The Economics of Saving and Growth

Theory, Evidence, and Implications for Policy

Edited by
KLAUS SCHMIDT-HEBBEL

LUIS SERVÉN

CAMBRIDGE
UNIVERSITY PRESS

Schmidt-Hebbel, K., S. B. Webb, and G. Corsetti. 1992. "Household Saving in Developing Countries: First Cross-Country Evidence," *The World Bank Economic Review* 6: 529–47.

Srinivasan, T. N. 1993. "Saving in the Development Process," in J. H. Gapinski (ed.): *The Economics of Saving*, Kluwer Academic Publishers, Boston.

Srinivasan, T. N. 1994. "Data Base for Development Analysis: An Overview," *Journal of Development Economics* 44: 3–27.

Summers, L. 1988. "Tax Policy and International Competitiveness," in J. Frenkel (ed.): *International Aspects of Fiscal Policies*, Chicago: University of Chicago Press.

Summers, R., and A. Heston. 1991. "The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950–1988," *Quarterly Journal of Economics* 106(2): 327–68.

Tesar, L., and I. Werner. 1992. "Home Bias and the Globalization of Securities Market." *NBER* Working Paper 4218. National Bureau of Economic Research, Cambridge, MA.

Visaria, P. 1980. "Poverty and Living Standards in Asia: An Overview of the Main Results and Lessons of Selected Household Surveys," *Living Standards Measurement Study Working Paper* 2, The World Bank.

Wilson, J. F., J. L. Freund, F. O. Yohn, and W. Lederer. 1989. "Measuring Household Saving: Recent Experience from the Flow-of-Funds Perspective," in R. E. Lipsey and H. S. Tice: op.cit.

CHAPTER 3

Saving and Growth

Angus Deaton

Introduction

Few economists would attribute the differences in growth rates between Asia and Africa to the optimal workings of the invisible hand, and most would favor policies that would raise African growth rates. Even in the absence of distortionary policies and even abstracting from skepticism that consumers make adequate intertemporal decisions, most governments and policy makers appear to regard growth as a good thing per se. A necessary (but certainly not sufficient) condition for growth is investment, in machines, in people, or in both. In a closed economy, these investments can come only from postponing consumption, that is from saving. In an international economy, investment in one country can be supported by saving elsewhere in the world, but as a matter of fact, there is a very high correlation between national investment and national saving at least when both are defined to exclude education (for recent assessments, see Feldstein and Horioka, 1980; Feldstein and Bacchetta, 1991; and Bosworth, 1993). Indeed, Feldstein and Bacchetta (1991) conclude that "an increase in national saving has a substantial effect on the level of investment" (p. 218). If so, it is a short step to the conclusion that saving drives growth, and that the appropriate policies for growth are those that promote saving.

That such a conclusion is logically coherent must be checked using a formal growth model, but as we shall see in the next section, the task is readily accomplished. Furthermore, the empirical evidence using cross-country regressions based on the Penn World Table (and other international data) show a significant positive and robust relationship across countries between saving rates and growth, whether interpreted as the effects of investment on growth (e.g., Levine and Renelt, 1992; and Mankiw, Romer, and Weil, 1992) or as growth driving saving (many studies since Modigliani, 1970). Of course, neither these studies nor the investment to growth argument have any bearing on whether it is saving that causes growth, growth that causes saving, or both simultaneously,

the last itself an attractive option since it suggests the possibility of multiple growth – saving equilibria. The causation is important, not just for understanding the process, but for the design of policy. If saving is merely the passive adjunct to growth or investment, then policies for growth should presumably be directed at investment (in people, plant, or equipment) or at the efficiency of such investment, with saving allowed to look after itself. But if saving is the prime mover, the focus would shift to the effects of saving incentives, such as tax breaks or special instruments like IRAs, compulsory saving in (fully funded) employee provident funds, as in Malaysia, Singapore, and Chile, to the design of social security systems, or to the role of financial intermediation in general, improvements in which are variously argued both to increase and to decrease saving.

This chapter reviews the evidence on growth and saving, considering various models in turn and summarizing the extent to which they appear to be consistent with the facts. These reviews are necessarily brief, and apart from the first two sections, I focus on models of household behavior that still have the most promise for helping us understand the process of saving and growth. The first section is a brief review of how we might interpret the world in terms of a saving to growth story. The second covers "plain vanilla" versions of the life-cycle and permanent income hypotheses, their implications for the relationship between saving and growth, and the evidence that shows they are not very useful for thinking about the saving and growth process in economic development. I then go on to discuss various modifications of these models, all consistent with intertemporal choice in general, but emphasizing various features that are given short shrift in the standard models. I also give brief attention to "classical," or post-Keynesian, models of saving and development. I then discuss in turn precautionary and liquidity constraint models, how such models can generate "two classes" of consumers (nonsavers and accumulators), and how restrictions on loans for house purchase might affect saving, bequests, and habits. I believe that all of these topics show promise for future research, and in a concluding section I summarize research directions for the future. In particular, I argue that attention should also be given to international comparisons of *micro*economic data on consumption and income. In many cases, the latter are more readily available, especially for the high-saving Asian countries. Recent research has shown that such data can yield important insight into intertemporal behavior in a way that does not require accurate measurement of saving, something that has been the stumbling block for many previous studies of saving in developing countries. Such data are sometimes better than time-series data for distinguishing various hypotheses, and they avoid many of the econometric difficulties that beset international comparisons using aggregate time-series data, such as the Penn World Tables.

From Saving to Growth: Growth Models

The relationship between saving and growth is often taken as axiomatic in the development literature, essentially for the reasons given in the opening paragraph of the introduction. If the capital–output ratio v is fixed, the rate of growth of output g is equal to the rate of growth of capital, so that as a matter of accounting, the rate of growth is equal to the ratio of the share of investment in output to the capital–output ratio, or $g = s/v$, where s is the saving rate, taken to be equal to the share of investment in output, as must be the case in a closed economy. Higher saving means higher growth, at least if there are no constraints in the labor market. Or perhaps better, higher *investment* leads to higher growth, with the saving rate automatically equilibrating to investment as in simple Keynesian models. The early Harrod-Domar growth models ran along these lines, and have never been entirely supplanted in the development literature, much less in the minds of practitioners and policy makers.

In Solow's (1956) neoclassical growth model, output comes from a linear homogeneous and concave production function of capital and labor, and the growth rate of the latter is given by an exogenous rate of population growth n. The share of saving in output, s, is also fixed. The system then satisfies two equations: the production function making output per head y a concave function of capital per head k,

$$y = f(k), \tag{1}$$

and the saving–investment identity, which takes the form

$$\dot{k} = sy - (n + \delta)k, \tag{2}$$

where δ is the rate at which the capital stock physically depreciates. Equations (1) and (2) have a unique (and stable) equilibrium solution for output per head and capital per head, y_0 and k_0, say. The steady state growth rate of total output is given, essentially by assumption, at the rate of population growth n, and the capital–output ratio v adjusts to equal the ratio $s/(n + \delta)$. Increases in the saving rate increase the capital–output ratio, raise output and capital per head, but cannot change the steady state rate of growth.

Output per head in this model increases only through technical progress, most simply modeled as Harrod-neutral or labor augmenting, by which the labor force grows in efficiency units at a rate $n + \gamma$, permitting output per *actual* unit of labor to increase at rate γ. Although

Solow's model takes the saving rate as fixed, in apparent contradistinction to the models of saving behavior with which I am going to deal below, it is readily converted into an optimal growth model. See Cass (1965) and Koopmans (1965), in which the forces of thrift are captured, not by an assumed exogenous saving rate, but by the rate of time preference and the intertemporal elasticity of substitution.

One interpretation of the Solow model is that saving does *not* cause growth, at least not in long-run equilibrium. Indeed, the understanding of this fact, and the associated dismissal of the simplistic saving to growth argument as a vulgar fallacy, was for many years a good test of a properly educated economist (although the test would have been failed by many successful finance ministers). However, it was also recognized that an increase in the saving rate would increase the rate of growth *temporarily* as output per head moved from the old equilibrium to the new higher one, and that the transition could be a very long one (for some early calculations, see Atkinson, 1969). One way of making the point and of leading into the recent work is to examine the dynamics by linearization around the equilibrium. If we approximate equation (2) around the equilibrium capital stock k_0, we reach

$$\dot{k} = -(n+\delta)(1-\alpha)(k-k_0), \tag{3}$$

where α is the elasticity of output per head with respect to capital per head at k_0, a quantity that is the (constant) exponent of capital if the production function is Cobb–Douglas. The solution to equation (3) is that k approaches k_0 exponentially, so that

$$k = k_0 + \theta \exp[-(1-\alpha)(n+\delta)t], \tag{4}$$

where θ reflects initial conditions. Output per head will approach its equilibrium in the same way (see also Mankiw, Romer, and Weil, 1992).

According to equations (3) and (4), the speed at which the system regains its equilibrium is inversely related to the elasticity of output with respect to capital, or to the share of capital in output if production is Cobb–Douglas. When α is large – or when population growth and the rate of depreciation are small, so that the effects of disequilibria in capital per head take a long time to wear off – adjustment will be slow. As a result, if economies share the same technology, but differ in their initial endowments of capital per head and in their preferences – here represented by the saving rate – they will "conditionally" converge, that is, converge to their respective different equilibrium levels of output per head, but slowly. As α approaches one, in which case the technology takes the "AK" form $Y = AK$ for (total) output and (total) capital Y and K, there is no tendency to return to equilibrium, and an increase in saving can permanently increase growth. The AK model is one of the

standard models in the "increasing returns" growth literature, and thinking about the Solow model with α close to unity provides a useful bridge between the old and new literatures (or, perhaps as accurately, back to the Harrod-Domar literatures).

Recent work has not only been concerned with explaining the rate of technical progress in the Solow model, but also refocused attention on whether the unmodified Solow model can explain divergences in growth rates across countries. If transitions are short, so that the data come from countries that are more or less in equilibrium, the Solow model is an unpromising candidate for explaining what we see, since, in equilibrium, all countries that have access to international technology but have different tastes, that is, different saving ratios, should have approximately the same rate of per capita economic growth. But if transitions take many years, there is scope for attributing international differences in growth rates to international differences in saving rates. Research on the rate of convergence by Barro and his collaborators (Barro, 1991; and Barro and Sala-i-Martin, 1992) suggests slow transitions, and the paper by Mankiw, Romer, and Weil (1992) has shown that a Solow model, albeit augmented for human capital and in which saving rates are treated as exogenous (i.e., as given by tastes), is capable of explaining a large fraction of the international variation in growth rates. Hence, even without abandoning the Solow model, it is possible to revive much of the standard view that higher rates of saving engender higher economic growth.

