# SAVING AND DEVELOPMENT

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1. Introduction

Saving, a sacrifice of current consumption, provides for the accumulation of capital which, in turn, produces additional output that can potentially be used for consumption in the future. The process is thus inherently intertemporal. Its presumed operation makes the saving behavior of citizens and their governments central to the development of poor countries. Moreover, threats of expropriation, repudiation and other hostile acts against foreign suppliers of capital, and donor resistance to significant increases in aid, mean that domestic savings is likely to remain the predominant source of capital accumulation in developing countries.¹

In this chapter I focus on the determinants of the volume of savings. My motivation is that the transformation of domestic savings into additional income in the future via the accumulation of capital is not only operative, but is a significant factor in the growth of incomes in developing countries. In this sense, I follow Lewis (1954, p. 155) who stressed that the “central problem in the theory of economic development is to understand the process by which a community which was previously saving…4 or 5 per cent. of its national income or less, converts itself into an economy where voluntary saving is running at about 12 to 15 per cent. of national income or more”. I do not, however, in any way document the linkages embodied in this hypothesis of the importance of saving; for the purposes of this chapter it is a matter of faith.

Savings not only allow for growth in income and increases in consumption, but also for the smoothing of consumption in the presence of various uncertainties. Saving behavior can only be understood fully after the sources of uncertainty facing decision-makers and their opportunities for responding to them are specified. In particular, the availability of insurance, the scope for borrowing and the role of the extended family can influence choices about saving in the uncertain environment of developing countries.

To the extent that there are theories of saving behavior supported by evidence, one can begin to judge the desirability of saving decisions and prescribe policies to improve saving performance. As with other normative discussions in economics, the optimality of saving behavior can only be discussed with reference to an explicit criterion of welfare, which for me is the value of individual’s utilities over time. By contrast, much discussion of saving performance proceeds as though more saving, regardless of the way it comes about, is necessarily good. These two criteria are by no means the same thing; this chapter provides many instances in which (arguably) desirable policies may decrease savings. Thus, while the study of saving behavior is important to an understanding of which countries

¹See Eaton and Gersovitz (1983) for a discussion of country risk and international capital mobility.
will develop and when, policy should not be directed to increasing saving for its effects on economic growth. Policy toward saving, like other policies, should be concerned with questions of efficiency and equity.

The development process is one of transition. While the proportion of income that is saved is a determinant of the level of income and not of its growth rate in the steady state [Solow (1956)], in the movement to the steady state a temporary increase in the saving rate temporarily increases the growth of income and shortens the time necessary to reach any given level of income. This distinction is worth keeping in mind, and is a specific instance of the fact that comparisons among steady states may be a poor guide to the evolution of an economy during development.

The plan of the chapter is as follows. In Section 2 I begin with a description of how individuals and households decide how much to save. This material is integrated with evidence on the posited relationships. In Section 3 I show how to add up savings from different sources in the economy, first by aggregating over individuals of different ages and incomes and then over the different sectors (household, corporate, and government). This section also summarizes the role of government policies in influencing the volume of saving, and reviews empirical studies of the determinants of aggregate savings. The conclusions comment on what is known and how more can be learned about savings. 2

2. Personal savings

Choices by individuals and families about their savings are one set of fundamental determinants of national savings. These decision-makers divide the current increment to their resources between consumption, the satisfaction of current wants, and savings that in turn will influence their ability to satisfy wants in the future. Any model of rational decision-making by savers must, therefore, focus very explicitly on the trade-offs between satisfying wants now and later. Within this limitation, however, there is considerable latitude for different specifications of consumers' objectives and the constraints they face in attaining them. I start with a very simple model of intertemporal decision-making about saving, and proceed to discuss various complications in subsequent sections. Empirical findings on these topics are limited, and only sometimes narrow the range of plausible theoretical formulations.

2Two earlier surveys of saving in developing countries are Mikesell and Zinser (1973) and Snyder (1974). The theoretical and empirical literature devoted to understanding savings primarily in developed countries is vast, and is often highly relevant to the situation in the developing countries. I refer to individual studies as appropriate; recent surveys of aspects of this literature are King (1985), Sandmo (1985), and Modigliani (1986). Deaton (forthcoming) provides an overview of recent advances in the analysis of aggregate time series, results that have yet to be applied to developing countries.
2.1. A simple model of individual saving

In the simplest model of saving, a single individual who lives for $T$ periods $(i = 0, \ldots, T - 1)$, receives income (from labor or sources other than interest payments) of $y_i$ and consumes $c_i$ in the $i$th period; he neither receives nor leaves bequests. If an individual does not desire that $y_i = c_i$, he can and does borrow or lend at an interest rate $r$ in the $i$th period. The only constraint on the individual's choices is that the present value of lifetime consumption, $C$, cannot exceed the present value of lifetime income, $Y$:

$$C = \sum_{i=0}^{T-1} \left[ \frac{c_i}{(1+r)^i} \right] \leq \sum_{i=0}^{T-1} \left[ \frac{y_i}{(1+r)^i} \right] \equiv Y. \quad (1)$$

So much for the opportunities faced by the decision-maker. His goal is to maximize the sum, $V$, of the discounted utility of consumption in each period, $\delta^i U[c_i]$, $0 < \delta < 1$:

$$V = \sum_{i=0}^{T-1} \delta^i U[c_i]. \quad (2)$$

The utility of consumption in each period is functionally the same, i.e. the function $U[.]$ is time invariant.

The decision-maker's problem (for $T = 2$) is solved by the first-order condition:

$$U'[c_0] = (1 + r) \delta U'[c_1] \quad (3)$$

which, along with condition (1) holding as an equality, yields optimal values of consumption, $c_0^*$ and $c_1^*$. Current savings are then a residual, $y_0 - c_0$, dependent on eqs. (1) and (3) and the particular time profile of incomes, which is why most theories are formulated and tested in terms of consumption rather than saving functions. A model of this simplicity is only suitable for a first pass at a short list of questions about saving, but it does speak to some classic ones:

(1) Perhaps the central notion of this type of intertemporal, maximizing model is that current consumption depends on lifetime resources, $Y$, and not on current resources, $y_0$. The latter only affects consumption insofar as it affects the former. Furthermore, if future incomes change while current income remains constant, $Y$ and therefore current consumption change. Various marginal propensities to consume are defined precisely by the effect on $c_0$ of different types of changes in income: (a) the marginal propensity to consume from a transitory increase in income, an increase in $y_0$ with $y_1$ fixed; and (b) the marginal propensity to consume from a permanent increase in (all) incomes, an equal increase in both $y_0$ and $y_1$ (when $T = 2$). The latter is larger than the former.
(2) The theoretical effect on saving \((y_0 - c_0)\) of changes in the interest rate is ambiguous because the income and substitution effects work in opposite directions. On the one hand, when the interest rate rises the cost of consuming in the future falls, promoting saving. On the other hand, an individual who is a positive saver \((y_0 - c_0 > 0)\) is better off, and tends to increase current consumption at the expense of savings.

Evidence on the interest elasticity of savings is difficult to obtain using micro data, because rates of interest are economy-wide variables that do not vary in cross-sections, while differential access to investment opportunities is difficult to measure (but see Section 2.5). There is no consensus from the research based on aggregate time series. In a recent study for developing countries, Giovannini (1985) estimates that this elasticity is essentially zero; see also Blinder and Deaton (1985) for the United States.

(3) The generalization of this model to many \((T > 2)\) periods is straightforward. An increase in the horizon in this type of model can be used to analyze a change in life expectancy. Such an analysis corresponds to an increase in the expectation of life for adults since the model is of a decision-maker in full control of his initial consumption decisions \((c_0)\). Much of the increase in life expectancy in the LDCs has been through decreases in infant mortality's raising the expectation of life at birth, and is therefore not well captured by this type of analysis. For instance, an understanding of how parents adjust the number of children they desire and their saving behavior in response to a change in the expectation of life at birth requires an explicit model of family decision-making; see Sections 2.8 and 3.1. Ram and Schultz (1979), however, present data that the expectation of additional years of life at age 20 for Indian males has increased from 33.0 to 41.1 between 1951 and 1971. This change has great potential significance for saving behavior, depending on the profile of income by age. For instance, if a large fraction of the additional years are spent in retirement, then the individualistic life-cycle model of this section suggests an increase in saving in the pre-retirement years to provide for consumption after retirement. (Section 2.7 provides further discussion of whether individuals do indeed dissave after retirement.)

To address additional issues in saving behavior as well as to re-assess the conclusions of this simple model requires the introduction of further considerations. Following sections take up such issues as: borrowing constraints and fragmented capital markets, human capital, uncertainty, nutritional effects, bequests, and the extended family. Before turning to these topics, however, I discuss some issues in the empirical analysis of saving behavior.

2.2. Evidence on the simple model

The model of Section 2.1 describes how an individual decides on the level of his savings. For many developing countries, household surveys would seem to
provide information on the actual choices about savings that individuals and households make, because they typically report incomes and consumption expenditures of the respondents. These surveys are therefore the natural source of data for the investigation of issues raised by models of saving behavior. The prospective implementation of models of saving behavior using these surveys raises a large number of problems, however, because closer examination calls into question the correspondence between the measured variables and the theoretical constructs.

First, the accuracy and usefulness of these data are dependent on the period of observation. If respondents are asked to report on income and expenditures over a very short period, their answers may be reasonably accurate, but may be dominated by idiosyncratic events or seasonal influences. By contrast, data collected by asking respondents to recall their decisions over an extended period, say a year, may suffer from omissions. Visaria (1980, especially pp. 23–31) discusses these and related problems in more detail.

In practice, researchers using these household surveys have found grossly implausible values for the savings variable for some respondents, and have used various criteria to drop observations from the sample before proceeding to econometric estimation. The criteria for exclusion tend to be somewhat arbitrary, may introduce selectivity bias because they are conditioned on the dependent variable, and in general are not a substitute for an (admittedly difficult) explicit integration of measurement error into the analysis. For instance, in their study of errors in panel data on the U.S. labor market, Duncan and Hill (1985) found that exclusion of outliers actually reduced the signal to noise ratio; in this case, error was not the predominant reason for atypical values. It could be a great help to have a similar study that cross-checked data on savings and identified the sources and nature of error.

