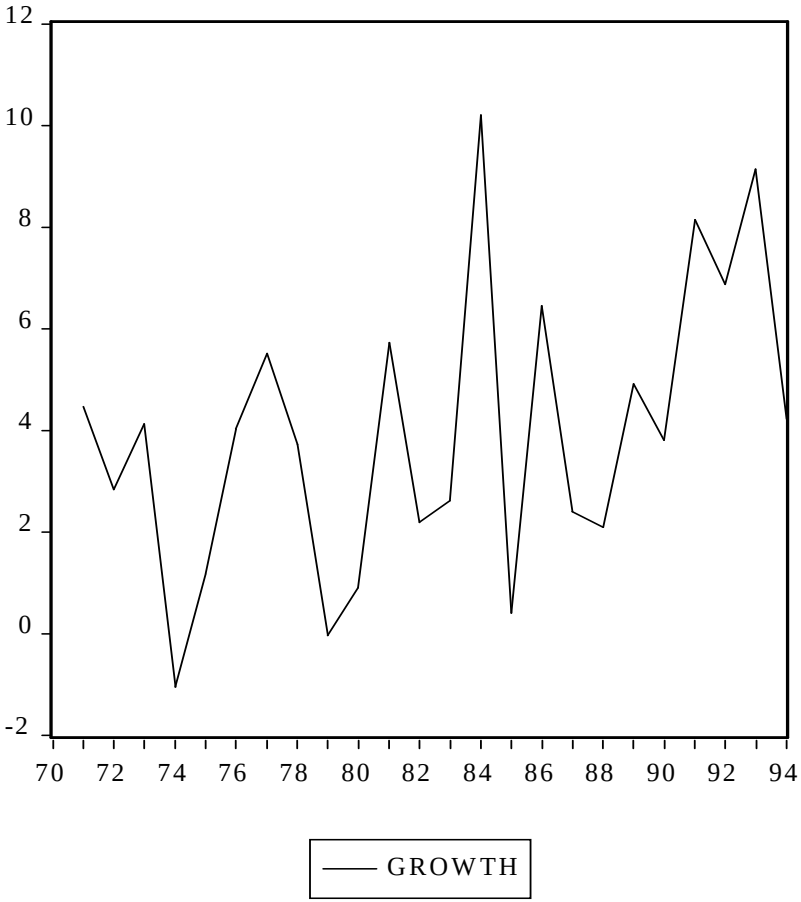

Figure 5.
Government savings (% of PDI), 1970-1994.

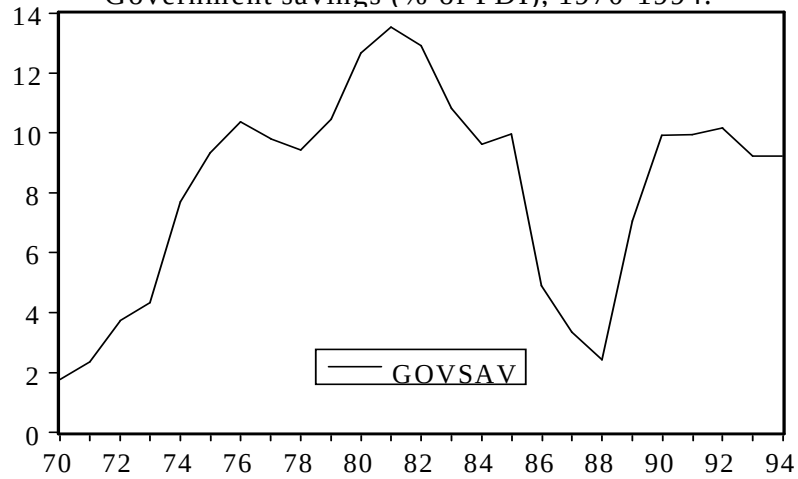

Figure 6.
Terms of trade (1993=100).

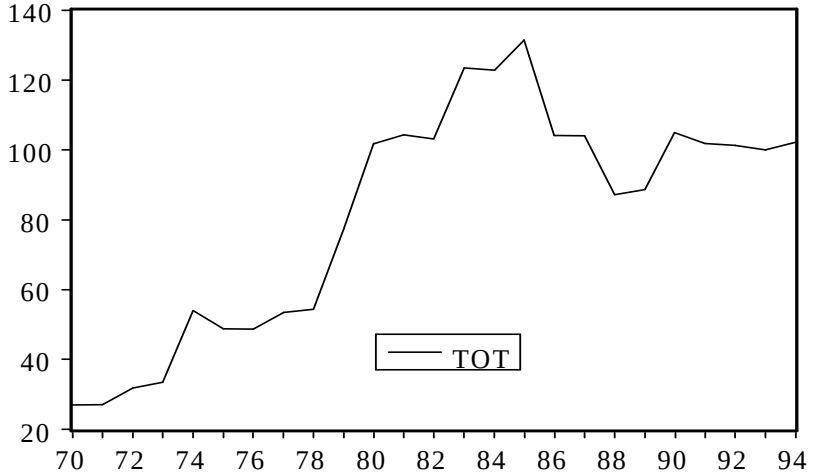

Figure 7.
Broad money (% of PDI).