The other strand in the modern literature is concerned with modeling technical progress and, in particular, the incorporation of knowledge and human capital into the production function and the process of growth. Although such models were quite well developed in the earlier literature, particularly by Arrow (1962), Uzawa (1965), and Kaldor and Mirrlees (1962), their modern incarnation starts with Lucas (1988) and Romer (1986, 1990). Romer eloquently argues that a production function containing knowledge, capital, and labor must exhibit greater than constant returns to scale; doubling labor and capital with existing technology should double output, so that the doubling of all three must more than do so. Lucas and Romer develop models containing human capital or stocks of knowledge in addition to capital and labor, and demonstrate how growth rates can be permanently increased in societies that are prepared to postpone consumption, not just to increase capital formation, but to increase simultaneously both capital and knowledge (or human capital). Such an expansion overcomes the diminishing returns to capital in the Solow model and can conveniently be thought of in terms of the simple AK model discussed above, provided that capital K is defined as a broad aggregate including human as well as physical capital.

There is also a good deal of empirical evidence, including once again

Barro (1991) and Mankiw, Romer, and Weil (1992), that shows that various measures of education add significantly to the explanation of growth offered by saving rates alone. (Of course, such regressions are subject to exactly the same causality issues as are the regressions that relate growth to saving; indeed, there is an older literature that interpreted the regression of education on output in terms of the elasticity of demand for education.) In the context of this chapter, these models take me away from my main purpose. The effects of education on growth are of the greatest importance, and it is hard to disagree with the proposition that knowledge and its production are an integral part of the growth process. But I am interpreting my topic as the relationship between growth and saving as conventionally defined, not as the relationship between growth and a broader aggregate of saving and educational expenditures. Note however the possibility that in the presence of liquidity constraints, parents may have to save up for their children's education, generating another link between growth, education, and saving. This effect is similar to saving up for housing, which will be dealt with later in this chapter.

From this brief account of the matter, it seems that as a matter of theory, it is hard to deny that higher saving should engender higher growth. The empirical evidence is consistent with the theory, although almost all of the empirical evidence is interpretative, in the sense that it shows that the configuration of growth rates, saving rates, and education across countries is consistent with what would be expected from Solow models or Solow models augmented to include measures of human capital. Of course, such evidence offers no explanation of what determines saving rates (or the amount of education that societies choose to provide their children), and they clearly have no power to detect the reverse causality that saving (and/or education) is caused by income or the growth of income.

Carroll and Weil (1994) address the causality issue explicitly and find some evidence against the proposition that growth comes from saving using Granger causality tests. Using pooled five-year averages of saving and growth for both the OECD and a wider sample of countries, they find that lagged saving lacks explanatory power for growth conditional on lagged growth, whereas the reverse is not true, so that lagged growth predicts saving conditional on its own lags. It is not entirely clear what to make of these results. Growth has to come from somewhere, and it is hard to think of growth rates as a pure time-series process, unaffected by previous levels of investment (= saving). At the same time, there are econometric difficulties with these sort of vector auto-regressions (VARs) in panel data in the presence of both fixed effects and lagged dependent variables (for discussion and possible remedies, see Holtz-Eakin, Newey, and Rosen, 1988; Arellano and Bond, 1991; and Arellano and Bover, 1995).

From Growth to Saving: Standard Models of Saving

In this section, I consider two standard models of intertemporal choice, the permanent income hypothesis and the life-cycle hypothesis, focusing on their implications for the relationship between growth and saving. I conclude with a brief review of some classical and neo-Keynesian models of growth and saving.

The Permanent Income Hypothesis

The permanent income hypothesis (PIH) is most often used for studying macroeconomic fluctuations and the short-run dynamic relationship between consumption, saving, and income. However, it also has implications for the long-run relationship between saving and growth. Although there are almost as many versions of the PIH as there are chapters in Friedman (1957), the version that is the basis for modern work sets consumption equal to the annuity value of the sum of assets and the discounted present value of expected future labor income (Flavin, 1981). Such a model can be formally derived from the maximization under uncertainty of a quadratic intertemporally additive utility function under the assumption that the real rate of interest and the rate of time preference are constant and equal to one another (see Deaton, 1992, Ch. 3 for an elementary exposition). The horizon is usually taken to be infinite – partly for algebraic convenience, and partly because we are usually concerned with a representative agent – in which case Flavin's version of the PIH takes the form

$$c_t = \frac{r}{1+r}\left(A_t + \sum_0^\infty \frac{E_t y_{t+k}}{(1+r)^k}\right), \tag{5}$$

where r is the constant real rate of interest, c_t is real consumption in period t, y_{t+k} is real *labor* income (earnings) in year $t + k$ whose expectation conditional on information available at time t is $E_t y_{t+k}$, and A_t is the real value of the single asset whose return is r.

For current purposes, equation (5) is best rewritten in an equivalent form suggested by Campbell (1987). He defines *disposable* income as the sum of earnings and asset income, here $y_t + rA_t/(1 + r)$, and then shows that saving s_t, defined as the difference between disposable income and consumption, satisfies the "rainy day equation"

$$s_t = -\sum_{1}^{\infty} E_t \frac{\Delta y_{t+k}}{(1+r)^k}, \tag{6}$$

so that saving is the discounted present value of expected future *falls* in earnings. (Deriving equation (6) from (5) takes a little practice, but the point to note is that the two formulations of the PIH are precisely equivalent; each can be derived from the other.) The rainy day equation comes directly from the assumption underlying the PIH that optimal consumption is flat over time. Hence, if earnings are also flat, there is no need to save; if earnings are growing, the consumer should borrow and repay later; and if earnings are expected to fall in the future, most notably because of retirement in a finite-life model, the consumer should save to hold consumption constant over that anticipated drop.

Equation (6) also shows why the PIH is not a very good candidate to explain a positive correlation between saving and growth (see also Carroll and Summers, 1991). Provided that growth is anticipated, saving should be *negative*, so that the PIH is consistent with high household saving in Thailand, Indonesia, Japan, Korea, Hong Kong, and Taiwan only if the citizens of those countries continue to be surprised by the growth in their incomes, even after a (more or less) continuous quarter century of growth. If they know what is coming, they should be borrowing en masse so as not to have to wait for higher incomes to materialize. Even if consumption is only *proportional* to permanent income, rather than equal to it, saving still ought to be lower the higher is the expected future increase in labor income, which once again violates the facts. Again as pointed out by Carroll and Summers (1991) and also by Viard (1993), the productivity slowdown of the early 1970s, which generated well-publicized declines in the rate of growth of future earnings, should also have generated higher saving (or less dissaving) if consumers were planning on smoothing their consumption over the rest of their lives. Once again this is the opposite of what happened; in *all* the OECD countries, saving declined with growth rates decade by decade, from the 1960s to the 1970s to the 1980s (see Modigliani, 1993).

I have been playing fast and loose with finite and infinite lives, but all of the conclusions can be restated correctly at the price of a little more algebra (for a finite-life version of equation (6), see Deaton and Paxson, 1994a). In finite-life models, retirement causes an anticipated drop in earnings and so provides a motive for saving. Hence, retirement can explain why people save even when they expect their earnings to grow in every year up to retirement. Even so, an increase in the expected rate of increase of labor income will still warrant an increase in consumption, although by an amount that is much larger for young consumers than for consumers nearing retirement. Similarly, the productivity slowdown should have increased saving by more for younger workers, yet as far as we can tell, saving rates fell for all age groups (for the United States, see Bosworth, Burtless, and Sabelhaus, 1991; for Britain, see Attanasio, Guiso, Jappelli, and Weber, 1992).

The Life-Cycle Hypothesis

Unlike the PIH, the life-cycle model is closely associated with the relationship between saving and growth, and its creator, Modigliani (1986), has argued the positive relationship between growth and saving as the central and most important prediction of his model. But as we have seen, the PIH with finite life, which is a simple form of the life-cycle model, predicts that increases in growth will *reduce* saving. That the life-cycle hypothesis (LCH) does the opposite is a consequence, not of its assumptions about behavior, but of its assumptions about how growth works, assumptions that are in principle testable. Growth in earnings is assumed to take place across generations (or cohorts) but not within them, so that when the growth rate of earnings shifts up, no individuals expect additional growth over their lifetime, only that their successors will have higher lifetime earnings profiles. There is a larger gap between the lifetime earnings profiles of successive cohorts, but no change in their slope. As a result, no individual wishes to decrease saving according to equation (6).

What happens instead is illustrated in Figure 3.1, which shows a lifetime profile of earnings and consumption that, although schematic, is a good deal more realistic than the simple "stripped-down" model used in the textbooks, in which consumption is taken to be constant throughout life, and earnings constant until retirement. The hump in consumption reflects the changing demographic composition of the household as children are born, grow expensive, and leave, and the hump in earnings reflects the standard age–earnings profile. I assume that consumption drops at retirement, not because of the fall in earnings, but because, when people no longer go to work, they no longer have to bear many of the expenses associated with work – transportation, working clothes, meals – that are counted as part of consumption during the working life. (Such expenses are immediately apparent in U.S. and British data if we compare consumption patterns of one- and two-earner households, and although some of these expenses are likely to be less important in poorer countries, this is not so for all, transport being the most obvious example.)

As shown in Figure 3.1, household members want to borrow at the beginning of their career, save in the middle, and run down the accumulated assets after retirement. If we measure the average age of each dollar saved and each dollar borrowed or dissaved, then as illustrated, the average age of the saved dollars is less than the average age of

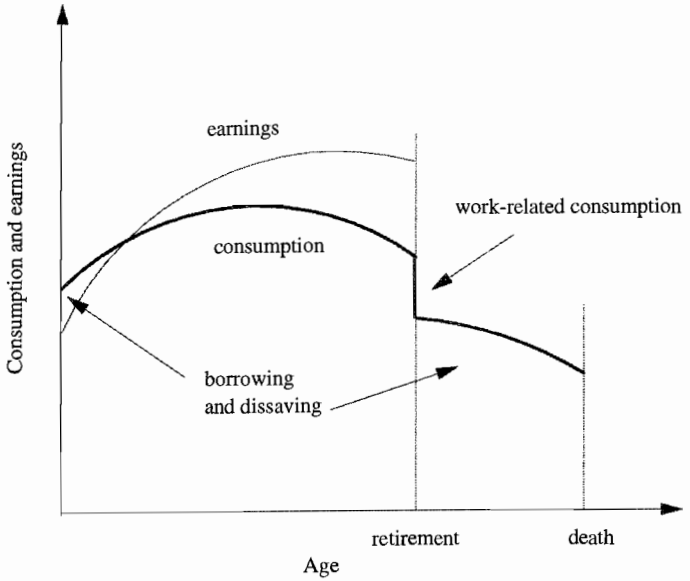

Figure 3.1. Schematic life-cycle profiles of earnings and consumption.

the dissaved dollars. In consequence, if there is economic growth across cohorts, with younger generations richer than older generations, but without any tipping of individual age–earnings profiles, saving will increase because the average age of savings is less than the average age of dissaving, and growth redistributes resources toward younger cohorts.