Visaria (1980, especially pp. 21–31) and Berry (1985, especially pp. 347–349) discuss checks for internal consistency in household surveys and for consistency with other data, and apply these tests to several surveys. Among the important findings are: (1) Household surveys underreport income relative to the national accounts. The most severe discrepancies arise for nonlabor income. (2) Units reporting negative savings are too numerous to reflect household responses to transitorily low incomes or high consumption needs. Income appears to be underreported relative to consumption. (3) There may be considerable differences in underreporting among surveys done in the same country with apparently similar methodologies, but at different dates.

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4 Among Duncan and Hill's other important findings are that correlations between measurement errors in the dependent variable and the independent variables can bias parameter estimates to a serious degree.
Another issue in the empirical study of saving is the treatment of consumer durables. Expenditures for consumer durables are more appropriately considered to be a form of investment rather than consumption, because they are not purchased solely for immediate satisfaction. Instead, consumption expenditure should include an adjustment for the services (flow) from the stock of currently-owned consumer durables. Such adjustments are not easily made because they require: (1) a clear classification of current expenditure between durables and nondurables; (2) information on the current stock of durables; (3) information on the depreciation of this stock; and (4) assumptions about interest rates.

There may also be particular difficulties in valuing certain types of durables that are produced by the reporting unit rather than purchased, for example urban-squatter or rural housing. The problem of imputation is, of course, a general one, since elements of current consumption, such as food, will often be produced at home as well. The expectation is that these problems will be much more severe in poor countries where proportionately less production is monetized than in richer developing countries or the countries of the OECD; see Blades (1975) and Chandavarkar (1977). And, within developing countries, the importance of non-monetized consumption differs by occupation (being higher in agriculture than elsewhere); by commodity; and by income groups [Coondoo et al. (1979)]. The omission of non-monetized components from both income and consumption will overstate the saving ratio but not savings, while the omission of non-monetized investment from income will understate both the saving ratio and the level of savings. The relationship of these errors to income and occupation can then lead to mistaken inferences about the variables that determine saving, or the functional form of these behavioral relationships.

Furthermore, the income measure in household surveys typically excludes changes in the values of assets and liabilities carried into the period. An alternative approach to the income-minus-consumption calculation of savings relies on the identity that all savings must show up as changes in the values of assets and liabilities. Bhalla (1978, 1979, 1980) uses this approach; Wolpin (1982) compares results based on the two methods of calculating savings. Here again there are problems, including: incomplete enumeration of assets and liabilities; problems of valuing non-monetized investment; and underreporting of asset stocks.

Despite these difficulties with data, a number of econometric studies do exist that analyze the saving behavior reported in household surveys. Ramanathan (1968) for India, Betancourt (1971) for Chile, Bhalla (1978, 1979, 1980) for India, Musgrove (1979) for Colombia, Ecuador and Peru, and Wolpin (1982) for India, all use variants of the permanent income hypothesis, while Kelley and Williamson (1968) for Indonesia look at some life-cycle features of saving behavior. The work by Bhalla and Wolpin has a particular strength in using three-year panel data [from the National Council of Applied Economic Research (NCAER) survey for India]. The Musgrove (1979) and Bhalla (1979) studies are notable for
their explicit treatment of errors of measurement in the variables, including permanent income, although under the assumption that the means of the errors are zero.\(^5\)

Friedman (1957) introduced the notion of permanent income as a determinant of consumption and saving behavior. The idea behind Friedman's approach is similar to the life-cycle model of Section 2.1; future resources as well as current resources affect saving. I will not present Friedman's approach as he originally did, partially because some of his assumptions, such as an infinitely lived consumer, are clearly untenable. The model of Section 2.1 can, however, be specialized to interpret the work of those analysts of saving and development who have used the permanent income approach:

A consumer with preferences such that \(\delta(1 + r) = 1\) lives \(T\) periods and receives life-time income of \(Y\). From first-order conditions like eq. (3) the consumer chooses

\[
c_i = c^* = \frac{\left(1 + r\right)^{T-1} - 1}{r(1 + r)^{T-1}} Y \equiv y^p, \tag{4}\]

in which \(y^p\) is termed permanent income. For purposes of estimation, this equation can be written (with an error term, \(u\)) as

\[
c_i = \alpha + \beta y^p_i + \gamma \left(y_i - y^p_i\right) + u, \tag{4a}\]

with the permanent income hypothesis as formulated in eq. (4) implying that \(\alpha = \gamma = 0\) and \(\beta = 1\). Confirmation of these parameter values through econometric estimation is taken to support the notion that lifetime rather than current resources determines consumption, and implicitly that consumers do have the borrowing and lending opportunities hypothesized in Section 2.1.

The assumptions used to derive the preceding version of the permanent income hypothesis are rather special. Among the most important problems is that permanent income is not directly observed. One approach, used by many of the researchers on developing countries among others, is to assume that permanent income equals current income plus an intertemporally independent error term. If eq. (4a) is true with \(\alpha = \gamma = 0\), a regression of consumption on current rather than permanent income would suffer from classic errors-in-variables bias. In turn, this problem could be corrected by using an instrumental-variables estimator.

There are, however, problems in finding suitable instruments. For instance, Musgrove's approach requires at least one variable that affects permanent income but not the propensity to consume. Bhalla assumes that average income over

\(^5\)For a treatment of measurement error in a study on saving using U.S. data, see Altonji and Siow (1987).
three years or lagged income are valid instrumental variables, which is troublesome if the transitory component of income is serially correlated. Wolpin's use of a measure of long-run weather conditions as an instrument seems to solve these econometric problems. It is not entirely clear, however, why long-run weather conditions should be correlated with the permanent incomes of individuals; such favored regions may simply be more densely populated.

The general sense of the literature on developing countries is that a permanent, or lifetime, notion of income in line with eq. (1) is an appropriate determinant of consumption, rather than current income. These authors present estimates of the propensity to save from permanent income. The propensity to save out of transitory income \((1 - \gamma)\) is generally higher than that out of permanent income, as predicted by the theory, although it is not often estimated to be effectively one.

In addition to the difficulty of finding suitable instruments, however, a questionable assumption is that consumption is determined by permanent income which in turn equals current income plus an intertemporally independent error. First, the model of Section 2.1 is a certainty model. If, however, incomes are uncertain and consumers are risk averse, consumers' behavior in the face of uncertainty in income must be taken into account. (On the other hand, if consumers were risk neutral, the model of Section 2.1 with its emphasis on consumption smoothing would break down because marginal utility is constant.) With risk averse consumers, \(Y\) in eq. (4) cannot be replaced by its expected value so that eq. (4a) does not derive from optimizing behavior. The only assumption that is generally consistent with the permanent income formulation is that the discrepancy between current and permanent income is measurement error, perceived by the econometrician but not by the consumer.

Recent methodological advances avoid these problems by estimating directly the parameters of models similar to those of Section 2.1, or 2.3 that incorporate risk, without recourse to the permanent-income restrictions. These methods have yet to be applied to household survey data from developing countries. The essence of these approaches is to use the first-order conditions of the model, such as eq. (3), in the estimation. Estimation of the parameters of the utility function can be combined with an analysis of the parameters of the income-generating process, but need not be; see Hall (1978), Hall and Mishkin (1982), Flavin (1981), and Hansen and Singleton (1983), as well as Deaton (forthcoming) for an overview.

The studies of saving in developing countries also treat the income variable as exogenous, as in the theoretical model of the previous section. In particular, individuals do not choose their employment status or the hours they work. These assumptions may be more plausible in industrial economies that in the agricultural sectors of developing countries. In the latter case, owner-cultivators may have great flexibility in adjusting their work time and effort, and labor markets may be generally closer to a simple demand–supply model. Both income and savings are
then the outcome of choices by individuals and households in response to the prices (including wages and interest rates) that they face currently, as well as those they will face in the future. It would seem worthwhile to investigate these questions in future research on saving in developing countries.⁶

2.3. Uncertainty and saving

Individuals and households face various uncertainties that affect their welfare. Because saving provides resources that are available in the future when these uncertainties are resolved and because the return on savings may be uncertain, the decision to save is intimately related to the nature and extent of uncertainty. The simple model of Section 2.1 suggests a typology of uncertainties. Savers may face randomness in: (1) future income, \( y_1 \); (2) the rate of return on savings, \( r \); (3) the utility of consumption \( U(\cdot) \), say because of health status; and (4) the length of life, \( T \).

The theoretical effects on savings of all these types of uncertainty are quite indeterminate, depending in complicated ways on the parameters of the decision-maker's utility function. The model of Section 2.1 can be extended easily to analyze uncertainty in \( y_1 \), \( r \) and \( U(\cdot) \); the fourth type of uncertainty, \( T \), is analyzed by Levhari and Mirman (1977).⁷ The first change is to substitute

\[
V = U[c_0] + E \delta U[c_1]. \tag{2a}
\]

for eq. (2) in the two-period model, on the assumption that the decision-maker maximizes the sum of expected, discounted utilities. In conjunction with eq. (1), eq. (2a) leads to the modified first-order condition:

\[
U'[c_0] - E\{\delta U'[c_1](1 + r)\} = 0, \tag{3a}
\]

in which either \( y_1 \) or \( r \) may be random.⁸

Using the method of Rothschild and Stiglitz (1971), the effect of an increase in uncertainty in \( y_1 \) or in \( r \) on savings is determined by the sign of the second derivative of \( \delta U'[c_1](1 + r) \) with respect to the random variable. If savings are

⁶See Heckman (1974 and 1976) for some theoretical aspects of the problem. Browning et al. (1985) and Mankiw et al. (1985) empirically analyze saving and work decisions in an integrated fashion, and, provide references to the earlier literature.

⁷References on the first two sources of uncertainty are Levhari and Srinivasan (1969), Miller (1976), and Rothschild and Stiglitz (1971).

