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Saving in Primitive Economies

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1. INTRODUCTION

The purpose of this paper is to examine some issues relevant to the study of saving behavior in primitive economies. A framework of analysis is used which economists have found helpful in studying questions concerning the allocation of resources both over time and between members of different generations. Emphasis is placed on the overlapping nature of all societies' generational structure: a given individual will normally have contact during his or her lifetime with some individuals who were born earlier and will die before the given individual does and with other individuals who have not yet been born and who will die after the given individual does. This overlapping structure was first analyzed in an economic model by Samuelson (1958), who showed that such a structure creates economic allocation problems which have important implications for the economic organization of any society. The usefulness of Samuelson's framework is that it isolates and focuses on one characteristic, overlapping generations, which is common to all societies, be they market, nonmarket, primitive, or industrial.[1]

The basic model is set out in section 2 of this study while various ways in which a society can distribute goods between different generations are compared in section 3. These range from markets and money to mats and clubs. Storage and aggregate savings are considered in section 4, and conclusions are summarized in section 5.

2. THE OVERLAPPING GENERATIONS MODEL[2]

The basic economic problem that arises in the overlapping generations model can be summarized as follows. Consider a member of the generation born at time t, for example, individual i. While i is in his or her most productive years, there will be other individuals, members of older generations, who are now less productive and who would like to use some of what i produces in order to maintain their own consumption levels. Individual i might like to lend some of what he or she produces, to be paid back when i is older and less productive, but the older generation wishing to borrow will not be alive to repay i when i is older. The flow of time is thus important in studying what, for the society, is a problem of allocating output between generations. The rest of this section is devoted to setting up an explicit model to study this allocation problem and defining what will be called an optimal allocation.

Suppose that each period a new generation is born. Individuals born at time t will be referred to as generation t, and are assumed to be identical in all relevant respects (endowments and preferences in this model). One could assume that each generation lives for some arbitrary, possible large, number of periods, but all the essential elements of the model can be captured by assuming that each generation lives for just three periods. Assume that generation t is of size $(1 + n)^t$ where n is the rate of population growth.

Throughout, this paper will deal with a pure exchange model; that is, no production occurs. This allows one to focus on the problem of exchange between generations. Each generation does, however, receive an endowment of the single good in the economy (food).[3] Initially it will be assumed that output is completely perishable; no technology for storage is available to the economy. It seems reasonable to assume that each generation's income (endowment) would be small when young, highest when middle-aged, and lower again when old, reflecting an individual's productive capabilities over a lifetime. For simplicity, assume then that the lifetime endowment is the same for all individuals (both within and across generations), and that it is equal to (0, 1, 0). That is, each individual receives one unit of food when middle-aged, nothing when young or old. Aggregate income for the economy in period t is therefore equal to $(1 + n)^{t-1}$, the number of middle-aged individuals.

Only stationary states will be considered. A stationary state is an allocation which reduplicates itself generation after generation. Along a stationary path, each generation receives the same lifetime consumption stream. Such consumption streams are assumed to be ranked by a preference function which is taken to be the same for all generations. The lifetime consumption stream of an individual can be written as $c = (c_1, c_2, c_3)$ where c_i is consumption in the ith period of the individual's life.

The economy as a whole faces a budget constraint; total consumption in period t cannot exceed total output for that period. This constraint can be written as $(1 + n)^t c_1 + (1 + n)^{t-1} c_2 + (1 + n)^{t-2} c_3 \le (1 + n)^{t-1}$ or, dividing by $(1 + n)^{t-1}$,

$$(1 + n)c_1 + c_2 + c_3/(1 + n) \le 1. \qquad (1)$$

Equation (1) is the aggregate budget constraint for the economy. An allocation (c_1, c_2, c_3) is defined as feasible if it satisfies (1). It is defined as efficient if it satisfies (1) with equality. Efficient distribution schemes are allocations in which all output is consumed.

