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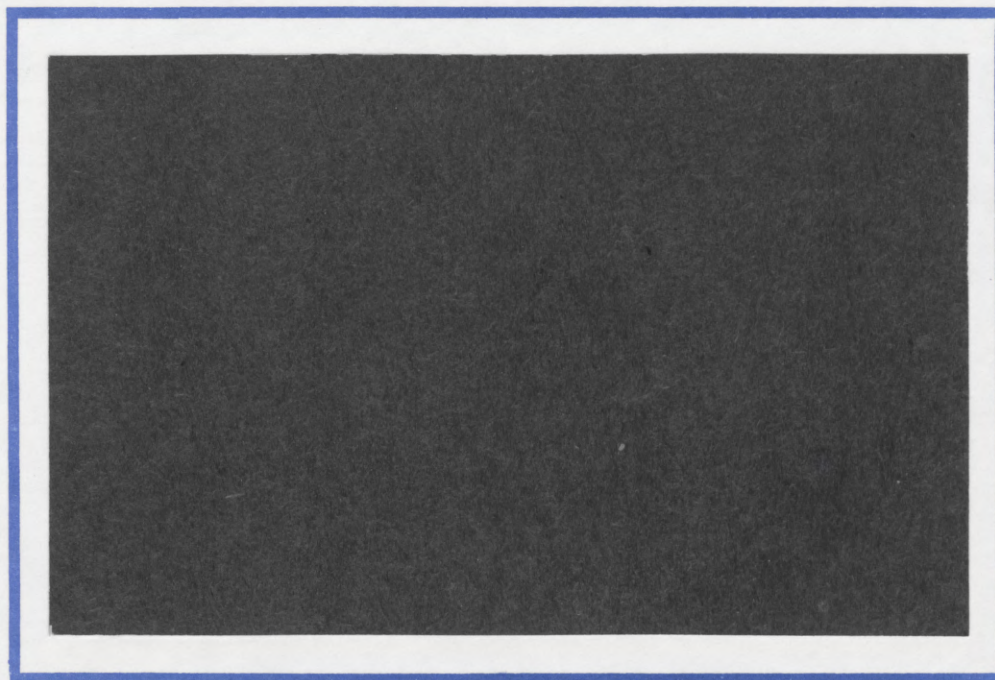
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THE "OLD AGE SECURITY HYPOTHESIS" RECONSIDERED<sup>#</sup>

by

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## I. INTRODUCTION

According to Schultz (1974), in developing countries, "Children are ... the poor man's capital". Neher (1971) and Willis (1980) develop the idea that parents in less developed countries are motivated, in part, to bear and rear children because they expect children to care for them in old age. In particular, Willis develops a model in which output is assumed to be produced with labor alone, any consumption demand for children is ignored by assuming that parents' utility is solely a function of their own consumption of commodities, and transfers from one's own children are the only source of parents' consumption in old age. Neher's assumptions are similar.

In this note we examine further the so-called "old age security hypothesis" and show that the common conclusion that better access to capital markets unambiguously reduces the demand for children<sup>1</sup> holds in general only when parents do not care about their children's numbers and welfare. When child numbers and welfare enter the parents' utility functions, introduction of a capital market for transferring present to future consumption, may plausibly increase the demand for children even though transfers from one's own children are a source of future consumption.

## II. A SIMPLE MODEL OF THE "OLD AGE SECURITY HYPOTHESIS"

Let parents live for two periods during which they consume  $c_1$  in the first period and  $c_2$  in the second. Utility is assumed to be a function only of  $c_1$  and  $c_2$ ,  $u(c_1, c_2)$ . All income is assumed to be produced by labor alone and parents and children are assumed to receive an endowment per capita of  $E_1$  and  $E_2$ , respectively, measured in units of consumption. Let  $n$  be the number of children a family has. Each child is assumed to consume  $q_1$  in the first

period of life and  $q_2$  in the second period, when they are productive. For the moment we consider  $q_1$  and  $q_2$  to be exogenously given (at conventional or subsistence levels). The difference between parents consumption plus child-rearing costs in the first period represents savings,  $s$ :

$$(1) \quad E_1 = c_1 + s + nq_1, \quad c_1, s, n \geq 0.$$

In this model savings represent only a transfer via investment from period 1 to period 2, and no borrowing from the future is possible. Suppose that such investment returns  $R$  units of consumption in period 2 for every unit of consumption foregone in period 1. Parents are assumed to earn nothing in period 2 and to subsist on transfers from their own children and the returns from prior investment. Children consume only  $q_2$  ( $\leq E_2$ ) per capita. Thus

$$(2) \quad nE_2 + Rs = c_2 + nq_2, \quad c_2, s, n \geq 0.$$

Suppose there is no capital market so that  $s = 0$  by definition and children become the sole means of transferring consumption from the present to the future. In this case, (1) and (2) imply

$$(3) \quad \frac{E_1 - c_1}{q_1} = n = \frac{c_2}{E_2 - q_2},$$

which yields the consumption possibility frontier:

$$(4) \quad c_2 = \frac{E_1(E_2 - q_2)}{q_1} - \frac{E_2 - q_2}{q_1} c_1.$$

Maximizing  $u(c_1, c_2)$  subject to (4) yields the optimal levels of parents consumption in periods 1 and 2,  $(\hat{c}_1, \hat{c}_2)$ , which, in turn, determine the optimal number of children  $\hat{n}$ , from (3) (see Figure 1).