⁸The choice of savings \( (y_0 - c_0) \) must be consistent with \( c_1 \geq 0 \) regardless of the realization of the random variable.
initially positive, then savings increase with an increase in the riskiness of \( r \) if \( 2U'' - \alpha \{ R'U' + (R + 1)U'' \} > 0 \), and decrease otherwise, in which 
\[
\alpha = \frac{(1 + r)(y_0 - c_0)}{(1 + r)(y_0 - c_0) + y_1}
\]
and \( R = \frac{-U''}{U'} \), the coefficient of relative risk aversion. In the special case of constant relative risk aversion \( (R' = 0) \), savings increase if and only if \( R \) exceeds one. Similarly, it can be shown that savings increase with an increase in the riskiness of \( y_1 \) if and only if 
\[
U''[c_1] > 0.
\]
If \( R' = 0 \), then \( U'' > 0 \). If utility is modified to depend on health status, \( H \), a random variable, as well as consumption so that \( U = U[c_1, H] \) with \( U_H > 0 \), then savings increase with an increase in the riskiness of \( H \) if and only if 
\[
U_{c_1, H, H} > 0.
\]

A saver's exposure to these uncertainties depends not only on whether the variables are random, but also on the opportunities he has for insurance. Future agricultural income may be risky, but if these risks are insurable through crop insurance that is actuarially fair, then the individual can insure and need not take this uncertainty into account in choosing his savings. Other types of insurance that are relevant, if available, are: health insurance, life insurance, life annuities (which insure against long life), and social security.\(^9\) These options are usually thought to be less available in developing than developed countries, although the extended family may substitute for various forms of insurance.

The availability of insurance is usually limited by adverse selection and moral hazard, but the extended family can acquire information about, and monitor and circumscribe the actions of, its members relatively costlessly. The extended family may consequently be better at insuring certain risks than insurance companies in the developed countries for whom their clientele is comparatively anonymous. If the extended family is to be good at insurance, however, the risks that its members face must be relatively uncorrelated, so that they can be diversified within the family. The extended family may have a comparative advantage in the implicit provision of health or life insurance including annuities [Kotlikoff and Spivak (1981)], but not in dealing with climatic effects on crops in an economy with few non-agricultural activities in which some family members may obtain employment.

Agriculturalists therefore are likely to face important and uninsurable climatological uncertainties in developing countries, and these can potentially be measured using parameters estimated from historical series on climatological variables. If a country with spatial variability in climatological uncertainty and good micro data on saving behavior can be identified, there is the opportunity to examine how savers respond to an important uncertainty. To date no one has

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\(^9\) With fair insurance the problem reverts to that of Section 2.1 with expected values replacing \( r \) or \( y_1 \). For uncertainty about health status, insurance cannot transform the problem back to that of Section 2.1 if health and income are not perfect substitutes in their effects on utility.
done such a study, but Wolpin (1982) provides a precedent in linking household survey data and information on rainfall to provide an instrument for permanent income. The next step is to see if the propensity to consume depends on agro-climatic variability.10

2.4. **Borrowing constraints**

An assumption of the simple model in Section 2.1 is that the individual can borrow (or lend) as much as he desires at a fixed rate of interest so long as the intertemporal budget constraint, condition (1), is satisfied. This assumption may not be valid, either with respect to borrowing or lending.

An individual is constrained in his borrowing in the simple model if he cannot borrow \( y_0 - c_0^* < 0 \). In this model, the most extreme case is a consumer without any opportunities to borrow and whose consumption is restricted to current income, \( c_0 = y_0 \). In this type of model, therefore, a borrowing constraint raises savings, but only from a negative value toward (or to) a zero level. The consumer is, nonetheless, worse off; higher savings and increased welfare are not the same thing.

In other formulations, a borrowing constraint can even convert a negative saver into a positive saver. For instance, a consumer who wants to take a trip (a consumption expenditure) as soon as possible, and can borrow for it, may report negative savings. But a consumer who cannot borrow and must save in advance of the trip will have positive savings until the target is met. An important assumption is that the particular consumption expenditure is indivisible, so that saving up for it makes sense, which is not true when choices are about a divisible good, the marginal utility of which declines in each period. The desire to purchase housing or other assets that are indivisible may also induce positive saving.11 Furthermore, in a multiperiod model, an individual who would be a dissaver in one period if always unconstrained in his borrowing, may save positive amounts in the presence of constraints if these are expected to prevail in

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10 From an agricultural producer's point of view, uncertainty in yields may be offset by a negative correlation between price and output via the demand for output [Newbery and Stiglitz (1981)]. Indeed, if demand is inelastic, and most of their output is marketed, farmers will be better off in years of poor agricultural production. This possibility suggests another desirable characteristic of a data set, that it derive from a country where prices are exogenous to weather. This condition would hold for a country that is small in relation to world markets for an internationally traded crop or for one where markets within the country are sufficiently integrated for prices to be geographically uniform and where weather is spatially independent. In the absence of these conditions, the correlation between price and weather would have to be integrated explicitly into the analysis.

11 For simulations based on this idea for the United States and Japan, see Hayashi et al. (1986).
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the future as well. Thus, positive saving is not per se evidence that a consumer's behavior is unaffected by borrowing constraints; see also Artle and Varaiya (1978). Are borrowing constraints likely to be prevalent in developing countries, and what kinds of consumers are likely to be subject to them? There are two considerations: (1) Will lenders establish credit ceilings, and at what levels for which type of borrower? (2) Which type of borrower will want to borrow amounts in excess of his assigned credit ceiling? A simple approach is to focus on the second question by implicitly assuming that the credit ceiling is exogenous, perhaps set at zero. The model of Section 2.1 can then be used to make predictions based on the size of $c_d^* - y_0$. For example, professions such as medicine that require an innate ability that is scarce and therefore provide high (discounted) lifetime earnings also seem to have steep age-income profiles. If this pattern is generally true, then individuals who are rich in a lifetime sense would also want to finance consumption in excess of current cash inflows (in their youth), and therefore would be potentially most susceptible to borrowing constraints. As Blinder (1976, p. 88) puts it: "The poor man with a flat age-income profile and no financial inheritance is constrained by many things but not by the inability to borrow against future receipts."

On the other hand, there are arguments that suggest that the (lifetime, i.e. low $Y$) poor may be more susceptible than the rich to borrowing constraints. For one thing, the poor may be more desirous of borrowing to offset various shocks than the rich because: (1) they experience shocks that are proportionately larger, say because there are economies of scale that discourage them from diversifying their income sources; or (2) the marginal utility of consumption is such as to place a premium on very stable consumption at low incomes, say because subsistence requirements must be met; or (3) the poor save proportionately less than the rich, and so have relatively less wealth to buffer consumption (see below on saving propensities of the poor versus the rich).

These factors are only part of a complete theory of credit constraints; neither asynchronous receipts and expenditures, nor risky receipts, nor risk aversion imply that credit relationships will be characterized by constraints on borrowing. When will lenders impose credit limits on borrowers? One set of considerations stems from the costs to a borrower relative to his lifetime income of not meeting his debt obligations. Presumably, lenders constrain borrowers because they fear that repayment is in doubt. In this case, a crucial determinant of the extent to which lenders constrain borrowers is the cost that can be imposed on a re-

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12 Consider a consumer with a moderate $y_0$, a very low $y_1$, and a very high $y_2$. With the option to borrow, it may be optimal to borrow in both periods 0 and 1. With a constraint on borrowing, it may be optimal to save in period 0 to consume in period 1.

13 This observation casts doubt on the otherwise interesting econometric approach of Hayashi (1985) which relies on the assumption that high savers are unconstrained by borrowing opportunities.
calcitrant borrower to compel adherence to the debt contract. These penalties may be quite indirect, and it is not clear how they vary relative to income.\textsuperscript{14}

An example of this approach is the contrast between the creditworthiness of a skilled artisan and a landless laborer. The village artisan may have a local reputation for reliable work that he would have to give up if he fled to another region in an effort to avoid his debt obligations.\textsuperscript{15} On the other hand, a day laborer might not develop a reputation in any case and, being highly mobile as a consequence, might be a bad credit risk even relative to his low income.

In other cases, asymmetries in the information available to lenders and borrowers or moral hazard [Stiglitz and Weiss (1981)], or governmental regulation of credit markets especially through ceilings on interest rates [Paxson (1986)] may lead to the rationing of credit. Furthermore, credit constraints may lead to different choices of investments as well as different levels of investment, if assets differ in their suitability as collateral or in their association with problems of moral hazard or adverse selection. To the best of my knowledge, however, there are as yet no micro-econometric studies of borrowing constraints in LDCs. It is therefore not possible to turn to evidence that distinguishes among these hypotheses about the type of borrower that is constrained, or to look at the related issue of individuals who may be able to borrow at one rate but lend at a lower one, or to suggest additional hypotheses about how lending and borrowing opportunities differ from those assumed in the model of Section 2.1.

2.5. Education and asset choice

The inclusion of an expenditure in current consumption rather than in savings should depend on whether it contributes to the immediate satisfaction of consumers' wants. One important anomaly in this regard is the treatment of educational expenditures, which are classified as consumption. If these expenditures are made for their effects on future income, then they would qualify as an investment expenditure (human capital), and would respond to the same determinants as other types of savings. Even if consumers desire education solely for its effect on their enjoyment of life, this benefit is spread over a consumer's lifetime because it presumably is not restricted to the years in school, and therefore has the attributes of a consumer durable.

Ram and Schultz (1979) adjust the estimates of capital formation in India to include expenditures on educational institutions and the opportunity cost of students' time. The results are fairly dramatic; their estimates of human capital

\textsuperscript{14}Eaton, Gersovitz and Stiglitz (1986) discuss models of willingness to pay in the context of international lending. Allen (1983) uses this approach in analyzing the agricultural loan market.