Figure 3.2 illustrates the effects on cross-sectional profiles of saving. The line for zero growth, $g = 0$, shows the lifetime profile of saving – here earnings less consumption, because the interest rate is taken to be zero – corresponding to the earnings and consumption paths in Figure 3.1. Because the growth rate is zero, the cross section over households at any instant replicates the lifetime profile for any and all of them. For positive growth rates, cross sections diverge from lifetime profiles, because younger households are on higher trajectories. The lines for growth of 2, 4, and 6 percent in Figure 3.2 come from the zero growth profile by scaling up the latter by the factor $(1 + g)^{T-a}$, where T is the date of death and a is age, and show the cross-sectional age profiles of saving in economies in long-term equilibrium at growth rate g. The total area under the zero growth line is zero; saving during the prime age years just finances borrowing in youth and retirement. At higher growth rates, there is net saving, since the midlife saving of the younger generations is greater than the retirement dissaving of their elders. At very high growth

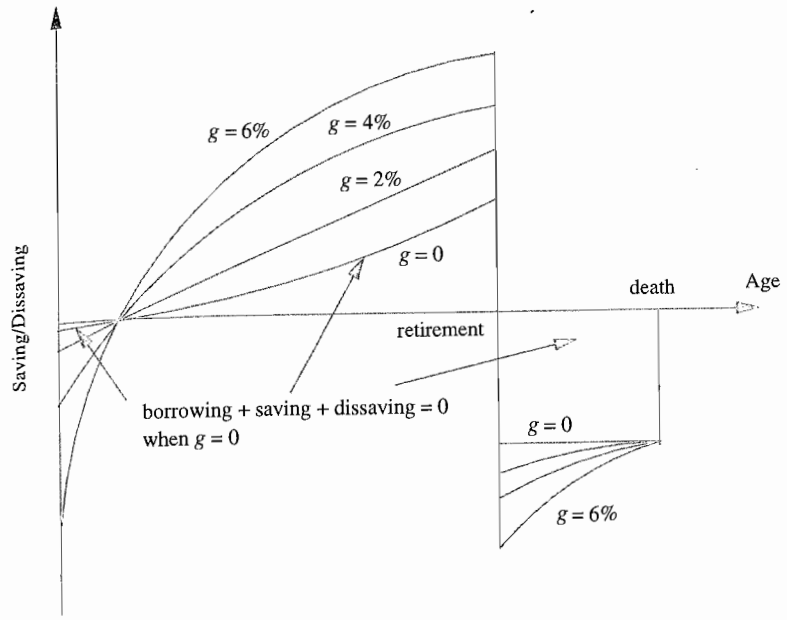

Figure 3.2. Cross-sectional profiles of saving as a function of the growth of earnings corresponding to Figure 3.1.

rates – higher than those shown here – the dissaving by the youngest households will eventually predominate, the age of dissaving will fall below the age of saving, and the direction of the growth effect on saving will flip. However, this may be a remote possibility in practice, and we can follow Modigliani in ruling it out by assuming – quite reasonably in my view – that the youngest households cannot borrow for consumption. This restriction then guarantees that the age of saving is less than the age of dissaving and, together with the assumption about the way in which growth affects the earning process, guarantees that higher growth will produce more saving.

This model has had many impressive successes to its credit. A crude version of Figure 3.1, in which consumption is constant over life, predicts a wealth to income ratio of three to four, which is close to the actual figure in the United States and other developed economies. (As we shall see below, the more realistic Figure 3.1 does less well.) The crude model also predicts a relationship between saving rates and growth rates that is close to that shown by the cross-country evidence. Although the ratio of wealth to income in these models is not independent of growth rate, a reasonably accurate first approximation to the effect of growth on saving comes from assuming a fixed ratio. Thus, to maintain a wealth to income

ratio of three, say, the saving ratio must be the growth rate of income multiplied by three, so that a one percentage point increase in the rate of growth should lead to a three point increase in the saving ratio. A more refined approach yields a nonlinear relationship with zero saving at zero growth, and a slope of closer to two at the relevant growth rates of income. International regressions of saving rates on growth have almost exactly the predicted slope and, perhaps even more impressively, give the same slope over time within countries as over countries at one time, at least for the OECD (see Deaton, 1992, Ch. 2; and Modigliani, 1993). Using decade averages of saving and growth rates, the international results are unaffected by the inclusion of country fixed effects.

The life-cycle hypothesis also yields a rich set of predictions about the effects of demographic change. The national saving rate is composed of the saving rates of different age groups weighted by their shares in the population, so that it should be possible to explain international differences in saving rates by international differences in population structure, a proposition that has found some (although not universal) support in the literature (see, e.g., Leff, 1980; Ram, 1982; Hammer, 1986; Mason, 1987, 1988; and Gersovitz, 1988). If these predictions are taken seriously, there are dramatic consequences, especially for East Asia, where populations are currently aging very rapidly, a consequence of post-war baby booms, increases in life expectancy, and later declines in fertility. For example, Horioka (1989) predicts that Japan's saving rate will become negative early in the next century. The life-cycle hypothesis has also proved a fertile vehicle for analyzing the effects of social security on private saving (for some of the early international evidence that points to social security as a cause of lower saving, see Feldstein, 1980; as well as the recent symposium edited by Arrau and Schmidt-Hebbel, 1994).

That such a simple model should yield accurate predictions is remarkable. It is also impressive that in contrast to much modern work on saving, no use is made of representative agents; indeed the growth and saving results do not hold for individual agents, but are explicit aggregation effects, one of the few examples in empirical macroeconomics where aggregation is used positively, not shrugged off as a nuisance. It is thus unfortunate that the closer scrutiny to which the model has been put in recent years should have revealed irreparable difficulties.

First, examination of age profiles of consumption and incomes, although admittedly beset by measurement error, usually yields shapes that are much more like Figure 3.1 than they are like the standard, stripped-down model in which consumption is flat throughout life. In consequence, there is not enough hump saving in the data to account for aggregate wealth in the economy, with the implication that a substantial amount of national wealth (perhaps a half or more) must be attributed to bequests (see Kotlikoff, 1988; Kotlikoff and Summers, 1981; and Modigliani, 1988). Similar results seem to hold for other developed countries, while in developing countries the survey data often show little, no, or even negative saving. While this is almost certainly a consequence of the gross difficulties in measuring income and saving in survey data, there is no direct survey evidence from poor countries that household saving for retirement plays any role in accounting for national wealth.

Second, if life-cycle wealth is a smaller fraction of national wealth, and therefore a relatively small multiple of national income, then the effects of growth on saving are correspondingly smaller and are also no longer consistent with the cross-country relationship. This conclusion is supported by other evidence. According to the life-cycle model, the declines in the saving rates in the OECD countries are attributable to declines in growth and the resulting reallocation of real income away from younger savers and toward older dissavers. But in the United States and the United Kingdom, where it is possible using survey data to give some account of who is doing the saving, the decline does not appear to be a compositional phenomenon; instead, and as I have already noted, saving fell for all groups (for the United States, see Bosworth, Burtless, and Sabelhaus, 1991; for the United Kingdom, see Attanasio et al., 1992).

There is also evidence from cross-sectional age profiles of consumption. As noted by Carroll and Summers (1991), age profiles of consumption in a single cross section are not the age profiles of any one individual, but are distorted by cohort effects. In rapidly growing economies, young cohorts are much wealthier over their lifetimes than old cohorts, and since consumption is proportional to lifetime resources, the consumption of the young will rise more relative to that of the old the faster is the rate of growth of real earnings. If different countries have the same tastes for the distribution of consumption over the lifetime, an assumption that is required to give the life-cycle model empirical content for an international cross section, then the age profiles of consumption in any given cross section must be tipped more toward the young in the faster-growing countries. But Carroll and Summers show that the profiles are roughly similar for a number of developed economies, including the United States and Japan, with the tipping if anything going in reverse, and Deaton (1991, 1992) shows that the same is true for a number of developing countries. The cross-sectional age profiles of consumption in the rapidly growing economies of Indonesia, Taiwan, and Korea are tipped toward older households, while in slow-growing Côte d'Ivoire, the profile favors the young. In all of these examples, the cross-sectional

profile of consumption is much better explained by the cross-sectional profile of earnings, not the cross-sectional profile of lifetime resources. That this is also true for cohorts of households tracked over time is confirmed using 15 cross-sectional household surveys for Taiwan by Deaton and Paxson (1994b).

Given the appropriate data, it is possible to estimate life-cycle models for individual countries and to use the results to calculate the effects of growth on saving. This requires either panel data or a time series of cross sections, so that cohorts of households can be tracked over time and the age profiles of saving calculated. This has been done for Britain, Taiwan, Thailand, and the United States by Paxson (1996), who finds that the increases in the rate of growth of income will generate little or no saving in any of these countries, because there is too little saving in general, and because what there is is not sufficiently negatively correlated with age. Yet these countries lie along the line linking growth and saving in international comparisons, so that, whatever the cause of the link, it is not the life-cycle hypothesis. Paxson's results are consistent with those of Carroll and Summers (1991), but provide a much more direct refutation of the life-cycle growth to saving mechanism.

It is surely no real surprise that saving for retirement is an unpromising candidate for explaining patterns of national saving in developing countries. Even in Western Europe, the cohort born in the mid-1920s is the first in history to have an uninterrupted 40-year work history over which they might have hoped to accumulate enough to fund their retirement. The lifetimes of earlier cohorts were punctuated by wars, not to mention inflations and political turmoil – events that still occur in much of the developing world. It is hard to see that ordinary people would have much hope of saving for retirement in such an environment, where there is little chance of securing the fruits of 40 years of saving, even if the sacrifice of consumption were itself possible. Nor do most people in the world have a need for this sort of protection. In most societies and for most people, the family provides better insurance than the market against the inability to work in an extended old age, in itself a relatively rare event in agricultural societies with relatively low life expectancy. For whatever reason, such arrangements seem to break down with economic development, as well as with decreases in mortality and fertility, so that more years of parental old age have to be covered by fewer children. Although this breakdown may turn some people into life-cycle savers, I suspect that a more common response is a political demand for old age social security, at least to the extent of eliminating a growing problem of poverty among the elderly. Although there are many different ways in which this demand can be satisfied, all require the state to accept at least some of the responsibility for financial security in old age.

Classical Explanations of Saving and Growth

For lack of anywhere better to discuss them, I want to note here the existence of older theories of saving that are much more explicitly focused toward development, and that also yield an explanation in which growth drives saving. These are the classical saving models associated with Lewis (1954) and (his teacher) Kaldor (1957). In both Lewis's and Kaldor's models, there are two classes of people, savers and non-savers, or workers and capitalists. In the simplest formulation, workers spend what they earn and capitalists, whose sole purpose is accumulation, save their incomes, although it is also possible to give different saving propensities to the two groups. In the Lewis model, the activities of the capitalists in the modern sector increase the share of the latter as the economy grows, and thus increases the share of saving in national income. The more rapid the accumulation, the faster the distribution of income tips toward profits, and the higher is the saving rate. In Kaldor's model, which is more focused on short-run dynamics and which has a more Keynesian flavor, investment is set by the "animal spirits" of the capitalists – though there is no reason why this could not be given a more modern flavor – and the income distribution adjusts between workers and capitalists so as to satisfy the identity between saving and investment. More investment brings more growth, a tip in income distribution toward the capitalists, and a higher saving rate. In the extreme case where workers save nothing and capitalists everything, investment is self-financing; workers "spend what they get" and capitalists "get what they spend" – the widow's cruse.