The only economic problem found in this

economy is one of distribution. How shall the $(1 + n)^{t-1}$ units of output received (produced) by the middle-aged during period t be distributed among the three living generations? Since individuals have preferences over consumption paths, some allocations will be preferred to others. Can an optimal allocation, one preferred by all generations, be defined? One way to answer this question is to think of a fictitious "social planner" (or all members of the society brought together in a Rawlsian original state) equipped with information on individual preferences and the economy's budget constraint. Such a social planner would try to find the feasible allocation that maximized the utility of a representative member of the society in a stationary equilibrium. Such an allocation can be found by choosing the most preferred consumption stream, subject to the feasibility condition given by equation (1). The solution to this maximization problem, denoted $c^* = (c_1^*, c_2^*, c_3^*)$, will be called the optimal distribution. Note that c^* defines both a distribution of consumption over each individual's lifetime (c_1^* when young, c_2^* when middle-aged, c_3^* when old) and a distribution of output across generations (each member of the middle-aged generation gives $(1 + n)\, c_1^*$ to the young generation and $c_3^*/(1 + n)$ to the old generation, keeping $1 - (1 + n)\, c_1^* - c_3^*/(1 + n) = c_2^*$ for himself or herself).

It will also be useful to consider the hypothetical case of an individual consumer facing an interest rate r on his or her saving. Such an individual faces a lifetime budget constraint which can be written as

$$c_1 + c_2/(1 + r) + c_3/(1 + r)^2 \leq 1/(1 + r) \text{ or}$$

$$(1 + r)c_1 + c_2 + \frac{c_3}{1 + r} \leq 1. \qquad (2)$$

Comparing (1) and (2) reveals that such an individual will choose c^*, the societal optimal consumption path, if the interest rate equals n, the rate of population growth and Samuelson's biological rate of interest (Samuelson 1958).

Since both the young and old receive no endowment, any allocation will involve taking output from those in the second period of their life and transferring it to those in the first and last periods of their lives. In the next section, alternative social schemes for carrying out such redistributions will be examined. An interesting question is to consider whether or not alternative distribution schemes allow the economy to achieve the optimal allocation c^* by, either implicitly or explicitly, offering individuals a rate of interest equal to n.

3. DISTRIBUTION SCHEMES

Primitive economies are largely nonmarket economies, but it will be instructive to first consider the possibility of a market arrangement for allocating food between generations. In this case, output is distributed among generations through a market for one period loans.[4] The demand for loans (i.e., borrowing) arises from the young generation. The old are precluded from borrowing in a market system since they would be unable to repay their loans; they die at the end of the current period. Market equilibrium requires that the demand and supply of loans be equal. The interest rate adjusts to achieve equilibrium and aggregate savings (the savings of the middle-aged minus the dissaving of the young) equals zero.

Since there is nothing to ensure that the equilibrium interest rate, say r', equals n,[5] a market system will lead to the optimal consumption path c^* only by chance. If $r' > n$, an interest rate equal to n results in an excess demand for loans; if $r' < n$, an interest rate equal to n leads to an excess supply of loans. The market allocation is, therefore, not generally optimal.

It may be useful to briefly spell out why the rate of population growth should be related to the rate of interest. Suppose that somehow members of the current middle-aged generation are each convinced to give x units of output to the current old generation.[6] In return, the middle-aged generation is told that, when they are old, they will be given output by the then middle-aged (the current young) generation. Since there will then be more middle-aged individuals ($[1 + n]$ more), each member of the current middle-aged generation will receive $(1 + n)x$ units of output when he or she is old. The rate of return on this transaction is just $[(1 + n)x - x]/x = n$; hence the term "biological rate of interest."

If $r' < n$, then the market equilibrium interest rate is too low.[7] Society is able to transfer resources over time at a rate of return equal to n (despite the lack of a technology for storing food), but individuals are faced with a rate of transformation of only $r' < n$. At an interest rate equal to n, there is an excess supply of loans; members of the middle-aged generation would like to save more for their old age but the only way they can do so in a market economy is by increasing their loans to the young and the young do not wish to borrow. The old generation would certainly accept food loans but such loans, because they cannot be repaid, will not be made in a market economy. A nonoptimal allocation results.