\textsuperscript{15}A reputation for good work is not true collateral, however; if the artisan chooses to flee, it does not serve to indemnify the creditor.
formation account for between 5 percent (in 1950–51) and 11 percent (in 1970–71) of net national product, and from just over a third to just over half of gross domestic capital formation as traditionally defined. It is important to have a set of parallel calculations for other developing countries. There is no reason to expect constancy, at different stages of development, in the relative amounts of investment in human and physical capital necessary to keep the associated rates of return moving in step, as would be optimal. In particular, Ram and Schultz emphasize that the return to human capital rises with increases in the life expectancy of individuals who are old enough to be educated, suggesting that the appropriate allocation of investment between human and physical capital may move in favor of the former in response to decreases in adult mortality. The neglect of human capital could then easily lead to mistaken views of the ability and willingness of countries with different incomes to divert resources from current consumption.

While the distinction between human and physical capital is perhaps the most marked among all non-consumption uses of income, there are a whole range of investment opportunities in any economy. In an idealized situation, all individuals can choose among the same set of investments, each of which pays different investors identical rates of return. This situation may prevail approximately in developed countries. There, stock markets, mutual funds and other financial institutions repackage large, potentially risky investments in physical capital, each with their own special attributes, into financial instruments that are available in relatively small units at costs roughly independent of the total number of units purchased. As a consequence many savers have the option of participating in a large fraction of the economy’s investment opportunities.

This view of relatively integrated capital markets and investment opportunities open to many savers is not the common view of the situation in many developing countries. In these economies, capital markets are thought to be fragmented with different investors choosing from very different menus of investment opportunities, see McKinnon (1973) and Shaw (1973). The closely-held or family firm is believed to be prevalent, in contrast to the public corporation of the developed countries. This picture is clearly correct in the predominant activity in most developing countries, i.e. agriculture, where production is often organized in small, family farms.

The introduction of more assets and rates of return does not result in any fundamental changes in concept. For instance, the economy may be composed of N individuals, each of whom solves the decision problem posed by the model of Section 2.1, but subject to a different \( r \), say \( r_i \) for the \( i \)th individual. While a decrease in the dispersion of rates of return, if costless to achieve, may be expected to increase the efficiency of the allocation of savings among investments, it need not increase the volume of savings. A mean-preserving decrease in the dispersion in the rates of return available to different individuals has an
ambiguous effect on total savings. This result follows from the ambiguity in the sign of \( dc_0/dr \) previously mentioned, and the ambiguity in the sign of \( d^2c_0/dr^2 \) even given the sign of \( dc_0/dr \).

Bhalla (1978) investigates the effect of differences in investment opportunities on the saving behavior of rural Indian households. He argues that the option to adopt high yielding varieties (HYVs) was an opportunity available to these households in varying degree, depending on their geo-climatic location. Furthermore, the reaction of these households should differ depending on whether they were able to borrow to finance adoption, or not. Those households that could borrow freely and were suitably located to adopt, ought to have a decrease in current period savings, because their expectation of higher future incomes from the new investment opportunities would lead them to increase current consumption. By contrast, households that experience constraints in borrowing and have an opportunity to adopt would be more likely to increase their savings to self-finance the required investments, especially if adoption depends on a lumpy investment. Bhalla’s empirical results support these predictions, although his distinctions between households that are constrained and those that are not (based on income level), and between households with good investment opportunities and those without (based on district-level adoption rates of HYVs), seem somewhat indirect.

2.6. Health, nutrition and savings

Health and nutrition expenditures share some attributes of educational ones; they affect welfare beyond the period when they are made. To a much greater extent than in the case of education, however, these expenditures also affect current well-being, and it would be impossible to devise a convincing allocation of these expenditures between current and future consumption. For instance, at low nutritional levels, food consumption has joint effects on current and future well-being and productivity. Despite these accounting difficulties, it seems both important and possible to introduce some notions about health and nutrition into an analysis of saving behavior at low incomes.

One way these factors enter is through their effects on life expectancy, as mentioned in Section 2.1. Modeling the effects of these expenditures as an exogenous (to the individual) change in life expectancy, \( T \), is most suitable if these expenditures are beyond the control of individuals, for instance medical research or public health measures. In other cases, individuals may be able to take decisions that affect their life expectancies and physical conditions, and these situations need to be modeled explicitly.\(^{16}\)

\(^{16}\)See Gersovitz (1983) for a discussion of the effects on savings of public health improvements when individuals make related private health expenditures, and when they cannot.
One approach is to specify a subsistence consumption level, \( \bar{c} \), that the individual must obtain. In the model of Section 2.1, this additional constraint can be represented by the requirement that \( c_0 \geq \bar{c}_0 \) and \( c_1 \geq \bar{c}_1 \). Following the analysis by Zellner (1960), the situation when \( y_1 = 0 \) and \( \bar{c}_0 = \bar{c}_1 = \bar{c} \) is illustrated in Figures 10.1(a) and 10.1(b). Because an individual cannot survive to the second period with \( c_0 < \bar{c}_0 \), the individual will consume all first-period income up to \( \bar{c}_0 \) (along \( O\bar{c}_0 \)). If the next priority is survival through the second period, then all first-period income above \( \bar{c}_0 \) will be saved until \( (1 + r)(y_0 - \bar{c}_0) = \bar{c}_1 \) (along \( \bar{c}_0X \)). Beyond this point, the consumer will increase either \( c_0 \) or \( c_1 \) with either \( c_1 = \bar{c}_1 \) or \( c_0 = \bar{c}_0 \) until the first-order condition (3) prevails as before (along \( X\bar{c}_0 \)); the survival constraints are then infra-marginal under this specification (beyond \( E_0 \) along \( E_0Y \)).

Because the individual must worry about second-period, as well as first-period, subsistence, the saving function [Figure 10.1(b)] is not well approximated by a linear one (familiar from elementary textbooks), with a negative intercept and a positive slope [Figure 10.1(c)]. On the other hand, once an individual finally has an income sufficiently high that eq. (3) holds, these

\[ \text{With } OE_0 \text{ above } OX, \text{ the marginal propensity to save would be zero, one, one because } XE_0 \text{ would be vertical, and then that given by eq. (3).} \]
thresholds play no role in saving decisions. (For instance, $OE_0Y$ is a straight line through the origin if the indifference curves are homothetic.)

Nutritional and health factors may affect saving behavior in less extreme ways than indicated by an either-or survival threshold. In Gersovitz (1983), I investigated two formulations:

1. The probability of survival, $\pi$, may depend on an individual’s standard of living at very low incomes. In this case the individual maximizes

$$V = U[c_0] + \pi[c_0]U[c_1],$$

with $\pi' \geq 0$ and $\pi'' < 0$, to yield the modified first-order condition:

$$U'[c_0] + \pi'[c_0]U[c_1] - (1 + r)\pi U'[c_1] = 0.$$

18 An alternative formulation is that $\pi = \pi[Y]$, where $Y$ is discounted lifetime resources. For instance, individuals with the same $Y$ may live in the same neighborhoods and $\pi$ may depend on public health externalities associated with the $Y$ of all individuals in the community rather than with a single individual’s own consumption. In this case, the term with $\pi'$ disappears from the individual’s first-order condition (3b), although the calculation of the comparative statics of a change in $Y$ would require the differentiation of $\pi$. 

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Figure 10.1(b). The saving function ($O\tilde{c}_0XE_0Y$) corresponding to Figure 10.1(a), for $r = 0$. 

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Figure 10.1(c). A Keynesian saving function $OAB$.

(2) A worker's productivity may depend on his own consumption. If the individual works only in the first period at wage $w$ and has non-wage income of $\alpha$, the budget constraint is

$$c_0 + s = y_0 = wh[c_0] + \alpha. \quad (1c)$$

The maximization of eq. (2) subject to (1c), for $T = 2$, yields the modified first-order condition:

$$U'[c_0] + (1 + r)\delta U'[c_1](wh' - 1) = 0. \quad (3c)$$

In both models, $c_0$ affects current welfare as well as future welfare via $\pi$ or $h$, so that there is no way to assign $c_0$ expenditure between consumption and investment in an accounting sense; nonetheless the consequences for behavior can be examined. These formulations also suggest a distinction in their effects on saving between goods that do affect survival and efficiency-in-work and those
that do not, thereby opening up a role for relative prices as a determinant of saving behavior.  

2.7. Bequests and savings

To this point I have focused on an individual who decides about saving with regard only to the consequences for his own well-being. The considerations that motivate this saver may loosely be termed: (1) life cycle, when they stem from the relationship between age and income, especially after retirement; (2) precautionary, if saving is to provide a reserve against bad outcomes of uncertain variables; and (3) investment, if the saver is motivated by rates of return and investment opportunities. That individuals leave bequests suggests another reason for their saving, one that raises the question of the relationships among individuals as a determinant of saving behavior. Indeed, much of the current debate about saving behavior in the developed countries is centered on the relative importance of life-cycle versus bequest motives.

Individuals may leave estates for at least three reasons:

(1) **Altruism.** They may save to provide their descendants with an inheritance. Alternative formulations of this notion are that the bequestor cares about (a) the size of the bequest or (b) the welfare (utility) of the heirs.

(2) **Control.** The bequestor may leave an estate to compensate the heirs for services or goods provided during his lifetime. By retaining assets until his death, the bequestor ensures his control over the actions of his heirs; for elaboration of this hypothesis and evidence, see Bernheim et al. (1985).

(3) **Accident.** When individuals do not know when they will die, they must provide for consumption if they survive but that they may not live to undertake. If life-contingent annuities are available, then individuals can buy the right to an income stream that continues as long as they live, at a level relative to the probability distribution of life expectancy. In the two-period case, the budget constraint is

\[(1 + r)(y_0 - c_0) = p(c_1 - y_1),\]  

where \(p = \pi\), the probability of survival, if the annuity is actuarially fair. These

19Lluch et al. (1977) discuss price effects on saving but use a restrictive functional form for consumer preferences.


21Data on bequests are not easily come by, see Menchik and David (1983).
contracts are not, however, generally entered into. In their absence, individuals will tend to maintain a reserve of wealth to finance possible future consumption. If they die before they exhaust this reserve, as must occur frequently if individuals plan for a negligible probability of living sufficiently long that their ability to consume is exhausted, they may be said to leave an unintended bequest [see Davies (1981)]. A similar pattern may arise if individuals plan for the possibility that they become ill toward the end of their lives in ways that can be mitigated by (or require) expensive health care.