These models deserve more serious empirical attention than they have received to date, although it is not clear that there have been major changes in either the personal or functional distributions of income associated with increases in saving rates – for example, in Taiwan and Korea. Of course, the Lewis and Kaldor models are highly schematic and require filling out before we know what to look for. Even so, the idea that there are two classes of savers is something that appears in a number of guises, and I will return to it below. For the moment, note that any such specification will forge a link between income distribution and national saving, an old topic that will be pursued in depth in Chapter 6, and one that was seen as central and obvious in the first consumption functions estimated in the 1930s and 1940s, but that has not been the focus of much recent research. It is more difficult to specify what we are talking about when we talk about "capitalists" and "workers," so that we know where to look, both for high saving rates and for changes in the distribution of income. Lewis had in mind enclaves or nascent modern sectors, "not one island of expanding capitalist employment, surrounded by a vast sea of subsistence workers, but rather a number of such tiny

islands," objects that are not obviously well reflected in surveys or in national accounts. Kaldor thought of his capitalists as the directors of corporations deciding on how much to retain and how much to distribute, so that the distribution of income would be the functional not the personal distribution. Other possibilities are the small-business sector, but it is not clear that this would apply everywhere; for example, it is surely a better story for Taiwan than for Korea. Kaldor's focus on profits versus earnings is surely one that is worth following up, at least in those countries where it is possible to disaggregate private saving into its personal and corporate components. In industrialized countries, saving by firms is often the major source of finance for business investment, and it would be useful to investigate the extent to which the same is true in developing countries.

Precautionary Saving, Buffer Stock Models, Saving, and Growth

By far the most active area of recent research in saving has been the move away from the PIH and life-cycle models toward a richer class of models, still within the general framework of intertemporal choice under uncertainty, but with a number of distinct predictions of their own. One line of work has been to relax the certainty equivalent utility function that underlies the PIH, so that the marginal utility of consumption is assumed to be nonlinear, typically convex. Such convexity generates precautionary motives for saving. A second line has been to consider the effects of borrowing constraints. I consider each topic in turn, again with a focus on saving and growth. A more detailed treatment is given in Deaton (1992, Ch. 6); see also Browning and Lusardi (1996) for an update.

Precautionary Saving

The usual vehicle for intertemporal choice under uncertainty is one in which the consumer maximizes expected utility given by

$$EU = E_t \sum_{0}^{T-1} (1+\delta)^{-k} \upsilon(c_{t+k}), \tag{7}$$

where δ is the rate of time preference, and $\upsilon(c)$ is the instantaneous (sub)utility function. In the simplest case, expected utility is maximized subject to the intertemporal budget constraint

$$A_{t+1} = (1+r)(A_t + y_t - c_t), \tag{8}$$

where A_t is the real value of a single asset and r is the constant real interest rate. As before, it is important to emphasize that y_t is earnings, or

labor income, not total income. The PIH (equation (5)) is the solution to this problem in the special case when $r = \delta$ and when the subutility functions are quadratic. But linear marginal utility supposes that the value of consumption is increased by a fall in consumption by the same amount that an increase in consumption decreases marginal utility, which many people find implausible. Quadratic utility also implies decreasing absolute risk aversion, which is implausible to even more people. A more attractive assumption is that marginal utility of consumption $\lambda(c)$ is strictly convex, where

$$\lambda(c) \equiv \upsilon(c_t). \tag{9}$$

While consumer theory carries no general supposition that marginal utility be convex, the assumption has a number of interesting consequences. Increased uncertainty about future consumption, next period or any period in the future, causes current consumption to decrease so that saving increases. The same effect tilts lifetime consumption profiles away from early consumption and toward late consumption. Until people know more about their lifetime prospects, it is prudent not to consume too much and to limit borrowing, an effect that will be stronger the greater the uncertainty about *lifetime* income. Transfers of funds that leave present values unaffected can affect behavior. Higher taxes now with lower taxes later will cause consumption to decrease if people have to rebuild precautionary balances and if they cannot borrow against their future tax breaks. In extreme cases, if people are very cautious and there is a great deal of uncertainty, consumption can be quite closely tied to income over all but the shortest time span, so that the aggregate economy behaves as if there were a close Keynesian link between consumption and income. The marginal propensity to consume out of earnings is higher when assets are low, so that transfers between consumers will also affect saving; income distribution matters.

Perhaps the main relevance of precautionary saving for saving and growth is a negative one. We now know, particularly from the work of Carroll (1992, 1997), that it is possible to construct plausible models of optimal intertemporal choice over the life cycle in which the path of consumption is closely related to the path of earnings, so that the growth to saving implications of the standard LCH are annulled. That higher growth should increase saving is an implication of the special assumptions that underlie the life-cycle model; it is not a general implication of optimal intertemporal choice. That said, we are still at the level of logical implications; the importance of precautionary saving in the data is far from fully established. The implications listed above all seem to have some support in the data, and it is possible to rig up precautionary models to tell very interesting stories about consumption tracking earnings (Carroll, 1997) and about the effects of social security and spend-

down rules on saving (Hubbard, Skinner, and Zeldes, 1992). It is also true that with different preference parameters and different assumptions about earnings, very different results can be obtained; indeed, as the precautionary motive becomes small, we can return to the PIH. Nor is it clear that all the predictions of precautionary models are correct. For example, Dynan (1993) finds no relation between consumption growth and future consumption uncertainty in the microdata; while such isolated findings can be explained away, much more work needs to be done before precautionary saving can be regarded as an established phenomenon.

Liquidity Constraints: Buffer Stock Models

Another way of complicating the standard model – and perhaps of making it more realistic – is to allow for the possibility that consumers may not be able to borrow, or at least that they cannot borrow more than some given limit. Although credit markets clearly exist in developing countries, it may in some circumstances make more sense to examine the consequences of prohibiting borrowing altogether than to allow the possibly large borrowing for consumption that can result from life-cycle, PIH, or precautionary models.

Liquidity constraints and their consequences for saving will be covered at length in Chapter 4; here we focus mainly on their implications for the saving–growth link. The basic model is as in equations (7) and (8) with the addition of the borrowing constraint

$$A_t \geq 0, \tag{10}$$

which can be trivially extended to allow for any fixed borrowing limit. As with precautionary saving and in contrast to the LCH and PIH, there is no explicit solution, but intertemporal behavior can be characterized by an Euler equation and solved numerically for any given utility function and set of parameters. The results depend on a number of factors, most importantly (i) the nature of the stochastic process driving earnings y_t, particularly its trend rate of growth and level of variability, (ii) preferences, particularly the rate of time preference δ and the curvature of the functions $u(c)$, the latter controlling the intertemporal elasticity of substitution, and (iii) the real rate of interest r. The configuration of these factors determines whether an individual is likely to be affected by the borrowing constraint, and if so, what behavior will look like. If the individual is patient, or if growth is low or negative, or if future incomes are uncertain, or if interest rates are high, all of which provide incentives to postpone consumption and to accelerate the rate of growth of consumption by accumulating first and decumulating later, and if the consumer has a high elasticity of intertemporal substitution so that he or she responds to these incentives, then borrowing constraints are unlikely to bind, and consumption and saving will be much the same as if there had been no constraints. When the factors stack up the other way, so that an unconstrained consumer would borrow early in life in order to finance a level of consumption that is higher than earnings, then behavior will be changed by the constraints. To take the simplest example where earnings follow an i.i.d. stationary process, individuals will accumulate if $\delta < r$ and will be "trapped" by the borrowing constraints if $\delta > r$. Relatively patient consumers get richer with time, but it is optimal for the relatively impatient to stay poor – never accumulating, spending something close to their earnings, and using assets (if at all) only to smooth out short-term fluctuations in earnings.

Such models divide consumers into two groups, only one of which saves. The distinction depends on preferences, but even if preferences are continuously distributed over the population, the borrowing constraints themselves will divide consumers into two groups; it is not necessary to postulate two distinct types of people or preferences. Note also that the division into savers and nonsavers depends not only on preferences, but also on the rate of growth of earnings – with higher expected rates of growth generating *fewer* savers – the variability of earnings, and interest rates, so that there is no fixed division between savers and nonsavers, and there is potential scope for policy to shift individuals from one group to the other. The nonsavers are not too poor to save, as in vicious-circle or subsistence models; indeed, being close to subsistence would seem to make people more sensitive to intertemporal issues, not the reverse. Instead, the poor are voluntarily poor because they do not save, and they would be worse off if they were forced to accumulate assets and become rich. Their lack of assets comes from their impatience, not from any structural inability to save.

The dynamics of borrowing-constrained consumers or buffer-stock savers has been worked out in papers by Schechtman (1976), Bewley (1977), Schechtman and Escudero (1977), and Deaton (1991, 1992). Under the relevant assumptions about earnings processes, consumers use assets only to buffer consumption, accumulating them when times are good and running them down to protect consumption when earnings are low. Over horizons of only a few years, consumption will be closely matched to earnings, and assets are regularly drawn down to zero when times are bad enough, and the last unit of assets is worth more as current consumption than it is as a precautionary balance. Assets are important for these consumers, not as a mode of accumulation, but as a protection against poor earnings and, in particular, against poor earnings coupled with the inability to borrow.

The relationship between saving and growth in these models is presently unclear and, as with precautionary saving, is likely to depend on the precise configuration of preferences and earnings processes. In the stationary stochastic equilibrium, there is a constant average assets to earn-

ings ratio, in very much the same way as the standard life-cycle model produces a stationary assets to earnings ratio. However, the ratio in the latter is from two to four depending on the importance of bequests, whereas simulations of the buffer-stock models – which is really all that we currently have – suggest that the ratio is a good deal less than one, perhaps as low as 10 percent. If so, growth will increase saving as buffer stocks are restored, but the effect will be small; if buffer stocks are even a half of income, a one point increase in growth will increase the saving ratio by half a point, not the two to three points predicted by the crude life-cycle model and confirmed by the international and long time-series evidence. But the fixed-ratio view is itself too simple. Higher growth should decrease the numbers of savers relative to the nonsavers, because growth will make more people want to borrow, and anticipated growth will change the buffer-stock equilibrium for the nonsavers. For example, if the expected growth of earnings is high enough relative to the variance of earnings, it is easy to produce the simple "rule-of-thumb" consumers who simply spend their earnings, in which case there will be no saving at all for the group; for further discussion and some results, see Deaton (1991) and Carroll (1997).