One way to demonstrate an allocation's nonoptimality is by showing that there exists a feasible reallocation which makes all generations better off (i.e., increases everyone's utility). At r', suppose the distribution of consumption across generations is (c_1, c_2, c_3). Suppose every period each member of the middle-aged generation is asked to give up a small amount, x units, of food in return for $(1 + n)x$ units of additional food to be received when they are old. The x units each middle-aged individual gives up can be used to give $(1 + n)x$ units of output to each of the members of the current old generation. This is illustrated in Figure 1. Such a transfer is feasible (i.e., it does not lead to a violation of the aggregate budget constraint [1]) and results in a new lifetime consumption path for each individual of $(c_1, c_2 - x, c_3 + (1 + n)x)$. Since at (c_1, c_2, c_3) the marginal rate of substitution between c_2 and c_3 is $(1 + r') < (1 + n)$,[8] all individuals prefer the new consumption path to the old one. Therefore, the old allocation was not optimal. Each succeeding generation is willing to give up a little consumption when middle-aged in return for a little bit more $(1 + n$ more) when old. The old are essentially borrowing from the middle-aged. They never pay this debt off themselves; it is paid off by future generations. This suggests that social institutions which allow the current members of a society to implicitly transact with future members of the society may allow the optimal distribution of output across generations to be achieved.[9]

One such social institution might be clubs or cult groups in which new membership fees are distributed to existing members. Suppose the old generation forms a club, charging the middle-aged a fee, say p, to join. The middle-aged are willing to join since they will, when old, receive the proceeds from the membership fees of the generation after them. During period t, receipts from new membership fees will be $(1 + n)^{t-1}p$ $(t-1$ since it is the middle-aged generation that joins). These new members will, in the following period, divide the revenue from new membership fees; each will receive $(1 + n)^t p/(1 + n)^{t-1} = (1 + n)p$. Hence, belonging to such a club yields its members a rate of

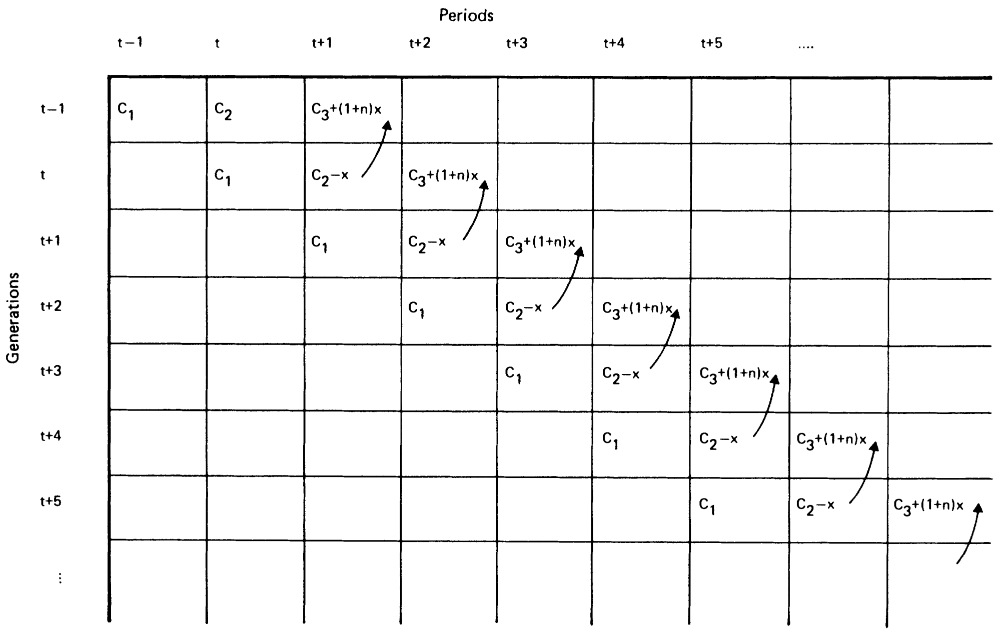

Figure 1. Borrowing from the infinite future. For each generation, its pretransfer consumption is (c_1, c_2, c_3); its posttransfer consumption is $(c_1, c_2 - x, c_3 + [1 + n]x)$. Arrows indicate direction of transfers. (Adapted from Starrett 1972.)

return of n, the biological rate of interest, on their investment. Such institutions therefore allow the optimal distribution of output to be achieved. As long as each generation expects succeeding generations to be willing to join, clubs implicitly allow trades to be made with future generations. Douglas (1963) documents the existence of such clubs among the Lele.[10]

An alternative method of organizing the transfer of output from the middle-aged to the old is to give the old some item (it need not be material) which the old can trade to the middle-aged in return for food. Firth, for example, speaks of the ritual knowledge passed from father to son among the Tikopia (1965:104).[11] Such knowledge is valuable, and the middle-aged generation will be willing to provide output to the old in order to maintain the knowledge which has been invested (by previous generations) in the current old generation. The return to such knowledge is just n since each generation is supported by a larger generation than it earlier had to support.