Which motivation for bequests predominates is important. For instance, an estate tax will have no impact on behavior if bequests are accidental, but may be consequential in either of the other cases. Barro (1974) argues that operative intergenerational transfers motivated by altruism have important implications for government decisions on national debt versus taxes, and for the relation between social security and private savings; however, see Buiter (1979).

I know of no empirical studies of bequest behavior in developing countries. The prevalence of the family farm leads to the expectation that bequests may be an important phenomenon relative to the incomes of the bequestors and their heirs. Rosenzweig and Wolpin (1985) emphasize the transfer across generations of experience that is specific to particular landholdings as an important impediment to sales of land to outsiders, which would lead to a loss of this knowledge. Such a view is certainly not inconsistent with a control approach to the determination of bequests, as the older generation keeps the land within the family where its value is greatest in exchange for support in old age.

2.8. The family and savings

Family ties among individuals can have important implications for saving behavior, affecting preferences between consumption and saving or substituting for functions that markets might otherwise perform. The presumption is that family networks are much more pervasive in developing than in developed countries [Greenhalgh (1982, p. 86)]. Higher rates of population growth mean more relatives, and the economic relations among kin are thought to be more intensive and extensive. There are at least three approaches to conceptualizing the role of the family in the saving process: (1) as a veil concealing purely individualistic behavior; (2) as a substitute for absent or imperfect markets; or (3) as the fundamental and indecomposable decision unit.

Individuals may live in family units simply because they like each others’ company, and may act entirely individualistically in their saving behavior, exactly as in the model of Section 2.1. As noted above, this view is not inconsistent with bequests, if bequests compensate younger family members for service to older ones. Under this first interpretation, the problem is an empirical one because
data on income and especially consumption are reported on a household rather than on an individual basis, so one does not really know what choices individuals are making. This viewpoint suggests that in analyzing household saving behavior it is important to take into account the age composition of the household, because household savings is the aggregate of saving by the young and dissaving by the old. The aggregation of savings over individuals of different ages is discussed in more detail in Section 3, with respect to the national level of savings, but the issue is essentially the same. The country is just one big family, in this interpretation, and correspondingly, the family is just a small country.

A second interpretation of the family's role in the saving process is that it is an institution that helps to make behavior approximate the individualistic model. That is, in the absence of the family, various market imperfections would distort decision-making from the model of Section 2.1. One notable example of this is the role of the family in insuring risks when insurance markets are absent, in effect transforming the models of 2.3 back to that of 2.1. Another example might be the family's role in alleviating borrowing constraints if family members feel that repayment of intra-family loans is incumbent upon them when they would not otherwise repay outsiders. Alternatively, family members may have better knowledge about the characteristics of relatives and what they are doing with borrowed funds, negating problems of adverse selection and moral hazard. And, they may have more sanctions with which to enforce debt service. Note that in these cases the presumption is that the impact of the family is to increase the welfare of its members, although it may raise or lower the volume of savings. We need empirical information on these matters, but none exists that is based on household survey data about how individuals behave.

Third, the family can affect savings by providing for (part or all of) the consumption of its older members directly from the earnings of the economically active ones, without a transfer of assets. The incentive to accumulate assets while young is therefore attenuated or possibly removed entirely. This behavior presupposes a true altruism on the part of the young, i.e. a sense of obligation to care for the aged without recompense from them. It may be possible to formulate theories of preferences that are interdependent among family members, or that involve bargaining among family members, but there is as yet no work that has produced estimable models or econometric results about saving behavior based on these concepts.

If children support their elderly parents, individuals may adjust not only their savings but also their family size, the saving-through-children hypothesis [Neher (1971), Willis (1980) and Nerlove et al. (1985)]. These models have empirical, as well as theoretical and policy implications. For instance, if parents choose family size with a view to being supported in their old age, then family structure and savings are jointly determined. In this case, it would be inappropriate in econometric analysis to explain savings by demographic variables. An exception is the
case of twins, an exogenous shock to the family's position that may prove fruitful in understanding saving, as it has in other areas of household behavior [Rosenzweig and Wolpin (1980)].

In all these cases it is important that data on savings and its determinants are collected so as to encompass the group of people whose saving behavior is interdependent. The relevant group may not be the household, the group of related or unrelated persons who live together and jointly supply basic living needs, or the narrower family household that excludes individuals who are not related by blood, marriage or adoption. For instance, Greenhalgh (1982) discusses the economic role of the Taiwanese chia, an economic family whose member need not be co-resident. She asserts (p. 73):

Consumption in the chia is focused around maintenance of a common budget. In principle all income received by chia members goes directly into the chia coffer, whence it is redistributed by the "redistributor" in accordance with chia requirements for consumption, savings, and investment in human and physical capital. In practice dispersed workers usually pay for their own living expenses, and they may remit all, a portion, or none of their earnings back to the primary household.

In principle, there is no problem if the saving unit differs from the household. Analysis can be focused at the former level, although the theory needs to be developed beyond that of Sections 2.1–2.7. In practice, the household is the unit of data collection for most surveys that provide information on saving. There will usually be no way to link households that share in saving decisions, most of which will have been omitted by the survey rather than census design of the data collection.

3. Savings at the national level

The sum of savings of all individuals and households is the national level of personal savings. If all individuals were identical as regards their saving behavior, then aggregate saving would simply be the product of a single (representative) individual's saving and the size of the population. To the extent, however, that individuals do differ in characteristics that impact on their saving behavior, the distribution of these characteristics in the population is a determinant of national savings. In fact, there is at least one characteristic that is both a potential important influence on individual saving behavior and that certainly varies among individuals, namely age. Another important determinant of saving over which aggregation may be undertaken is the level of lifetime resources, \( Y \), available to individuals. Finally, the savings of individuals can be added to that of the corporate sector and the government.
3.1. Aggregation over cohorts

As individuals age, their saving behavior may change, as suggested by the life-cycle model (Section 2.1). In this model, active workers save for retirement, while the retired dissave to pay for consumption. The aggregate amount of saving, $S$, therefore, depends on the relative number of active, $n_0$, and retired, $n_1$, people in the population, which, in turn, depends on the population growth rate:

$$S = \sum_{i=0}^{1} n_i (y_i - c_i). \tag{5}$$

If individuals do not leave bequests, then they consume all the resources available to them over their life cycle. As a consequence, if the population is not growing so that there are equal numbers of individuals at each age, aggregate saving is zero; the amount of saving done by workers is exactly offset by the dissaving done by the retired. In the two-period model, an increase in the population growth rate caused by an increase in age-specific fertility rates that have persisted for some time increases the number of active workers (savers) relative to the number of the retired (who are dissaving), and therefore increases the total amount of saving.

The two-period model ignores the period of childhood dependency. Like the aged, the young consume more than they earn, if they earn anything at all. On the assumption that what each age group consumes and earns is independent of the population growth rate, there are two (equivalent) ways to account for the period of childhood dependency in analyzing the relationship between aggregate personal savings and the population growth rate.

1. The model can be extended to incorporate three age groups (young, active, and retired). An increase in the population growth rate increases the number of active individuals relative to the retired, but decreases their number relative to the young. Because both the young and the retired (the dependent generations) consume more than they earn, the net effect on aggregate saving is theoretically ambiguous.

2. Alternatively, the two-period structure of the model can be retained. Population growth has the following effects: (a) a change in the relative numbers of active and retired (adult) individuals; and (b) the consumption of active workers inclusive of that of their (more numerous) children rises.

22 In this case, eq. (5) coincides with the budget constraint of eq. (1) holding as an equality.

23 Arthur and McNicoll (1978) and Lee (1980) provide an elegant analysis of the continuous age case, but the principles are the same.
The second way just mentioned of incorporating the young into the life cycle highlights the fact that the young do not consume independently of the family. This perspective on dependency suggests that saving need not be adjusted in response to additional children in the way that a model with fixed income per earner and consumption per child would predict: (1) With economies of scale in family consumption, children in large families can be provided with the same welfare as children in smaller families with a less than proportionate increase in expenditure. (2) Parents may choose to decrease the consumption and welfare of children or themselves when they choose larger families. (3) Parents or children or both may increase their work time (or effort). On the other hand, the time involved in child care may decrease the labor force participation of women. (4) Parents may increase their saving in advance of births. Finally, some of the relationships between lifetime income and savings discussed in Section 3.2 may also come into play if changes in the population growth rate alter income per capita via changes in the economy-wide availability of capital and land relative to labor. Hammer (1986) discusses the evidence on these questions addressed by such authors as Epenshade (1975), Kelley (1976, 1980), Bilsborrow (1979a) and Smith and Ward (1980). None of these studies, however, incorporates a fully adequate treatment of the income variable along transitory–permanent, expected–unexpected lines, and some ignore this important issue entirely. Furthermore, there is neglect of the possibility that choices about children and savings are joint decisions that should respond to a set of common exogenous determinants.

The effects of changes in mortality on savings can be quite different from the corresponding effects of changes in fertility. In the short run, a drop in adult mortality increases population growth and changes the dependency rate in a direction dependent on the nature of the shift in age-specific mortality schedules. In the long run, the population growth rate is unaffected, but the dependency rate is. Furthermore, there may be changes in individual age-specific saving rates as incentives to save for old age change. Thus, the source of changes in population growth rates as well as how long they have been ongoing affects the aggregate saving rate.

The life-cycle model can also account for the effect of technological change that increases the lifetime incomes of each successive cohort. As with population growth, technological change has an ambiguous effect on savings. On the one hand, each young worker, expecting to be richer during his own lifetime than his parents, wishes to provide for retirement consumption that is higher than what the currently retired are each consuming. Aggregate savings will tend to rise with increased technological change for this reason even if population is not growing. For example, if individuals earn the same wage in each period of their lives but each successive cohort's wage is higher, so that technological change is embodied in labor, this effect is the only one. If technological change is unembodied,
however, so that every worker's wage rises in each period, there is another effect. Because a disproportionate amount of a worker's income is received toward the end of his working life, when young he may wish to save less or even to borrow against higher future incomes. In this case, increases in technological change can decrease aggregate savings.