As with the precautionary model, research into the buffer-stock model has enriched our understanding of saving behavior. It has also provided a formal justification for phenomena that seem to be present in the data – many households accumulating nothing in the long run and possessing few if any financial assets, but still using cash and other liquid assets to separate consumption and income at high frequencies, if not at low. Like the precautionary models, it is also far from having been fully estimated and tested on the data. As for the link between saving and growth, it is possibly consistent with a link from higher growth to higher saving, but the effects are surely small. It is worth also noting that, in many respects, liquidity constraints and precautionary motives have similar effects. The inability to borrow when the consumer is in trouble induces a precautionary motive even where none would otherwise exist. Correspondingly, consumers who are extremely cautious may voluntarily abstain from borrowing in bad times because they are fearful of having to repay when things are even worse. In consequence, buffer-stock saving can be generated by either precautionary saving or liquidity constraints, and it is unclear that many new insights would be gained by constructing models with both liquidity constraints and precautionary motives.

Liquidity Constraints: Housing

Rather different effects of liquidity constraints are associated with housing; these have received some attention in recent years, and probably

deserve a good deal more, since there is evidence that housing finance is somehow implicated in the saving story. Houses are the largest and most expensive assets that most people ever own. In many countries, markets for the consumption of the services of these assets are distorted in various ways. Rental markets can be eliminated or restricted by rent control policies, and tax policies typically favor home ownership over rental and over the possession of alternative assets. There are typically no taxes on the return from the ownership – the implicit rental value – and low or zero taxes on capital gains from home sales. But the purchase of housing is also made difficult in many countries by restrictions on the amount that can be borrowed for house purchase, so that consumers have to accumulate saving before they make a purchase; the same may be true for other large durables and for educational expenditures. In many countries, there are also restrictions on the extent to which home owners can borrow against home equity, although these have been relaxed in a number of countries in recent years, and the relaxation may have contributed to declining saving ratios (Miles, 1992), as well as (perhaps) allowing the old to behave more like life-cycle dissavers. What determines these borrowing restrictions is something of a puzzle; they are much more severe in some European countries (e.g., Germany and Italy) than others, and in some East Asian countries, such as Korea and Taiwan, the lack of development of financial intermediation for households seems to have been a conscious pro-saving policy. Yet in Singapore and Malaysia (but not in the reformed pension schemes of Latin America), which have explicit saving policies in the form of mandatory saving for retirement schemes, accumulations may be used for house purchase.

Saving up for house purchase is analogous to saving up for retirement, although the timing in the life cycle is different. Such saving can be added on to a standard life-cycle model or it can be taken alone, which we might want to do if we believe that people save for housing, but not for retirement above and beyond what is provided by social security and employment related schemes. The fact that the saving takes place *before* the dissaving, although irrelevant in a stationary economy, means that saving up for house purchase will elicit positive saving in an economy with growth in *total* GNP, which is exactly as in the life-cycle model. If the housing equity can be effectively run down during retirement – for example, through reverse annuity mortgages – housing and life-cycle saving can substitute for one another. In practice, there is very limited evidence of the elderly behaving in this way, although even if they did, the housing motive is likely to decrease the age at which saving begins. Since the effect of real income growth on saving depends on the difference between the average age of saving and the average age of dissaving, saving for house purchase will lower the average age of saving and thus

increase the effects of growth on saving (for a demonstration, see Jappelli and Pagano, 1994).

These results suggest a possible route from policy to saving; if governments deliberately restrict mortgage availability – for example, by setting minimum down payment ratios – saving will increase, and the sensitivity of saving to growth will increase. If saving drives growth, through the transitional dynamics of a Solow model or through an AK model, such financial restrictions can set up a virtuous circle of growth and saving, moving the economy from low-saving/low-growth to a high-saving/high-growth equilibrium, what might be called the Korean model. Note that this is exactly the opposite of the financial repression view, in which financial liberalization generates more saving, capital deepening, and growth for a recent statement (see McKinnon, 1991; for a skeptical analysis in the Korean and Taiwanese contexts, see Park, 1993).

The documentation of such effects is the purpose of Jappelli and Pagano's (1994) paper. They find that, even allowing for the standard variables in international saving regressions – mainly the growth and level of GDP and dependency ratios – the higher the minimum down payment ratio, the higher the saving rate. In a typical regression, an increase in the minimum down payment from 20 to 50 percent will raise the saving rate by 6 percentage points, holding constant the rate of growth. They also estimate Barro type regressions in which the down payment ratios increase growth itself. Of course, these regressions suffer from all of the same problems as the standard cross-country regressions in which saving is regressed on growth. Quite apart from causality issues, the cross-country evidence lacks the conviction that comes from a demonstration that the estimated effects are the size that we would expect from the within-country evidence. Indeed, in the one study that has attempted to simulate the effects, Hayashi, Ito, and Slemrod (1988), the contribution to the Japanese saving ratio of differences in credit arrangements between the United States and Japan is modest and accounts for only a small fraction of the difference between the U.S. and Japanese saving rates. Even so, this study is based on a large number of assumptions about behavior and institutions, and it is unclear how robust the findings are to alternative assumptions. Certainly, a good deal more work needs to be done along these lines.

There are some other reasons why housing is worth a good deal more attention. Informal conversations in Taiwan or Korea about saving nearly always lead quickly to housing. The young say that they are saving 30 or 40 percent of their incomes in order to buy a house, while their elders claim that they are saving even in retirement so that they can buy houses for their children; whether and under what circumstances these reports can be reconciled is itself an interesting topic for research. The cost of housing is also frequently mentioned, and apartments in Taipei

appear to cost as much as apartments in New York, in spite of the differences in real incomes. These sorts of conversations tend to (a) support the saving for house purchase story, (b) suggest again that bequests are important, and (c) point out that land prices are part of the story, especially in relatively small economies. I shall turn to bequests in the next section, which leaves the question of land prices and saving. This certainly needs investigation, and it is surely worth attempting to find out about land prices, as well as to link house prices to saving in more formal analyses. But while it is straightforward to see why the relative price of land ought to be high and to rise quickly in rapidly growing economies, it is harder to see why this should drive increases in saving rates.

Starting with land prices themselves, suppose that there is a fixed supply of land for housing A and that land does not depreciate, so that if the real interest rate is r, the cost of holding one unit of land for one period – the user cost – is $rp_t - \dot{p}_t$, the rental cost less capital appreciation. Hence, if we assume Cobb-Douglas preferences and equate demand to supply,

$$A = \frac{\alpha y_t}{rp_t - \dot{p}_t}. \tag{11}$$

If total national income is growing at rate $n + g$, the sum of the rates of population growth and per capita income, the solution to (11) is given by

$$(p_t/y_t) = \alpha/A(r - g - n), \tag{12}$$

so that land prices grow at the same rate as national income. (This result requires that $r > n + g$, and the equilibrium price to income ratio equation (12) can be reached only if the initial price to income ratio is higher than the equilibrium.) Prices can be very high relative to national income if the cost of holding land is low, which will be the case if real interest rates are not much higher than the rate of growth. According to even this simple story, and given a common world interest rate, the ratio of the value of land to national income will be highest in the most rapidly growing economies. We can also relax the Cobb-Douglas assumption that the income and (absolute) price elasticities of land are unity; if the former is η and the latter is $(-)\upsilon$, then the price of land rises at the rate of growth of output multiplied by the ratio η/υ. Although the demand for housing is presumably price inelastic since structures can be substituted for land, so that η/υ might be greater than 1, but the possibility remains that the value of land could rise more rapidly than does national income.

At first blush, the land price story seems to add to the attractiveness of the saving for house purchase account of saving. If there are restrictions

on borrowing for housing, the amount required for a deposit is increased the higher are house prices, so that the effect of growth on saving would be further enhanced. But it is hard to tell this story in any convincing way. The problem is that, unlike housing, land does not depreciate, so that, although it is true that first-time buyers are faced with higher prices when land prices rise, they are also the beneficiaries of the increase in land prices, if not directly, at least through eventual bequests by their parents or whoever currently owns the land. In the simplest PIH or LCH, where consumption is driven by present values, the increase in the price of land that requires more saving for one person also generates a capital gain for someone else, a capital gain that can be used for consumption and dissaving. As with any form of bequest, the saving of the donor provides a motive for dissaving for the recipient. It is possible that precautionary motives or other effects may introduce enough asymmetry so that there is a positive effect on saving, but there is no simple story that immediately comes to mind.

Bequests

There is some direct evidence for bequest motives, such as that in Bernheim (1991), who finds that people increase their life insurance and reduce annuities (i.e., increase bequeathable wealth) in response to the involuntary annuitization of social security. But much of the evidence for the importance of bequests is indirect, in the sense that it is often difficult to reconcile the evidence with anything other than a bequest motive. Even so, there are sometimes quite plausible alternative explanations. I have already discussed the Kotlikoff and Summers work, that it is difficult to find enough life-cycle saving in the microdata to explain the level of national wealth. Because the microeconomic data are so difficult to use to measure life-cycle saving, such calculations are subject to a wide band of error, although there has certainly been an upward revaluation in the profession's assessment of the importance of bequests in accounting for national wealth.

There is also a great deal of evidence that old people save, or at least do not dissave, as required by the simple life-cycle model without bequests. Such evidence goes back at least as far as Mirer (1979) and is continuously being updated as new data sets become available. In many household surveys from around the world, rates of saving among elderly households are as high or higher than among younger households, who are supposed to be saving for their retirement. (Note however that household surveys rarely have adequate data on private pensions and other annuities; an elderly couple living on a pension from an ex-employer is running down the value of an annuity, but if their consumption is less than their income – here the annual yield from the annuity –

they will be reported as saving.) Such saving among the elderly is observed in the United States, Japan, the United Kingdom, Germany, Italy, and Taiwan (see Attanasio, 1991; Börsch-Supan, 1992; Deaton and Paxson, 1994b; Banks and Blundell, 1995; and the papers collected in Poterba, 1995). Such results are certainly consistent with bequests, and in some cases, particularly Taiwan, casual conversations and (largely unsupported) statements in the literature tend to emphasize bequests. There is also a very large small business sector in Taiwan, investment in which is not usually thought of as retirement saving. But there are other explanations and some contrary evidence. Elderly people – or very rich people – may have a low or zero marginal utility of consumption, so that once their needs are met, additional income is saved faute de mieux; see Börsch-Supan and Stahl (1991), who focus on the German case, where the elderly receive extraordinarily generous state pensions.

There are also difficult selectivity problems in trying to study the elderly using household survey data, problems that are particularly severe in developing countries. Household surveys, by construction, survey households, not individuals, and even though the surveys yield a great deal of information about individuals within each household, they cannot collect information on saving by individuals, if only because consumption can be measured only at the household level. As a result, evidence that saving rates are high among elderly households usually means that saving rates are high among households headed by an elderly person, or are high among households containing only elderly people. But household formation and dissolution depends on economic factors, health, and age, so that, even if we had panel data, such as the American Retirement History Survey (RHS) or the new Health and Retirement Survey (HRS), the households and individuals that survive to old age are not randomly selected. In particular, since wealthier (i.e., lifetime high savers) have a lower risk of death as individuals, and presumably as household heads, there will be a progressive selection toward high savers over time (see Shorrocks, 1975). In industrialized countries, most elderly people live in independent households, so that the selection is probably less severe than is the case in developing countries, where living with children is the norm. Selection seems intractable in transitional economies such as Taiwan, where living arrangements are rapidly changing (Hermalin, Ofstedal, and Li, 1991; and Lo, 1989). The option of living alone is one that is increasingly available to wealthier Taiwanese – though it is also increasing as a result of increased life expectancy and decreased fertility – so that it is plausible that parents move in with their children when they no longer have the resources to live by themselves.