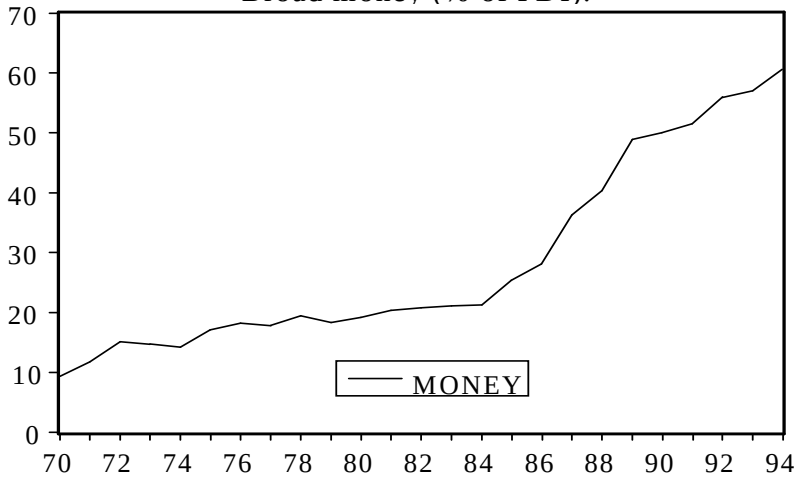

Figure 8.
Real interest rates (%).

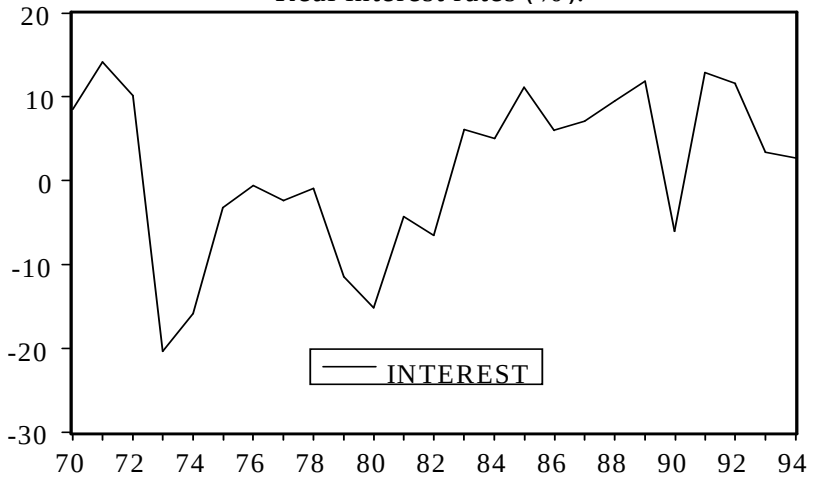

Table 1.1. Growth and savings. Period averages.

	1970-74	1975-79	1980-84	1985-89	1990-92
Real per capita private disposable income growth (in percent)					
Indonesia	2.8	2.1	3.1	1.9	2.0
Malaysia	4.1	3.7	3.8	3.0	4.8
Singapore	6.1	6.3	6.5	4.8	4.6
Thailand	2.0	1.8	0.6	3.1	3.1
Gross private savings (in percent of private disposable income)					
Indonesia	13.3	18.1	23.3	27.9	30.8
Malaysia	28.5	33.4	33.2	37.5	33.4
Singapore	21.8	28.7	40.3	39.8	43.4
Thailand	23.4	24.4	26.1	31.3	33.8

Source: Faruqee and Husain, 1995.