The recognition that aggregate savings is the outcome of the saving behavior of cohorts of different ages that are contemporaneous raises issues of the optimality of aggregate savings, of the role for intergenerational transfers, and of the interaction between saving decisions and fertility decisions. The overlapping generations models of Samuelson (1958) and Diamond (1965) provide a framework for analyzing savings and intergenerational transfers. Without intergenerational transfers, saving to provide for retirement through the accumulation of capital can lead to steady-state welfare that is lower than it need be [Diamond (1965)]. Either too much or too little capital may be accumulated relative to the Golden Rule steady state in which the lifetime utility of individuals is at a maximum and the rate of return on capital equals the rate of population growth.

Consider two economies with the same preferences, technologies and rates of population growth. Both are in the steady state. Individuals follow a two-period life cycle, as in Section 2.1. One economy has no intergenerational transfers, and there is too much saving relative to the Golden Rule. Another has intergenerational transfers, from the young to the old. If these transfers are of the right magnitude, the second economy can be in the Golden Rule steady state. Indeed, the adoption by the first economy of an altruistic ethic mandating the right level of transfers can make all generations better off; in particular the generation gains that is old when the change is made.

The situation is quite different when the economy is saving too little relative to the Golden Rule level of saving. Developing countries are likely to be in this situation because their rates of return to capital probably exceed their population growth rates. In this case, the appropriate alteration necessary to attain the Golden Rule steady state is to an ethic embodying reduced transfers from the young to the old, or possibly requiring transfers from the old to the young, to induce more savings. Those individuals who are old when such a change is first introduced will be net losers; they cannot be compensated by more consumption in their youth, which is past. The policy of transition is consequently not a Pareto improvement. At levels of capital below the Golden Rule level, therefore, unambiguous welfare comparisons can only be made between economies already in the steady state that are otherwise identical except for the level of intergenerational transfers. In such comparisons across steady states, the economy with lower transfers from the young to the old would have a capital–labor ratio closer to that of the Golden Rule, and a higher present value of lifetime utility for each of its members.
As in the case of capital accumulation, individuals who depend only on their children for old-age support may over or under invest, i.e. have too few or too many children [Willis (1980)]. Giving these individuals the opportunity to save in the form of other assets will likely lower their fertility. Nerlove et al. (1985) argue, however, that income effects or the existence of individuals who wish to borrow to have more children but could not prior to the improvement in financial markets may work in the opposite direction.

If individuals can save through physical capital accumulation as well as children, the question of the optimal rate of population growth arises. It has not yet been fully resolved; see Samuelson (1975, 1976) and Deardorff (1976) for some of the problems and references to earlier literature. Eckstein and Wolpin (1985) suggest one solution when the utility of parents has the number of their children as an argument. Furthermore, these models of endogenous population do not incorporate the possibility of altruistically motivated bequests, another fundamental determinant of whether the saving decisions of individuals are socially optimal [Barro (1974), Drazen (1978), Buiter (1979), Carmichael (1982), Burbidge (1983, 1984), and Buiter and Carmichael (1984)]. Finally, and perhaps most importantly, the bulk of the results in these papers are derived by comparing different economies that are in the steady state; for an exception, see Laitner (1984). The concern about many of the questions from a developmental perspective, however, is motivated by situations of transition, say as the result of the actual diffusion of the ability to save through financial assets or because mortality and fertility rates are changing.

3.2. Income distribution and aggregate savings

Individuals differ in their lifetime access to resources (income plus transfers received, including inheritances). If differences in lifetime resources affect individuals' saving behavior, then the distribution of income becomes a determinant of the fraction of aggregate income that is saved. For instance, in an economy in which individuals behave as in Section 2.1 with \( s_0 = y_0 - c_0 > 0 \), and in which the number of savers with a given level of lifetime resources exceeds the number of dissavers (in the second period of their lives) with the same lifetime resources, saving aggregated over all individuals with the same lifetime resources is positive. If the marginal propensity to save, \( m \), in the first period rises with lifetime resources \( (m' > 0) \), then policies that equalize the distribution of lifetime incomes will decrease the aggregate level of savings [using the method of Rothschild and Stiglitz (1971)]. Or, if there is an income threshold below which savings are a low fraction of income (or zero) and above which they are a higher fraction, then transfers of income from those below the threshold to those above increase
aggregate savings. While models based on thresholds and those based on a smoother specification of behavior often incorporate similar notions about factors that motivate saving, there can be important qualitative differences in their implications; I give an example below.

A belief that a decrease in the dispersion of incomes lowers aggregate saving is one potentially important underpinning for purported trade-offs between growth and equity. The hypothesis deserves further scrutiny, and is by no means established, either theoretically or empirically. Indeed, the opposite view that the rich indulge in (conspicuous) consumption to the neglect of saving also has its adherents. Of course, even if the poor do save relatively less of their incomes, it may not reflect any market failure, and so this fact in itself need not suggest the desirability of a policy intervention.

The hypothesis that the marginal propensity to save rises with the level of lifetime resources can be addressed using the various theoretical models of saving presented in Section 2. To simplify the exposition, I assume that all income is received in the first period. In the simple model of Section 2.1, the lifetime utility of consumption, $V$, is additive in the utility of consumption in each period, the $U$'s. In this case, the marginal propensity to save is independent of lifetime resources if either: (1) one plus the interest rate $(1 + r)$ is equal to the inverse of the discount rate $(1/\delta)$ and the form of the utility of consumption in each period, $U$, is age invariant, so that $c_0 = c_1$ [from eq. (3) of Section 2.1], or (2) the utility function is age invariant and (a) belongs to the generalized Bergson family (of which constant relative risk aversion functions are special cases), or (b) belongs to the family of constant absolute risk aversion utility functions [Pollak (1971, p. 405)]. If $V$ is not additive, the condition for a constant marginal propensity to consume out of lifetime resources is the general one that $V(c_0, \ldots, c_T)$ have linear Engel curves.

Because these are rather special conditions, there is no theoretical presumption that the marginal propensity to consume is constant. A suitable parameterization of preferences, the $U(\cdot)$, is all that is necessary to show that saving behavior need not be characterized by a constant marginal propensity to save. Obviously, such a parameterization could make utility in any period depend on age, but clearly need not.

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24 For instance, Kuznets (1962, pp. 7–8) appears to adhere unequivocally to the view that reductions in inequality of incomes decrease savings.

25 The shape of the relation between income and saving also plays an important role in the big-push or low-level-equilibrium-trap theories of development; see Nelson (1956).

26 To calculate the marginal propensity to save, $m$, simply totally differentiate the equilibrium equations of the saver, say eqs. (1) and (3), with respect to $y_0$. Then totally differentiate the expression for $m$ with respect to $y_0$ to get $m'$, substituting from the equations of the saver's equilibrium to simplify. Because the resultant expressions for $m'$ for the several variant models that I present are quite complicated and relatively uninformative, I have not reproduced them.
On the other hand, there is no particular reason suggested by the simple model to expect that the marginal propensity rises rather than falls with lifetime resources. Intuitively, there needs to be a reason why a poor man would wish to split his (meagre) lifetime resources between current and future consumption in a way that is proportionately different from what a rich man chooses. A belief that the marginal propensity to save rises with lifetime income suggests that the poor prefer that consumption in their youth more closely approximate that of the rich than does their consumption in their old age. Is this a theoretical or psychological law? To see if there is a theoretical presumption about how the marginal propensity might vary with lifetime resources, I turn to the models of Sections 2.3 through 2.8.

3.2.1. Bequests

Blinder (1976) presents a model in which individuals choose consumption and bequests to maximize the present discounted value of their utility, inclusive of the utility, \( \phi \), of bequests, \( B \):

\[
V = \sum_{i=0}^{T-1} \delta^i U [c_i] + \phi [B],
\]

where \( U = c^\alpha \) and \( \phi = B^\beta \) subject to

\[
\sum_{i=0}^{T-1} \left[ \frac{c_i}{(1 + r)^t} \right] + \frac{B}{(1 + r)^T} \leq Y.
\]

If \( \alpha < \beta \), so that bequests are a luxury, aggregate savings increase when income is transferred from the poor to the rich.

3.2.2. Education

Blinder (1976) also reviews the argument that individuals will not allocate income to uses conventionally defined as savings to provide for bequests until the (marginal) return to educating their children (or other prospective heirs) is driven down to the return on savings. Lump-sum redistribution of income from individuals below this threshold to those above it would then increase aggregate savings, as conventionally defined.\(^{27}\)

\(^{27}\)On the other hand, individuals may finance their own education. The more able, having higher marginal returns to education and higher lifetime incomes, would then be low savers, as conventionally measured, in their youth when they are being educated. If the age distribution were such that these cohorts were important in aggregate savings, transfers from the lifetime rich to the lifetime poor might increase aggregate savings. See also the discussion in Section 2.4.
3.2.3. Investment opportunities

Lewis (1954) argues that saving is predominantly undertaken from profits by entrepreneurs in a modern, industrial sector. The national capital market is segmented, in that investment is limited to individuals who are directly involved in organizing production in this sector. These rich entrepreneurs save a high (and constant) fraction of their incomes while other groups save a lower fraction. Redistribution from low saving groups to entrepreneurs via a change in the distribution of aggregate income between profits and other categories would then increase aggregate savings.

3.2.4. Physiological influences

The health and nutrition models of Section 2.6 also provide for possible structural explanations for a relationship between lifetime resources and the marginal propensity to save. Because current consumption is more likely to influence survival and efficiency-at-work at low levels of consumption, these factors suggest that the poor will be more concerned than the rich to consume in the present. Despite this promise, I have been unable to obtain readily interpretable expressions for \( m' \) in these models. By contrast, in threshold models such as that embodied in Figure 10.1(b) there are quite unambiguous predictions about the effects of redistribution among individuals in the different zones \( \tilde{c}_0, \tilde{c}_0 X, XE_0 \) and \( E_0 Y \). On the other hand, there can be few economies in which individuals are typically in the first two zones. The smoother models of eqs. (3b), (3c) and footnote 18 therefore seem inherently more attractive, although less tractable, descriptions of the circumstances of the poor.