Valuables can also be material. The only requirement is that the item be demanded by the middle-aged, either because of its intrinsic value or because the middle-aged generation expects it to be demanded by the generations that follow them. Such items, be they mats, raffia cloth, or shell necklaces, are often described as primitive money.

These brief examples are meant to illustrate the ways in which societies might develop non-market institutions or customs which help to lead the society toward an optimal distribution of resources both between generations and over the lifetime of each individual. Societies need some mechanism which allows individuals to give to the old and have confidence that they in turn will be the recipients of gifts when they are old. Money, ritual knowledge, clubs, land, kinship groups, and a host of others are all social arrangements which help to inspire this confidence and to achieve an optimal allocation of consumption.

4. STORAGE AND AGGREGATE SAVINGS

So far it has been assumed that the economy's output is perishable and there is no storage technology that would allow the output of period t to be available during period $t + 1$. Suppose instead that there is such a technology such that if x units of output are stored at time t, $(1 + m)x$ units are available at time $t + 1$.[12] Clearly it will never be optimal for the society to store output if m is less than n. A society with positive population growth and in which stored goods depreciate from spoilage ($m < 0$) should not store output. Zero storage, then, cannot be taken to infer the absence of a storage technology.

The inefficiency of storage is a reflection of the fact that society can already transfer goods over time at the rate n. Society essentially throws away output if it uses the less efficient storage technology. Suppose that at time t generation $t-1$ stores some output for use at time $t + 1$. At $t + 1$ it consumes the goods it has stored, but simultaneously generation t is storing goods for its consumption at $t + 2$. The economy carries along a positive amount of stored output, but this represents output that is never consumed. Consumption could be increased at time t without being reduced at any future time.

This analysis does help to explain why societies do store even when $m < n$. One can interpret the no storage result as saying that in a world of certainty, a growing population in a stationary state will not store output if $m < n$. This suggests that uncertainty plays a key role in explaining any observed storage of output. For example, suppose that the endowment received by the middle-aged generation is random. Risk-averse behavior would lead generally to some storage even if, on average (in expected value), storage is not the most efficient means of transferring output over time.

Returning to the basic model (no uncertainty), a few comments can be made on the relationship between individual and aggregate savings in a closed economy. First, money is not necessary for individuals to save in the relevant sense of having a claim against future resources. Any social institution that leads to the middle-aged supporting the old or lending to the young allows implicitly for individuals to save.

Second, only the market solution required aggregate savings to be zero. On the optimal consumption path, aggregate wealth, A_t, can be either positive or negative. This may seem paradoxical. If A_t is positive, but there are no durable goods, who holds the negative liabilities that offset this positive wealth? For the examples of the previous section we have the following answers. When a new member pays in his or her fee, the club incurs a debt that will be paid off (with interest) the following period. The liability of the club just balances A_t. Secrets can be viewed as a type of capital whose value is simply A_t so that a positive net worth is just a reflection of the fact that the economy owns some capital. The first old generation to receive output for "money" essentially incurred a debt that is never paid off. When the middle-aged generation makes gifts to the old generation, the old generation incurs a liability. The old generation never pays off this debt and it grows over time to just keep balance with A_t.

5. CONCLUSIONS

The present paper is an attempt to present an explicit model that economists have found useful in studying the allocation of resources across generations. The model focuses on one particular aspect of society, its overlapping generations structure, that is common to all cultures. The model then provides a framework for thinking about how different societies allocate output over time and how some social institutions may help lead to optimal distributions. A few illustrative examples of alternative social arrangements were discussed, and it was shown how each affected the intergenerational distribution of output. By carrying out the analysis using an explicit model, it was shown that money is not necessary for individuals to be able to save (ceremonial rituals, clubs, and kinship groups also allow saving to occur), aggregate saving in a closed economy need not equal zero, and storage, if technologically feasible, may be an inefficient method of saving.