Table 3.1. Indonesian Private Savings 1970-1994. At Current Market Prices (billion rupiahs)

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
National income	2883.0	3249.0	3868.0	5740.7	9057.9	10746.6	13337.7	16250.9	18658.5	27146.8	38838.3	46838.1	51666.5
Direct taxes	110.7	137.3	262.7	454.3	1047.8	1454.0	1917.2	2395.1	2875.1	4596.1	7455.1	9632.8	10032.5
Private disposable income	2772.3	3111.7	3605.3	5286.4	8010.1	9292.6	11420.5	13855.8	15783.4	22550.7	31383.2	37205.3	41634.0
private consumption	2692.0	2973.0	3314.0	4790.7	7258.6	8744.5	10463.8	12458.4	14408.8	19513.7	27502.9	35560.0	41670.3
private savings	80.3	138.7	291.3	495.7	751.5	548.1	956.7	1397.4	1374.6	3037.0	3880.3	1645.3	-36.3
private savings as share of private disposable income	2.9	4.5	8.1	9.4	9.4	5.9	8.4	10.1	8.7	13.5	12.4	4.4	-0.1

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
National income	65513.5	78484.7	84609.6	86827.3	105424.3	119045	138301.6	177287.3	211408.5	237721.5	279563.4	319636.1
Direct taxes	11190.5	12427	13395	10005.3	11938.5	14825.5	16857.3	23291	25440	27631.5	29072.3	36077.8
Private disposable income	54323	66057.7	71214.6	76822	93485.8	104219.5	121444.3	153996.3	185968.5	210090	250491.1	283558.3
private consumption	44739.3	54066.5	57201.4	63355.3	71988.9	81045.3	88752.3	124184.2	145540.4	157909.7	183530.5	213256.1
private savings	9583.7	11991.2	14013.2	13466.7	21496.9	23174.2	32692	29812.1	40428.1	52180.3	66960.6	70302.2
private savings as share of private disposable income	17.6	18.2	19.7	17.5	23.0	22.2	26.9	19.4	21.7	24.8	26.7	24.8

Note:

1. Converted from fiscal to calendar year.

Source: *National Income of Indonesia*, various issues; *BPS Indikator Ekonomi*, various issues; IMF "Recent Eonomic Development 1995".

Table 3.2. Estimated parameters, long run equation.

SAVINGS VERSION	SAVINGS RATES				THREE YEAR AV.	
SAMPLE	1971-1994	1970-1994	1971-1994	1970-1994	1971-1993	
VARIABLES[1]	I	II	III	IV	V	VI
CONSTANT	74.2** (11.1)	70.7** (10.1)	90.6** (10.22)	89.7** (8.6)	95.6** (6.23)	92.8** (5.11)
DEPEND	-0.70** (0.11)	-0.68** (0.10)	-0.85** (0.11)	-0.86** (0.10)	-0.91** (0.07)	-0.88** (0.06)
GROWTH	-0.19 (0.24)	---	-0.13 (0.32)	---	-0.14 (0.16)	---
GOVSAV	-0.59* (0.22)	-0.51** (0.21)	-0.65* (0.26)	-0.53* (0.24)	-0.60** (0.13)	-0.59** (0.13)
DUM82	-13.1** (3.11)	-13.2** (3.15)	---	---	---	---
TOT	0.05+ (0.03)	0.06+ (0.03)	---	---	---	---
ADJ R^2	0.87	0.87	0.78	0.77	0.92	0.91
D-W	2.11	1.93	1.8	1.67	1.06	0.99
ADF-TEST[2]	-5.28** (k=0)	-4.94** (k=0)	-4.29** (k=1)	-4.18** (k=1)	-4.11** (k=1)	-4.10 ** (k=1)

Notes:

1. DEPEND = old and young population (below 15 and above 64) in percentage of working age population (15-64), GROWTH = growth in real per capita disposable income, GOVSAV = government current savings as percentage share of private disposable income, TOT = terms of trade, DUM82 = dummy for 1982.

The standard errors are given in the parenthesis under the parameter estimate.

--- not included in the reported regression.

2. The stationarity tests of the error terms consisted of performing an augmented Dickey-Fuller test (ADF). k denotes number of lags in the auxiliary ADF regression, chosen to minimize the AIC criterion. The significance tests are based on MacKinnon's critical values for rejecting the null hypothesis of a unit root against a stationary alternative. Note that the ADF test is a low powered test, and so prone to indicate unit roots although the series is stationary.

3. Since the error distribution is non standard, the usual t-tests are formally invalid. For a check of how important this effect was in the estimations, the standard errors and parameter values of the regressions in columns I and II were corrected using the three step method suggested by Engle and Yoo (see Harris, 1995). However, this correction procedure changed the parameter values (reduction in the case of DEPEND, increase in the case of GOVSAV) or their significance level only very marginally. The coefficients and the conventional significance levels used above provide very reasonable indications.