3.2.5. Uncertainty

The presence of uncertainties of the types discussed in Section 2.3 can also affect the relation between the marginal propensity to save and lifetime resources. To the best of my knowledge, no one has derived and interpreted general results on the relation between lifetime resources and the marginal propensity to save in the presence of these different types of uncertainty.

3.2.6. Borrowing constraints

Following the discussion of Section 2.4, transfers of income between constrained and unconstrained individuals may increase or decrease savings because the constrained may be low or high savers, and the constrained may be either relatively rich or poor.
At the micro level, a number of authors find that consumption is not proportional to their measures of permanent income. Musgrove (1979) estimates a log-linear relation between consumption, \( c \), and permanent income, \( y^P \), \( c = \beta(y^P)^{\alpha} \) and concludes that the elasticity, \( \alpha \), is less than one, so that the marginal propensity to consume out of permanent income falls with increases in permanent income. Bhalla (1980) is the only author to have estimated a relation between savings and permanent income that provides for a marginal propensity to save from permanent income that can reach an asymptote (of less than one). He finds that the marginal propensity does rise with permanent income, although the structure of his model does not suggest any particular source for the nonlinearity [among explanations (1) to (6) or any others]. In this sense the approach of these authors is inherently somewhat ad hoc because it does not explicitly model the factors in an individual’s dynamic optimization problem that lead to a non-linear relation between lifetime resources and savings.

By contrast, Wolpin (1982) shows that using a measure of long-run weather conditions as an instrument produces an estimate of the permanent income elasticity of consumption in a log-linear model that is much higher than those produced with instruments used in earlier studies. In some cases his estimates are statistically indistinguishable from one. Wolpin argues that his choice of an instrument is likely to be closer to exogenous than those used by previous researchers, and that for this reason it is both more appropriate, and more likely in theory to produce the results that he obtains.

It is also important to recall the general issue of the potential for biases in the measurement of saving that may be related to the level of permanent income (Section 2.2). As well, the NCAER data used by Bhalla and Wolpin have particular weaknesses; the measurement of consumption expenditures was peripheral to the design of the survey and the calculated change in assets omit gold, jewelry and currency, as well as revaluations [NCAER (1975, ch 6)]. It may be that the data used so far in the analysis of savings cannot disentangle hypotheses about behavioral non-linearities in savings from problems in measuring the variables.

3.3. Corporate savings

The difference between private savings and personal savings is retained earnings, the savings of the corporate sector. The corporation is termed a veil if individuals and households consider earnings that are retained to be part of their current incomes in the same way as income that corporations distribute to them via dividends. If this is so, individuals will choose their savings based on income inclusive of corporate retained earnings. Because retained earnings are a form of savings, individuals will act to choose their savings recognizing this component.
Other things equal, if corporations increase their retained earnings, individuals will decrease their own savings to maintain a constant relationship between total (private) savings and their incomes (inclusive of retained earnings). In this case the discussion of Section 2.1 can be viewed as determining private rather than personal savings, based on this comprehensive definition of income.

The view that the corporation is a veil is not consistent with all the models presented in Section 2. For instance, an individual may own part of a corporation that is not widely traded and therefore cannot be sold easily. If this person is constrained in his borrowing, he may find that a decision by the corporation to retain earnings forces him to decrease his consumption if he is saving nothing or if he is saving to meet a future expenditure target, as in Section 2.4.

These issues have so far not received attention in the literature on savings and development. Contributions by David and Scadding (1974), Feldstein (1973), Feldstein and Fane (1973) and Bhatia (1979) have produced conflicting results on whether savers in the developed countries view the corporation as a veil.

3.4. The role of government

Government affects the level of national savings in two ways. First, it chooses the level of one of the three components of national savings, government savings, by raising income for itself through taxation and spending it on government consumption. Second, government indirectly affects the other two components through its influence on the incentives to save faced by households and corporations.

While the government can choose the level of its own savings directly, a change in this variable need not imply a one-for-one change in national savings. The other sectors may respond in such a way as to offset the government's actions, at least to some extent. In the extreme, such as in Barro (1974), a government issue of bonds to finance its dissaving results in an equal increase in private saving, because the private sector saves in anticipation of a future increase in taxes to service the bonds. This view presupposes, among other things, that government consumption is a perfect substitute for private consumption. The assumption of close substitutibility may be a reasonable approximation in some cases, such as the provision of retirement pensions through pay-as-you-go financing, which at least some developing countries have introduced. On the other hand, when governments shift funds from consumption to particular types of investment, such as infrastructure, that the private sector is unlikely to undertake, the return to, and volume of, private savings may increase.

Governments also affect private savings without necessarily altering the volume of government savings. Administrative regulation of credit markets affects the rates of return that savers earn in developing countries. Choices between the
taxation of income (including income from past savings) and taxation of con-
sumption (via indirect taxes) also have implications for the after-tax rate of
return that savers earn.\textsuperscript{28} Governments may provide insurance programs that
reduce uncertainties when the private sector would not otherwise do so, say
because there are problems of adverse selection. It may be able to do so by
making membership in such programs universal. Finally, governments provide
the legal and administrative framework that enforces contracts and proscribes
various types of activities, such as insider trading in stock markets. Presumably,
financial markets, more than others, need government involvement of this type if
they are to emerge and to function efficiently.

Other government activities that are not directly related to saving behavior of
individuals may be at least as important as policies that are conventionally
targeted at savings. Examples are policies that affect population, health, nutrition
and education, as suggested by the models of Sections 2 and 3.

3.5. \textit{Evidence at the aggregate level}

A comparison of the proportion of national income that is devoted to saving in
different countries reveals a striking dispersion. For instance, Modigliani (1970)
analyzes the ratio of private saving to private income, averaged over periods of
mostly seven to nine years, for each of 36 countries. The mean of this (averaged)
ratio over all countries is 11.2 percent, but ranges from −2.1 to 21.0 percent.
There is thus a lot to be explained, and the potential for learning much about the
determinants of saving behavior. On the other hand, there are considerable
obstacles to arriving at a convincing analysis of these data. First, there are
marked problems of measurement that confound the way the data are con-
structed with the behavioral determinants of saving, and that might contribute
significantly to the apparent cross-country differences in this variable. Second,
problems of exogeneity and simultaneity are at their most extreme when the unit
of analysis is the country. I have already raised variants of these concerns in
connection with the analysis of micro data from household surveys, and some of
the specific issues are the same, but there are new ones as well.

In most developing countries, savings at the national level are calculated via
the identity aggregate savings equals aggregate investment, \( S = I \), where \( S \) is
defined inclusive of foreign savings. In the commonly used commodity flow

\textsuperscript{28} King (1980), Kotlikoff (1984) and Sandmo (1985) discuss aspects of taxation and savings. As for
the choice between income and expenditure taxes, it is important to allow for a labor–leisure tradeoff
as well as a present-versus-future-consumption tradeoff. If revenue is to be constant, exemption of
interest income (the expenditure tax) must be compensated by greater taxation of labor income, so
that one distortion is removed at the cost of changing another.
approach for estimating $I$, goods are assigned between investment and consumption based on their supposed end use; saving is then calculated as a by-product.\textsuperscript{29}

Investment has two components, inventories and fixed investment, $I = I_i + I_f$. Hooley (1967) gives examples of developing countries where inventories are estimated on the basis of the holdings of a few primary commodities. In countries where manufacturing is expanding relative to primary industry, this method can impart a downward bias to estimates of investment in inventories. This problem is exacerbated by the tendency of manufacturing in developing countries to operate with a high ratio of inventories to fixed capital in comparison to practice in developed countries [Hooley (1967)]. Furthermore, changes in inventories held by households are not included in the definition of inventory investment, and these may be large in the rural sector of developing countries. On the other hand, Rakshit (1982) argues that recent Indian saving rates may be overstated by as much as 3.3 percent by the way the procurement of grain stocks enters the estimates of saving. Because there has been a recent step-up in government acquisition of grain, it (arguably) accounts for a spurious jump in the Indian saving rate.

As for fixed investments, these are often estimated by referring to the imports of capital goods and making an allowance for construction. Perhaps the bulk of investment in agriculture, which is not included in these categories, may simply be ignored [Hooley (1967, p. 202)]. Furthermore, official exchange rates are often overvalued, making imports artificially cheap; tariffs and exchange controls promote smuggling; and tariffs lead to underdeclaration of the value of imports. Because investment is often import intensive relative to consumption, these factors lead to a relative underestimate of investment and an underestimate of the saving rate. On the other hand, the desire to keep funds overseas may lead importers to overinvoice imports, working against the effects just mentioned. Hooley’s (1967, p. 204) evidence on the value of imports recorded by developing countries relative to their value as given in the trade statistics of the exporting countries suggests a net positive relation between the overvaluation of the exchange rate and the degree of understatement of imports, and therefore investment and savings. Mamalakis (1976) argues that extreme trade regimes that make it very difficult to import capital goods induce levels of equipment maintenance that go beyond usual practice, and that should be included in investment. He speaks (1976, p. 326) of a “quasi capital goods sector that uses secondhand capital goods as inputs for the production of new ones” in Chile.

Once an estimate of total savings is obtained from the estimate of investment, national income accountants use various methods to break the total down into its

\textsuperscript{29}Mamalakis (1976, ch. 13) and Rakshit (1982) discuss the measurement of savings in some detail in the cases of Chile and India, respectively. I refer to their findings only when they seem to be of potential applicability to developing countries as a whole, but their review of seemingly idiosyncratic practice in each of these countries is also an important caution about the potential variation in procedures across countries.
components, foreign savings, government savings, and private savings, the latter decomposable into corporate and personal savings, $S = S_f + S_r + S_c + S_p$. Mamalakis (1976) argues that government savings are overestimated in Chile by the transfer of current expenditures to the capital account. This, in turn, affects the estimate of private saving, which is calculated as a residual. On the other hand, Rakshit (1982) suggests that national income is underestimated, and the saving ratio overestimated, by the convention of accounting for government's contribution to value-added by its expenditure on wages and salaries, neglecting any imputation for the services of government capital.