A very broad definition of savings has been implicitly used in this paper—individuals save by acquiring claims on future resources. Such a broad definition is necessary if the great diversity of saving mediums that exist in different cultures is to be recognized. A narrow definition too easily limits the analysis only to those channels of saving utilized in industrial, market societies.

The model used in this paper is very abstract. It is hoped that the particular abstraction on which the model relies, the overlapping generations structure, will help in highlighting one of the crucial functions of savings in all societies and aid in the understanding of the economic function of alternative social arrangements.

NOTES

Acknowledgments. My thinking on this subject was greatly stimulated by sitting in on Alice Dewey's economic anthropology course at the University of Hawaii during the fall of 1981, while I was on leave from Princeton. I thank Charlene Gregory for helpful comments. This report is based on a longer paper with the same title, which is available from me.

[1] Samuelson's overlapping generations model has bred a large literature in economics. See Diamond (1965), Cass and Yaari (1966), Lucas (1972), Starrett (1972), Gale (1973), Barro (1974), Kareken and Wallace (1980). For general discussions of primitive economics, see Forde and Douglas (1967) and Nash (1967).

[2] For more rigorous developments of the overlapping generations model, see Samuelson (1958), Cass and Yaari (1966), Gale (1973), and Balasho and Shell (1980).

[3] Given the time path assumed below for the endowment stream, one could equivalently assume each individual inelastically supplies one unit of labor to a constant returns to scale production process during the individual's "middle age."

[4] It is food that is being borrowed or lent. No money has yet entered the model.

[5] The demand for loans is given by $(1 + n)^t c_1(r)$ where $c_i(r)$ is the consumption path chosen if the interest rate equals r. The supply of loans is $(1 + n)^{t-1} c_3(r)/(1 + r)$. Equilibrium requires that r be such that $(1 + n)^t c_1(r) = (1 + n)^{t-1} c_3(r)/(1 + r)$. This will not generally hold for $r = n$. See Cass and Yaari (1966).

[6] How this might be done will be considered when nonmarket distribution schemes are discussed.

[7] The case $r' > n$ occurs, when, at $r = n$, members of the young generation would like to increase their current consumption but can find no willing middle-aged lenders. Virtually everyone has participated in a nonmarket, social institution that serves to eliminate this nonoptimality—the parent-child relationship. The remainder of this paper concentrates on the case in which $r' < n$ since this case probably has more relevance to an understanding of the issues dealt with by economic anthropologists in studying savings.

[8] This follows from the first order conditions for the maximization of utility.

[9] That such institutions will arise is explicit in the methodological view of Lucas: ". . . institutions and customs are designed precisely in order to aid in matching preferences and opportunities satisfactorily." (Lucas 1981:4). For an alternative point of view, see Sahlins (1976).

[10] Similar social institutions are reported by

Einzig (1966) in the New Hebrides and on the Banks Islands.

[11] Among the Lele, "old men kept the secret of making coloured borders for the most admired dance shirts" (Douglas 1963:54).

[12] It might be worth remembering that the length of a period is arbitrary, and that none of the results depends upon assuming only three periods. It is thus not necessary to think that storage requires output to be kept for 20 or 30 years. Since output in the model is received every period, one might think of the time between harvests as the minimum calendar time period in dealing with an agricultural society. A period could be much shorter for a hunting society.

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Toward a Functional Approach to Narrative Structure

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THE MOTIVATION FOR MEANING-DEPENDENT NARRATIVE STRUCTURE

Narratives, and particularly folktales, vary along many dimensions. Their most significant variability, however, is in kind and degree of impact, which is the emotional-intellectual reactions elicited in the receiver (listener or reader). Narrative impact is independent of narrative comprehensibility. While the former is made possible by the latter, it is related mainly to the narrative *image base,* which is the totality of facts, and in most cases fictitious past realities, of which the narrative text is the *verbal report.* Comprehensibility is related mainly to the report. Thus, narratives having different impact may be equally comprehensible when told by similar reporting devices.