** significant on 1 percent level, * significant on 5 percent level, $^{+}$significant on 10 percent level

4. For a check of robustness, the equation in column 1 was augmented by a dummy variable for 1981. The only noticeable difference regarding both significance levels and coefficients was a slight reduction in the parameter value for GOVSAV.

Table 3.3. Estimated parameters, error correction model.

EXPLAINED VARIABLE / EXPLAINING VARIABLES	CONSTANT	ERRORLAG[2]	ΔSAVINGSLAG[3]	ΔGOVSAV	ΔTOT
Δ*SAVINGS RATES*[1]	0.67	-0.44	-0.07	-1.08^{+}	0.23*
1971-1994	(1.07)	(0.52)	(0.25)	(0.62)	(0.10)
$R^2 = 0.28$		LM[$\chi(1)$][4] = 1.09		DW = 2.03	

Notes:

1. Δ denotes first differences of the variable.

2. $ERRORLAG = \frac{S_{t-1}}{Y_{t-1}} - (70.7 - 0.68DEPEND_{t-1} - 0.51GOVSAV_{t-1} - 0.06TOT_{t-1})$

3. $\Delta SAVINGLAG = \Delta \frac{S_{t-1}}{Y_{t-1}} = \frac{S_{t-1}}{Y_{t-1}} - \frac{S_{t-2}}{Y_{t-2}}$

4. The Lagrange Multiplier test is used to check the presence of serial correlation in the error correction specification. The test statistics do not indicate that the residuals should be serially correlated. Again, the small sample size poses problems, since the test statistics is chi-squared only asymptotically.

The standard errors are given in the parenthesis under the parameter estimate.

Table A1 Correlation Matrix.

	SAVINGS	DEPEND	YOUNGDEP	OLDDEP	GROWTH	GOVSAV	TOT	M2	INTEREST
SAVINGS	1.00	-0.84	-0.85	0.48	0.35	-0.14	0.56	0.84	0.47
DEPEND	-0.84	1.00	0.99	-0.48	-0.45	-0.14	-0.69	-0.95	-0.41
YOUNGDEP	-0.85	0.99	1.00	-0.57	-0.44	-0.15	-0.70	-0.96	-0.40
OLDEP	0.48	-0.48	-0.57	1.00	0.16	0.22	0.56	0.52	0.17
GROWTH	0.35	-0.45	-0.44	0.16	1.00	0.04	0.22	0.43	0.40
GOVSAV	-0.14	-0.14	-0.15	0.22	0.04	1.00	0.44	0.03	-0.33
TOT	0.56	-0.69	-0.70	0.56	0.22	0.44	1.00	0.49	0.24
M2	0.84	-0.95	-0.96	0.52	0.43	0.03	0.49	1.00	0.41
INTEREST	0.47	-0.41	-0.40	0.17	0.40	-0.33	0.24	0.41	1.00

DEPEND = old and young population (below 15 and above 64) in percentage of working age population (15-64), YOUNGDEP = young population (below 15) in percentage of working age population , OLDDEP = old population (above 64) in percentage of working age population, GROWTH = growth in real per capita disposable income, GOVSAV = government current savings as percentage share of private disposable income, TOT = terms of trade, M2=broad money as share of private disposable income, INTEREST= real interest rates on six month deposits.

Table A2.2. Results from Augmented Dickey Fuller Tests.

Variable[1]	Level ADF- test statistic	First difference ADF - test statistic	Second difference ADF - test statistic
Private saving rates	-0.78 k=2	-4.46** k=1	
Dependency ratio [3]	1.17 k=2	-1.41 k=1	
Growth in real per capita private disposable income	-4.48** k=0		
Real interest rates	-2.87+ k=0	-4.63** k=2	
Broad money as share of PDI	1.21 k=1	-1.27 k=1	9.31** k=0
Terms of trade	-1.61 k=0	-2.53* k=1	
Government savings	-2.77+ k=1	-3.16* k=0	

Notes:

1. For dependency rates, an intercept and a deterministic trend term was included in the auxiliary regression. For all other variables, the auxiliary regression included an intercept but no trend.

2. The number of lags, *k*, in the ADF test, have been chosen so as to minimize the AIC criterion.

3. We cannot reject a unit root in first differences. However, given how the variable has been constructed from interpolations, tests for higher order integrations are meaningless to undertake.

* indicates significance on 5 per cent level.

** indicates significance on 1 per cent level.

\+ null hypotheis of a unit root can be rejected on 10 per cent significance level only.

The critical values used for evaluation are MacKinnon's critical values for rejection of hypothesis of a unit root.