The contrary evidence on bequests comes from Hurd (1992), who uses data from the RHS to argue that the elderly in the United States do

indeed dissave, though these data are hard to use, much depends on the treatment of housing, and there is a good deal of scope for alternative interpretations. Hurd (1987, 1989) also shows that in the RHS, older people with children have no more assets than people without children, an implausible finding if bequests are important. Of course, the RHS, like all household surveys, has difficulty generating good measures of assets. But the new HRS in the United States appears to have been much more successful than previous surveys in collecting wealth data; respondents who at first refuse are faced with a series of bracketing questions, which most are prepared to answer. These "new" respondents are much richer on average than those who respond to the first, direct question, so that the estimates of total assets from the HRS are much higher than those from comparable surveys, though there is still a core group who refuse to cooperate and who presumably have the highest wealth of all. These results, reported in Juster and Smith (1994), are important for further research because they show constructively, at least in one context, that it is possible to get much better wealth data than was previously thought. These techniques are well worth extending to developing countries.

Some evidence on bequests can also be gleaned from the literature on the permanent income hypothesis and from international comparisons. In the standard life-cycle model with no bequests, the present value of lifetime consumption is equal to the present value of lifetime resources. If a fixed share of lifetime resources is set aside as bequests, then consumption will be proportional to lifetime resources, but the elasticity of consumption to permanent income will still be unity. However, it is possible that bequests are a luxury good, so that the elasticity of consumption with respect to lifetime or permanent income is less than unity. If bequests are a luxury, saving rates will be higher for lifetime richer consumers, and saving rates will be higher in richer countries, so that there will be a relationship between saving rates and the level (not the rate of growth) of national income.

There is some evidence in favor of these predictions. The older literature on the permanent income hypothesis, from Friedman (1957) up to Hall (1978), usually found elasticities of consumption to permanent income that were substantially less than unity, both on time-series and cross-sectional data. This evidence also holds good in developing countries, where cross-sectional regressions of consumption on income rarely give unit elasticities, even when measures of long-term income and assets are used as instruments; see Bhalla (1979, 1980) and Wolpin (1982) for India, Musgrove (1978, 1979) for Latin America, and Paxson (1992) for Thailand. Even more explicit is the evidence from Taiwan in Deaton and Paxson (1994b), who use 15 successive cross-sectional surveys to decompose consumption and income into cohort and age effects, the former

representing the lifetime components of consumption and income. But these cohort effects show steadily decreasing ratios of consumption to income for the more recent and lifetime wealthier generations.

The international cross-sectional evidence on growth and saving (e.g., Modigliani, 1993) shows that in the OECD countries the level of national income does *not* increase the saving rate once the rate of growth of income is taken into account. However, there is a positive effect among developing countries, a result supported for private saving in 10 Asian countries in Collins (1991) and for household saving in 10 Asian and Latin American countries in Schmidt-Hebbel, Webb, and Corsetti (1992). According to this evidence, bequests could be a luxury good at low or medium levels of income, but stop being so in rich countries. Indeed, some such relationship is necessary if the ratio of bequests to national income is not to increase indefinitely. Starting with Leff (1969), there is also a controversial literature on dependency effects, in which saving rates are regressed on the proportion of the population that is old and on the proportion of the population that is young, sometimes separately and sometimes summed. Careful reviews, such as Gersovitz (1988), conclude that these effects are not robust across studies, and that there are good theoretical reasons to expect such a result. Nevertheless, there is perhaps a preponderance of studies showing that the fraction of elderly decreases saving, as would be predicted by the standard LCH, and even the absence of a positive effect is in stark contrast to the survey evidence showing that saving rates are high among the elderly. But Weil (1994) has argued that both sets of results are consistent with an important bequest motive if the recipients of bequests (or expected bequests) reduce their consumption. He finds that data from the American Panel Study on Income Dynamics support such an effect.

Where does all this leave us, and what are the implications for the relationship between saving and growth? I suspect that, like housing, bequests are worthy of a good deal more study, that it would be a good idea to use the new techniques to collect more wealth data in LDCs, and that we should explore techniques of explicitly getting at the question of bequests. Dynastic accumulation – for example, through the founding of small businesses and the turning of small businesses into large businesses – is surely an important aspect of development in many countries. The development of a bequest motive may increase the saving rate as income begins to increase and contribute toward an acceleration of the growth rate.

Habits

The standard theoretical models of intertemporal choice make the assumption that preferences are intertemporally separable, so that the

marginal rate of substitution of consumption between any two periods is independent of what happens in any other period. A simple way of recognizing intertemporal dependencies is through habit formation, according to which the subutility in any period depends positively on consumption in that period, but negatively on consumption in earlier periods. Such models are quite rich and can be used to give a number of interesting and nontrivial predictions. Perhaps the simplest model is one in which subutility is written in the form

$$u_t = \upsilon(\alpha c_t - \beta S_t), \tag{13}$$

where S_t is a stock of habits, defined (for example) as a distributed lag on past levels of consumption. A simple special case of equation (13) arises when the stock is proportional to the preceding period's consumption, so that

$$u_t = \upsilon(c_t - \gamma c_{t-1}). \tag{14}$$

According to equations (13) and (14), current consumption is good, but as the consumer gets used to that level of consumption, he or she needs more in order to attain the same level of utility. Given these specifications, consumers can be modeled as myopic, in which case they ignore the influence of their current decisions on the future stock, or as nonmyopic, in which case they take the future bad effects into account when considering how much to consume today. The former is sometimes justified in representative agent models by treating the state variable S as other people's consumption, which each agent takes as given (Abel, 1990; Campbell and Cochrane, 1994).

In these sort of models, the presence of habits acts as a drag on consumption, so that in some contexts, the effects are similar to simply assuming that it is costly to adjust consumption, or that it is only possible to do so over time. When consumers are not myopic, the habit effects will make them less likely to consume when they are young, because habits (like a wife and children) are hostages to fortune, so that there is an effect similar to that of precautionary saving, or indeed liquidity constraints if earnings are low in early life. But the effect is associated not only with uncertainty; consumption is costlier for young consumers, because the habit it induces has to be fed for the rest of life, and cheaper for old consumers, who do not have long to live. These sort of habits tip consumption profiles away from the young and toward the old. Consumers with habits also respond differently to surprises in earnings. For example, in the standard PIH, consumption follows a martingale process, so that the change in consumption from one period to the next is simply the change in the expectation of the discounted present value of earnings, a quantity that is not predictable by previously known information. In the equation (13), it is $\alpha c_t + \beta S_t$ that follows a martingale process (see

Deaton, 1992, pp. 29–34), so that although changes in $\alpha c_t + \beta S_t$ are unpredictable, changes in *consumption* can be predicted, as we find in the data. In the "moving-average" case, equation (14), the change in consumption follows an autoregression

$$\Delta C_{t+1} = \gamma \Delta C_t + \eta_{t+1}, \tag{15}$$

where η_{t+1} is a surprise determined by the innovation in current and future earnings. Equation (15) shows how the drag works and that in any given period, consumption responds only partially to new information.

These habit models are useful in a number of different contexts. They are consistent with the "excess sensitivity" literature in that they imply that the change in consumption is predictable by previously known information. They have also been used in the asset-pricing literature (see Constantinides, 1990; Singleton, 1990; and Campbell and Cochrane, 1994). The presence of habits heightens risk aversion by effectively making consumers much poorer than their total consumption would suggest. Habits therefore help explain what might appear to be excessive risk premia, though they have a much harder time explaining the correlation between asset returns and the rate of growth of consumption. There is also a large literature on the time-series consumption function showing that consumption is well described by an error-correction process in which consumption adjusts slowly to some long-run fixed ratio with disposable income (see almost any large macroeconometric model and, in particular, Davidson, Hendry, Srba, and Yeo, 1978).

Habit models are also consistent with a link between saving and growth. At its crudest, consumption takes time to catch up to higher income levels, and the faster income grows, the further behind consumption lags and the higher the saving rate increases. Consumption is not attached to income by an inflexible link, but is dragged behind it on an elastic cord. To make this work, there has to be an element of surprise in income growth. By itself, the tipping toward the young that is induced by habits will make consumption more like earnings and so reduce both savings and the sensitivity of the saving rate to changes in the rate of growth. But it is at the least arguable whether the high-saving citizens of Japan, Korea, Taiwan, or Indonesia continue to be surprised by their rates of growth. If so, these saving rates are ultimately transitory phenomena, albeit long-lived ones. Nevertheless, habits remain one of the more plausible of the growth to savings explanations for the international correlations, and there is also the previously cited evidence of Carroll and Weil (1994), who interpret their Granger causality tests in favor of the habit-based story. Even so, the leads are not exactly obvious in their time-series plots, nor are those presented by Collins (1991). Some only partially confirmatory evidence comes from Deaton and

Paxson's (1994b) work on Taiwan; they find that birth cohorts that experienced the highest rates of earnings growth were those with the highest saving ratios, as would be expected if consumption habits are important. But the effects are not very large, and certainly not large enough to explain the slope of the international correlation between growth and saving.

Directions for Research

This final section draws on the previous ones to outline what seem the most promising directions for future research. We need to know more about national income data on saving and its relationship to survey data, we need to collect better survey data on wealth and on bequests, we need to assemble internationally comparable time-series data, and we need to pull together international panels of household survey data.

The central question concerns disentangling the paths of influence between growth and saving, whether one causes the other, whether there is mutual dependence, or whether both are affected by some third common factor. This nexus has been investigated for many years, without a great deal of progress, so it makes sense to approach it from different angles, using a range of tools and data from several different sources. What gives a reasonable hope of progress now is that there are more data available now than ever before, especially from the rapidly growing and high-saving economies of the East. One possible way forward is to take as a working hypothesis that the relationship between growth and saving results from investment driving growth; the reverse mechanism from growth to saving is at best relatively unimportant. If this hypothesis is true, policies that promote saving will enhance growth, provided of course that the efficiency of investment is being properly maintained.

Because there are so many different strands to the growth–saving relationship, the working hypothesis can usefully be broken down into a number of implications that need to be examined individually. First, I suspect that nowhere in the world is there a long-term, low-frequency detachment of consumption from earnings/income, at least for the vast majority of people. Consumption growth is rapid when earnings growth is rapid, both for different groups within countries and for the same groups across countries. In consequence, there is no common taste-determined, lifetime profile of consumption, but lifetime profiles of consumption are determined by lifetime profiles of earnings and income. In consequence, there is no tendency for higher growth to generate higher saving through the age compositional effects of the life-cycle hypothesis. The international correlation between growth and saving rates comes from the response of growth to investment, as predicted by a variety of

growth models. Saving responds passively to investment through mechanisms that are at present not well understood. A likely candidate is the saving behavior of firms or small entrepreneurs, who retain profits in order to finance investment. In any case, such saving is done, not by the mass of households, who play little part in the process of aggregate accumulation, but by a few relatively well-off people or by firms.