There is finally the problem of inflation accounting in the treatment of the components of saving. In a closed economy, saving at the national level must ultimately take the form of an increase in tangible capital; there are no outside financial assets. In the case of an open economy, or when it is desired to distinguish the components of national saving, say government versus private, the situation is different. There are then outside financial assets; the sum of a sector's financial assets and liabilities need not be zero. In an inflationary context, part of the net interest paid by a sector or the residents of a country is actually amortization of the principal, which is declining in real terms. Thus, foreign saving might be viewed as zero if the real value of foreign debt, rather than its nominal value, is constant and similarly with government savings.\(^{30}\)

On balance, these factors seem to suggest that savings, and especially private savings which are calculated as a residual, may be understated, possibly to an extent that varies inversely with the level of development.\(^{31}\) No econometric study attempts to correct its data base for these problems, however. Nor is there much analysis of whether the appropriate dependent variable is personal, private or domestic savings based on questions of substitutability as raised in Sections 3.3 and 3.4. Different authors use different definitions of the dependent variable.\(^{32}\) Econometric analyses of cross-national data on the saving ratio have focused largely on the effect on the saving ratio of: (1) the growth rate and age structure (as in Section 3.1) and (2) the level of income and the distribution of income (as in Section 3.2).

Leff (1969) and Modigliani (1970) are the primary studies using cross-country aggregate data to provide support for the propositions that: \(^{33}\)

(1) Aggregate saving is affected by demographic variables, either the population growth rate or the proportion of the population that is economically dependent (the dependency rate). The theory of Section 3.1 is based on the latter

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31 Kuznets (1960, pp. 24–25) seems to agree with this presumption.
32 On the appropriate definition of the dependent variable, see Modigliani (1970, pp. 219–221), Bilsborrow (1979b, pp. 189–190), and Leff (1979, pp. 206–208).
33 Leff (1969) uses the aggregate domestic saving ratio while Modigliani (1970) gives primary attention to the ratio of private saving to private income, with a secondary analysis of the distinction between the private and personal saving ratios.
variable. There is not a one-to-one relationship between the two variables because economies need not be in the steady state, and even when they are, different age-specific mortality rates can imply different dependency rates but the same population growth rates.

(2) The rate of growth of per capita income affects the saving rate.

(3) The level of per capita income does not have an independent effect on the saving rate if the growth of per capita income and/or the dependency variables are also included in the estimated equations. This result is most marked in the Modigliani paper. Leff finds that per capita income is a marginally to moderately significant additional variable, but he uses annual rather than averaged data. Modigliani's results are therefore more indicative of the effect of permanent income on saving rates. This evidence suggests that the non-linear effects discussed in Section 3.2 may not be operative. By contrast, regressions of the saving rate on per capita income as the sole explanatory variable do exhibit a strongly significant relationship between the two, a relationship emphasized by Kuznets (1960, 1961, 1962) based on his tabular examination of national saving rates and per capita incomes.

These conclusions are elaborated and sometimes qualified by the papers of Adams (1971), Gupta (1971, 1975), Leff (1971, 1973, 1979), Goldberger (1973), Singh (1975), Bilsborrow (1979b), and Ram (1982). Ram's study provides the strongest evidence that per capita income has a significant effect on the saving rate, and that the dependency variables are insignificant, although his growth variable is the growth in total rather than per capita income and so implicitly includes demographic influences. Fry and Mason (1982) argue that the effect of population growth on the saving rate may be non-linear, and present a specification to incorporate this effect. On balance, these papers seem to point to some instability in the statistical significance of the dependency rate as an explanatory variable, depending especially on the definition of the sample.

A particular problem with these studies is the potential for simultaneous-equations bias in the estimates, because the rate of population growth, and certainly the rate of growth in per capita income, may depend on, or be jointly determined with, the saving ratio. The problem of bias may easily degenerate into the more serious one of identification, if there are not any convincingly exogenous variables that can be introduced into the analysis.

Modigliani (1970) and Gupta (1975) do use a simultaneous equations estimation technique, but their specification depends crucially on the doubtful assumption that movements of foreign capital are exogenous. Foreign capital inflow can be divided into two components, private flows and aid, but both seem to be potentially endogenous. Donors may provide aid in response to low savings or other economic conditions in the recipient country. Private flows are even less likely to be exogenous. One set of considerations arises from an analogy between the position of an individual and that of a country: an individual chooses to
consume, to accumulate some assets, and to issue some liabilities; the accumula-
tion of assets net of liabilities is savings. It is incorrect to explain an individual's
net addition to assets by his issuance of liabilities; these decisions are taken
jointly. At least part of what happens at the aggregate level probably reflects this
type of mechanism, with foreign capital flows analogous to the individual's
borrowing or lending. Even if the inflow of foreign private capital is sometimes
constrained by country risk [Eaton and Gersovitz (1983)], the constraint itself
may depend on the attributes of countries. For these reasons, foreign capital
inflow does not seem to be exogenous. Nor can it confidently be postulated as an
independent explanatory variable in the saving equation, as has been done by
some authors; see Papanek (1972) for a discussion and references.

Della Valle and Oguchi (1976) and Musgrove (1980) investigate the relation-
ship between savings and the distribution of income using cross-country data. 34
Their findings are largely negative; the distribution of income seems to have no
statistically significant effect on savings. The exception is when the sample is
restricted to higher income countries; there is then some support for the hypothe-
sis that increases in inequality increase savings. Measures of the distribution of
income in developing countries are notoriously error ridden [Berry (1985)], and
the results of these studies may derive from this problem. Presumably, there is
some improvement in the accuracy of statistics in the richer countries, most
particularly for Della Valle and Oguchi's sample of OECD countries, and this
may explain the latter results.

A problem in interpreting regression results of the type presented by these
authors is that they refer to changes in the distribution of income that arise for
any reason [Blinder (1975)]. For instance, an increase in the proportion who are
young as a result of increased population growth may increase or decrease
measures of the distribution of income such as the Gini coefficient, as well as the
saving rate (as indicated in Section 3.1). Such changes in the distribution of
income are not, however, equivalent to shifts in lifetime income among otherwise
identical individuals, as posited in Section 3.2. In fact, these studies ignore the
growth rate and age structure variables so much emphasized by Modigliani and
Leff, and an integration of these two types of aggregation (over age groups and
income groups) might be valuable.

One set of issues that could be, but has not yet been, explored using cross-
country data is the effect of fluctuations in variables such as the terms of trade
and climatic conditions on aggregate saving rates. 35 Data from the last two
decades, when the terms of trade were particularly volatile, provide the potential

34 Van Doorn (1975) and Musgrove (1980) show how to build up aggregate consumption functions
that depend on the distribution of income from the behavior of individual consuming units.
35 A number of the cross-country studies referred to above define their variable as averages of
annual observations over about ten years, so that they are attempts in a rough way to estimate
relationships among permanent variables.
for a fruitful analysis. A first step would be to distinguish transitory from permanent changes in these variables, as well as expected from unexpected changes. This information could then be used to understand how saving behavior adjusts to shocks, the ex post realizations of random variables. It would also be useful to examine the behavior of countries in response to differences in the extent of uncertainties that they face by looking at the impact of ex ante measures of variability in random variables. A particular focus could be the behavior of oil-exporting countries.

A further factor that influences the aggregate saving of many developing countries is remittances by short-term emigrant workers. Examples include southern Africa, Turkish workers in Europe, and the substantial flows of manpower to oil-exporting countries after 1973. These episodes have yet to be studied.

4. Conclusions

What do economists know and what should they try to find out about savings in developing countries?

On the theoretical side there is a considerable body of hypotheses, part of which derives from work done to explain savings in the developed countries. Notions deserving special emphasis in the context of developing countries include: family structures; the prominence of agriculture; the self-financing of investment; borrowing constraints; uncertainties; the roles of education, health and nutrition; and non-linearities in the saving function and the relationship between the distribution of income and the aggregate level of savings. One significant gap in the theory is the definition and role of the group of individuals whose saving decisions are interdependent and the associated problem of the motivation behind bequests.

Empirical knowledge about saving seems to lag considerably behind the theory, so that most of the implications of the theories remain untested. Evidence is not yet available on the effects on savings of exogenous factors that influence nutrition, health, life expectancy, education, the availability of other investment opportunities and their returns, family structure, and bequests. One reason is the relatively severe problems of measurement that make it difficult to investigate hypotheses about savings. Very simply put, savings is a difficult variable to measure.

In this context it may be useful to think about hypotheses that are robust in the face of errors in the measurement of savings and those that are fragile. In the former category is the hypothesis that consumption depends on lifetime or permanent, in addition to (or even rather than) current, resources available to the consuming unit. Here, one can point to evidence that suggests the importance of
lifetime factors; there is little reason to think that the systematic problems of measurement that I have catalogued would overturn this conclusion. On the other hand, hypotheses about a non-linear behavioral relation between lifetime resources and saving could easily be confounded with errors in measuring saving that are themselves a non-linear function of lifetime resources. For this reason, I believe that we just do not know much about the relation between the distribution of (lifetime) income and the aggregate saving ratio.

Another difficulty in empirical work is that the intertemporal nature of saving means that data on the behavior of individuals over time is required, if the lifetime behavior of individuals is not to be inferred from the behavior of contemporaneous cohorts of different ages. Also, if responses of individuals to uncertainties are to be studied, time series on various variables, such as rainfall, are necessary to estimate the uncertainties from repeated realizations of the random variables; some of these data can be obtained, and suggest one practicable and potentially fruitful area for research. Furthermore, while information on saving behavior is widely available from household surveys, their very household focus means that the surveys are silent on relationships among households embodied in extended families.

All in all, then, it seems that a lot of effort is needed to improve the data base on saving, so that further progress can be made through econometric analysis.

References