Second, bequest and dynastic motives are more important in explaining national saving than are life-cycle retirement motives. Life-cycle retirement saving implies that increases in growth rates will increase saving rates through age compositional effects. There is no such necessary implication in the case of bequest motives, although if bequests are a luxury good, richer economies – not more rapidly growing economies – will have higher saving rates. It is also possible that bequests are luxury goods only in the early stages of economic growth.

Third, because most households are not saving for retirement, changes in the rate of population growth will not reduce private saving rates. There is no reason to expect that the "graying" of East Asia will reduce its saving rates over the next two decades, or that population aging will threaten economic growth by limiting the supply of saving to finance investment.

Fourth, because most households are not saving for retirement, the substitution of (unfunded) social security will not much reduce private saving, so that the introduction of such social security systems cannot be held responsible for reductions in private savings rates and the associated reductions in growth, at least not through the direct mechanism of a reduction in private retirement saving.

Fifth, house prices and the arrangements for house purchase are *not* a major determinant of international differences in saving behavior. While we can expect land prices to be high and to rise rapidly in small, rapidly growing economies, the associated high price of housing does not generate additional saving, even in the absence of markets for home mortgages.

Sixth, consumption is subject to habit formation, but the effects are too small to explain the correlations between saving and growth in the international data.

I do not know if these implications are true, though in all cases, except possibly the fifth, I would bet (modestly) on the propositions as stated rather than on their opposites. If true, they put a heavy weight on (a) firm behavior and (b) bequest – or accumulation – motives as an explanation of the international differences in saving rates.

It is much easier to state hypotheses about saving than it is to propose data on which they might usefully be tested. The inadequacy of data, especially but not exclusively household survey data, has been a major stumbling block in designing research on saving. Saving measured from

household surveys is typically very different (much less or even negative) than saving measured in national accounts estimates, which is itself derived as a residual or, worse, as the difference between two large residuals. Even in the United States and the United Kingdom, saving data from the Consumer Expenditure Surveys (U.S.) and the Family Expenditure Surveys (U.K.) behave differently than do the national aggregates that they might be thought to mirror, and in both countries coherence between the two data sources seems to be getting worse over time. In the United States, it is hard to track the recent decline in the saving rate through to the microdata, so that we cannot be sure whether the decline is a compositional effect – as would be the case if the LCH were true and the productivity slowdown were driving down the saving rate – or whether, as Bosworth et al. (1991) argue, the decline is more uniform across groups. Nor has there been any real progress in resolving the question of whether IRA saving incentives actually increase saving; they appear to do so in the microdata, but not in the aggregate.

It is therefore no accident that many of the most important papers over the past 15 years either have been theoretical or have come from thinking about intertemporal issues in a way that does not require good data on saving. A large fraction of the U.S. literature on the microeconomics of intertemporal choice has used the Panel Study of Income Dynamics (PSID), which collects data on only a fraction of consumption, so that it is (perhaps conveniently) impossible to calculate saving totals. The RHS, as well as the new HRS, do not attempt to collect consumption data. Important insights have come from thinking about what the various hypotheses mean for the behavior of consumption or for its growth rate, stochastic behavior, and profile over the life cycle. I think that the best work from individual researchers is likely to come from continuing to think this way. However, there are international institutions, such as the World Bank, that have an interest in saving, that do not have to take the quality and quantity of data as given, and that can play a role in improving the quality of saving data.

As a matter of urgency, a few selected countries should attempt a reconciliation between survey data and national accounts. This should entail the investigation of both types of data, with a full explication of how saving and income data are *actually* put together in the national accounts. At the survey level, there should be some small-scale experimental surveys that track cash flows and asset formation. Attention will also have to be given to a better separation of private saving into its household and firm components; while this is close to impossible for small business within the household sector, it should not be so for large corporations. This exercise should be done in countries where there are several years (not necessarily consecutive) of household income and expenditure surveys. Trends in survey saving rates can then be compared

with trends in the national encome accounts, the accounting procedures in each systematically compared, and the effect of various adjustments tested. The statistical output would be (a) a better understanding of the sources of discrepancy in the selected countries and (b) general recommendations about national accounts and survey practice in general. The latter should not exclude the possible general recommendation that surveys do not attempt to collect saving data, a position to which the LSMS (Living Standards Measurement Study) surveys are coming close. Much of the survey data we currently have suggests that saving is done by relatively few households. A well-based comparison with the national accounts can help us decide whether this finding is correct or simply reflects measurement error. The disaggregation of macroeconomic saving totals is also a prerequisite for resolving the growth–saving puzzle, as in the U.S. example cited above. It is not possible to make much progress in interpreting changes in national saving without some idea of who is responsible for those changes.

There should also be more attempts to collect data on wealth in household surveys. Although it may be difficult to collect the accurate income information that would be required to compute saving flows, there is a better chance of obtaining data on the asset stocks, at least if the questions are asked in the right way. In particular, the bracketing techniques for collecting wealth that have been pioneered in the HRS in the United States should be applied to developing countries, perhaps as part of the natural evolution of the World Bank's LSMS surveys. The collection of data on bequests and on bequest intentions and expectations is also a priority. If it can be established that bequests are important, we have further evidence that growth does not drive saving through life-cycle considerations, and if we say something about the relationship between bequests and lifetime wealth, we can calibrate the likely effect of growth on saving through the bequest motive. In addition, if saving for bequests is important among the elderly, the aging of Asia may actually increase saving rates, not decrease them, while higher economic growth may actually dampen saving through a reverse life-cycle effect. If it is the old who save, the redistribution of relative income to the young with higher growth will redistribute income from high to low savers. If this effect looks real, it is yet more evidence that the saving–growth correlation is coming from somewhere else, most likely from the relationship between investment and growth.

References

Abel, Andrew B. 1990. "Asset Prices under Habit Formation and Catching Up with the Joneses," *American Economic Review*, Papers and Proceedings, 80: 38–42.

Arellano, Manuel, and S. R. Bond. 1991. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies* 58: 277–97.

Arellano, Manuel, and Olympia Bover. 1995. "Another Look at the Instrumental Variable Estimation of Error-Components Models," *Journal of Econometrics* 68: 29–51.

Arrau, Patricio, and Klaus Schmidt-Hebbel. 1994. "Pension Systems and Reform in Developing Countries," Special Issue of *Revista de Analisis Economico* 9: (June).

Arrow, Kenneth J. 1962. "The Economic Implications of Learning by Doing," *Review of Economic Studies* 29: 155–73.

Atkinson, Anthony B. 1969. "On the Timescale of Economic Models: How Long Is The Long Run?" *Review of Economic Studies* 36: 137–52.

Attanasio, Orazio P. 1991. "A Cohort Analysis of Saving Behavior by US Households," Stanford University (Sept.), mimeo.

Attanasio, Orazio P., Luigi Guiso, Tullio Jappelli, and Gugielmo Weber. 1992. "The Consumption Boom in the UK and Italy in the Late 1980s," Stanford University, Bank of Italy, Universita di Napoli, and University College London (May), mimeo.

Banks, James, and Richard Blundell. 1995. "Household Saving Behaviour in the UK," in Poterba (1995).

Barro, Robert J. 1991. "Economic Growth in a Cross-Section of Countries," *Quarterly Journal of Economics* 106: 407–43.

Barro, Robert J., and Xavier Sala-i-Martin. 1992. "Convergence," *Journal of Political Economy* 100: 223–51.

Bernheim, B. Douglas. 1991. "How Strong Are Bequest Motives? Evidence Based on Estimates of the Demand for Life Insurance and Annuities," *Journal of Political Economy* 99: 899–927.

Bewley, Truman. 1977. "The Permanent Income Hypothesis: A Theoretical Formulation," *Journal of Economic Theory* 16: 252–92.

Bhalla, Surjit S. 1979. "Measurement Errors and the Permanent Income Hypothesis: Evidence from Rural India," *American Economic Review* 69: 295–307.

1980. "The Measurement of Permanent Income and Its Application to Saving Behavior," *Journal of Political Economy* 88: 722–43.

Börsch-Supan, Axel. 1992. "Saving and Consumption Patterns among the Elderly: The German Case, *Journal of Population Economics* 5: 289–303.

Börsch-Supan, Axel, and Konrad Stahl. 1991. "Life Cycle Savings and Consumption Constraints: Theory, Empirical Evidence, and Fiscal Implications," *Journal of Population Economics* 4: 233–55.

Bosworth, Barry P. 1993. *Saving and Investment in a Global Economy*, Washington, D.C., The Brookings Institution.

Bosworth, B. P., Gary Burtless, and John Sabelhaus. 1991. "The Decline in Saving: Some Microeconomic Evidence," *Brookings Papers on Economic Activity*, 183–241.

Browning, Martin J., and Annamaria Lusardi. 1996. "Household Saving: Micro Theories and Micro Facts," *Journal of Economic Literature* 34: 1797–855.

Campbell, John Y. 1987. "Does Saving Anticipate Declining Labor Income? An Alternative Test of the Permanent Income Hypothesis," *Econometrica* 55: 1249–73.

Campbell, John Y., and John H. Cochrane. 1994. "By Force of Habit: A Consumption Based Explanation of Aggregate Stock Market Behavior," Harvard U. and University of Chicago, Mimeo.

Carroll, Christopher D., 1992. "The Buffer Stock Theory of Saving: Some Macroeconomic Evidence," *Brookings Papers on Economic Activity*, 2: 61–156.

1997. "Buffer Stock Saving and the Life Cycle/Permanent Income Hypothesis," *Quarterly Journal of Economics* 112: 1–55.

Carroll, Christopher D., and L. H. Summers. 1991. "Consumption Growth Parallels Income Growth: Some New Evidence," in B. Douglas Bernheim and John B. Shoven (eds.), *National Saving and Economic Performance*, Chicago: Chicago University Press for NBER, 305–43.

Carroll, Christopher D., and David N. Weil. 1994. "Saving and Growth: A Reinterpretation," *Carnegie-Rochester Conference Series on Public Policy*, 40: 133–92.

Cass, David. 1965. "Optimum Growth in an Aggregative Model of Capital Accumulation," *Review of Economic Studies* 32: 233–40.

Collins, Susan M. 1991. "Saving Behavior in Ten Developing Countries," in B. Douglas Bernheim and John B. Shoven, eds., *National Saving and Economic Performance*, Chicago: Chicago University Press for NBER, 349–72.

Constantinides, George M. 1990. "Habit Formation: A Resolution of the Equity Premium Puzzle," *Journal of Political Economy* 98: 519–43.

Davidson, James E. H., David F. Hendry, Frank Srba, and Stephen Yeo. 1978. "Econometric Modeling of the Aggregate Time-Series Relationship between Consumers' Expenditure and Income in the United Kingdom," *Economic Journal*, 88: 661–92.

Deaton, Angus S. 1991. "Saving and Liquidity Constraints," *Econometrica* 59: 1221–48.

1992. *Understanding Consumption*, Oxford: Clarendon Press.

Deaton, Angus S., and Christina H. Paxson. 1994a. "Intertemporal Choice and Inequality," *Journal of Political Economy* 102: 437–67.

1994b. "Saving, Growth, and Aging in Taiwan," in David A. Wise, ed., *Studies in the Economics of Aging*, Chicago: Chicago University Press for NBER, 331–57.

Dynan, Karen E. 1993. "How Prudent Are Consumers?" *Journal of Political Economy* 101: 1104–13.

Feldstein, Martin J. 1980. International Differences in Social Security and Saving, *Journal of Public Economics* 14: 225–44.

Feldstein, M. J., and Philippe Bacchetta. 1991. "National Saving and International Investment," in B. Douglas Bernheim and John B. Shoven, eds., *National Saving and Economic Performance*, Chicago: Chicago University Press for NBER, 201–26.

Feldstein, M. J., and Charles Y. Horioka. 1980. "Domestic Saving and International Capital Flows," *Economic Journal* 90: 314–29.

Flavin, Marjorie. 1981. "The Adjustment of Consumption to Changing Expectations about Future Income," *Journal of Political Economy* 89: 974–1009.

Friedman, Milton, 1957. *A Theory of the Consumption Function*, Princeton: Princeton University Press.

Gersovitz, Mark. 1988. "Saving and Development," in Hollis Chenery and T. N. Srinivasan, eds., *Handbook of Development Economics*, New York and Amsterdam: North Holland.

Hall, Robert E. 1978. "Stochastic Implications of the Life Cycle–Permanent Income Hypothesis: Theory and Evidence," *Journal of Political Economy* 96: 971–87.

Hammer, Jeffrey. 1986. "Population Growth and Savings in LDCs," *World Development* 14: 579–91.

Hayashi, Fumio, Takatishi Ito, and Joel Slemrod. 1988. "Housing Finance Imperfections, Taxation and Private Saving: A Comparative Simulation Analysis of the United States and Japan," *Journal of the Japanese and International Economies* 2: 215–38.

Hermalin, Albert, Mary Beth Ofstedal, and Chi Li. 1991. "The Kin Availability of the Elderly in Taiwan: Who's Available and Where Are They?" Ann Arbor: University of Michigan, Population Studies Center.

Holtz-Eakin, Doug, Whitney Newey, and Harvey Rosen. 1988. "Estimating Vector Autoregressions with Panel Data," *Econometrica* 56: 1371–95.

Horioka, Charles Y. 1989. "Why Is Japan's Private Saving Rate So High?" in Ryuzo Sato and Takashi Negishi, eds., *Developments in Japanese Economics*, San Diego: Academic Press, 145–78.

Hubbard, R. Glenn, Jonathan Skinner, and Stephen P. Zeldes. 1995. "Precautionary Saving and Social Insurance," *Journal of Political Economy*, 103: 360–99.

Hurd, Michael D. 1987. "Savings of the Elderly and Desired Bequests," *American Economic Review* 77: 298–312.

1989. "Mortality Risk and Bequests," *Econometrica*, 57: 779–813.

1992. "Wealth Depletion and Life-Cycle Consumption," in David A. Wise, ed., *Topics in the Economics of Aging*, Chicago: Chicago University Press for NBER, 135–60.

Jappelli, Tullio, and Marco Pagano. 1994. "Saving, Growth, and Liquidity Constraints," *Quarterly Journal of Economics* 109: 83–109.

Juster, F. Thomas, and James P. Smith. 1994. "Improving the Quality of Economic Data: Lessons from the HRS," Ann Arbor: Institute for Social Research, University of Michigan, and RAND.

Kaldor, N. 1957. "A Model of Economic Growth," *Economic Journal* 57.

Kaldor, Nicholas, and James A. Mirrlees. 1962. "A New Model of Economic Growth," *Review of Economic Studies* 29: 174–92.

Koopmans, Tjalling C. 1965. "On the Concept of Optimal Economic Growth," in *The Econometric Approach to Development Planning*, Amsterdam: North Holland.

Koltikoff, Lawrence J., and Lawrence H. Summers. 1981. "The Role of Intergenerational Transfers in Aggregate Capital Formation," *Journal of Political Economy* 89: 706–32.

Leff, Nathaniel. 1969. "Dependency Rates and Saving Rates," *American Economic Review* 59: 886–96.

1980. "Dependency Rates and Savings Rates: A New Look," in J. Simon and J. Da Vanza, eds., *Research in Population Economics*, Greenwich, CT: JAI Press.

Levine, Ross, and David Renelt. 1992. "A Sensitivity Analysis of Cross-Country Growth Regressions," *American Economic Review* 82: 942–63.

Lewis, A. 1954. "Economic Development with Unlimited Supplies of Labor," *Manchester School* 22: 139–91.

Lo, Joan Chi-chiung. 1989. "The Changing Patterns of Household Structure and Economic Status of the Elderly: 1976 to 1985," in *Conference on Economic Development and Social Welfare in Taiwan*, Vol. 1, Taipei: Institute of Economics, Academia Sinica.

Lucas, Robert E. 1988. "On the Mechanics of Economic Development," *Journal of Monetary Economics* 22: 3–42.

Mankiw, N. Greg, David Romer, and David Weil. 1992. "A Contribution to the Empirics of Economic Growth," *Quarterly Journal of Economics* 107: 407–37.

Mason, Andrew. 1987. "National Saving and Population Growth: A New Model and New Evidence," in D. G. Johnson and R. D. Lee, eds., *Population Growth and Economic Development: Issues and Evidence*, Madison, WI: University of Wisconsin Press.

1988. "Saving, Economic Growth, and Demographic Change," *Population and Development Review* 14: 113–44.

McKinnon, Ronald. 1991. The Order of Economic Liberalization, Financial Capital in the Transition to a Market Economy, Baltimore: Johns Hopkins University Press.

Miles, David. 1992. "Housing Markets, Consumption and Financial Liberalization in the Major Economies," *European Economic Review* 36: 1093–136.

Mirer, Thad W. 1979. "The Wealth–Age Relationship among the Aged," *American Economic Review* 69: 435–43.

Modigliani, Franco. 1970. "The Life-Cycle Hypothesis of Saving and Intercountry Differences in the Saving Ratio," in W. A. Eltis, M. F. G. Scott, and J. N. Wolfe, eds., *Induction, Trade, and Growth: Essays in Honour of Sir Roy Harrod*, Oxford: Clarendon Press, 197–225.

1986. "Life Cycle, Individual Thrift, and the Wealth of Nations," *American Economic Review* 76: 297–313.

1993. "Recent Declines in the Savings Rate: A Life Cycle Perspective," in Mario Baldassarri et al., eds., *World Saving, Prosperity, and Growth*, New York: St. Martin's Press, 249–86.

Musgrove, Philip. 1978. *Consumer Behavior in Latin America*, Washington, DC: Brookings Institution.

1979. "Permanent Household Income and Consumption in Urban South America," *American Economic Review* 69: 355–68.

Park, Yung Chul. 1993. "The Role of Finance in Economic Development in South Korea and Taiwan," in Alberto Giovannini, ed., *Finance and Development: Issues and Experiences*, Cambridge: Cambridge University Press.

Paxson, Christina H. 1992. "Using Weather Variability to Estimate the Response of Savings to Transitory Income in Thailand," *American Economic Review* 82: 15–33.

1996. "Saving and Growth: Evidence from Micro Data," *European Economic Review* 40: 255–88.

Poterba, James. 1995. *International Comparisons of Saving*, Chicago: Chicago University Press for the National Bureau of Economic Research.

Ram, Rati. 1982. "Dependency Rates and Aggregate Savings: A New International Cross-Section Study," *American Economic Review* 72: 537–44.

Romer, Paul M. 1986. "Increasing Returns and Long-Run Growth," *Journal of Political Economy* 94: 1002–37.

1990. "Endogenous Technical Change," *Journal of Political Economy* 98: S71–102.

Schechtman, Jack. 1976. "An Income Fluctuation Problem," *Journal of Economic Theory* 12: 218–41.

Schechtman, Jack, and Vera Escudero. 1977. "Some Results on 'An Income Fluctuation Problem,'" *Journal of Economic Theory* 16: 151–66.

Schmidt-Hebbel, Klaus, Steven B. Webb, and Giancarlo Corsetti. 1992. "Household Saving in Developing Countries: First Cross-Country Evidence," *World Bank Economic Review* 6: 527–49.

Shorrocks, Anthony F. 1975. "The Age–Wealth Relationship: A Cross-Section and Cohort Analysis," *Review of Economic Statistics* 57: 155–63.
Singleton, Kenneth J. 1990. "Specification and Estimation of Intertemporal Asset Pricing Models," in Benjamin M. Friedman and Frank H. Hahn eds., *Handbook of Monetary Economics*, Vol. 1, Amsterdam: North Holland, 583–626.
Solow, Robert M. 1956. "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics* 70: 65–94.
Uzawa, Hirofumi. 1965. "Optimal Technical Change in an Aggregative Model of Economic Growth," *International Economic Review* 6: 18–31.
Viard, Alan D. 1993. "The Productivity Slowdown and the Savings Shortfall: A Challenge to the Permanent Income Hypothesis," *Economic Inquiry* 31: 549–63.
Weil, David. 1994. "The Saving of the Elderly in Micro and Macro Data," *Quarterly Journal of Economics* 109: 55–82.
Wolpin, Kenneth I. 1982. "A New Test of the Permanent Income Hypothesis: The Impact of Weather on the Income and Consumption of Farm Households in India," *International Economic Review* 23: 583–94.

CHAPTER 4

Financial Policies and Saving

Patrick Honohan

Introduction

The financial sector plays an important role in the saving process. On the one hand, use of financial instruments offers the household saver wide, albeit indirect, access to the yield on the investment opportunities available in the economy. An established literature stresses the importance of ensuring effective operation of this channel, as intermediated savings are likely to be more productive than where the household saver is limited to his or her own production and storage technologies. Of course, not all saving involves the accumulation of financial assets; furthermore, the characteristics of different financial assets likely influence the total volume of saving much less than they do the composition of the savings portfolio, a topic that is not dealt with here.

On the other hand, reliable access to borrowed funds through the financial system can reduce precautionary saving as well, turning some households into dissavers. Recently, the rapid deregulation of financial systems in many industrial countries has highlighted the fact that financial repression may have constrained some households from borrowing more than it constrained others from saving. Although financial liberalization can enhance the efficiency with which saved resources are channeled into productive use, the suspicion that it may have contributed to the sharp decline in saving ratios in many industrial countries has brought financial-sector policy to the fore in the discussion of saving.

Differences in the structure and performance of the financial sector in different parts of the world may help explain some of the empirical contrasts noted in Chapter 2 – for example, in regard to the historical average decline in savings rates and the fact that this decline has been absent in many Asian countries. Improvements in the efficiency of the international financial system may help to reduce the correlation between national saving and investment ratios. In order to be in a position to evaluate the validity of such hypotheses, we need much more informa-