Observe that an increase in the cost of children,  $q_1$ , reduces the slope of the budget line in Figure 1 and the intercept with the vertical axis, leaving unchanged the intercept with the horizontal axis. Therefore, if  $c_2$  is not a Giffen good, then  $c_2$  falls and, by (3),  $n$  also falls. However, the effect of a decrease in the return from investment in children ( $E_2 - q_2$ ) on the number of children is ambiguous. Such a change has the same effect on the budget line as before (making  $c_2$  more expensive relative to  $c_1$ ) and, again,  $c_2$  must fall if it is not a Giffen good. However, whether  $n$  falls or rises depends on whether the decrease in  $c_2$  is proportionally higher or lower than the decrease in  $E_2 - q_2$ . The reason for this ambiguous result is the following: since the return to their investment through children falls, families may need to invest more (i.e., have more children) even in order to consume less in the future. An increase in  $E_1$  unambiguously increases the optimal number of children if  $c_2$  is a normal good.

In general, families will differ in the amounts of endowment parents have and can expect their children to have. Both affect the number of children desired, but differences in the latter affect the rate of return on investment in children, so that, if an alternative means of transferring present to future consumption is available, the total number of children as well as their distribution among families may be altered.

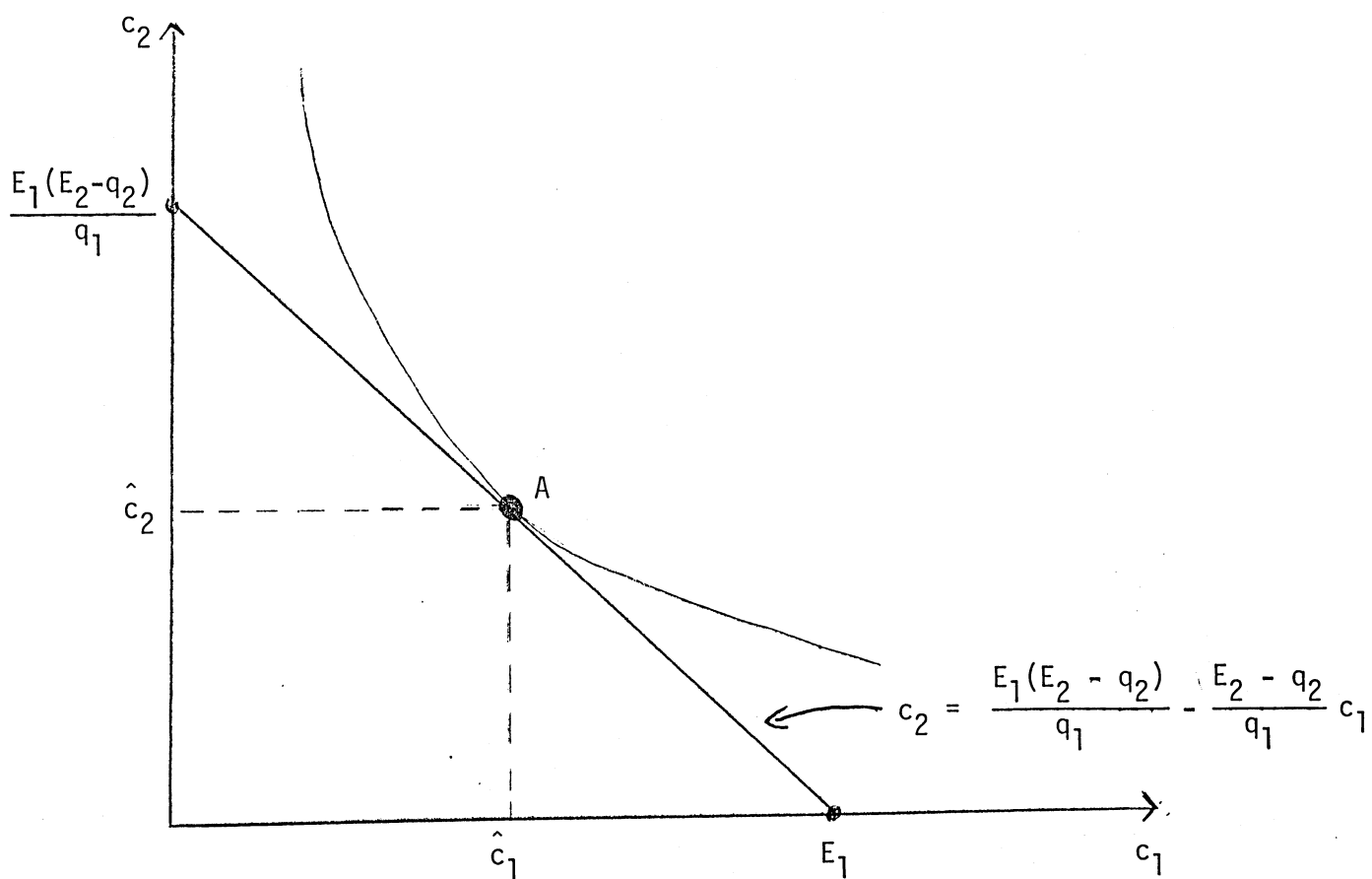


FIGURE 1

If a capital market, in the sense of a means alternative to children for transferring present to future consumption, exists,  $s$  may be strictly positive for some families. In this case, (1) and (2) may be consolidated by substituting for  $s$  in (2) from (1):

$$(5) \quad E_1 + \left[ \frac{E_2 - q_2}{R} - q_1 \right] n = \frac{c_1}{R} + c_2,$$

with an added requirement that  $s = E_1 - c_1 - nq_1 \geq 0$ . The expression in square brackets is the net present value of having a child. Clearly, since  $n$  does not enter the utility function, a family will have children only if

$$(6) \quad \frac{E_2 - q_2}{R} \geq q_1.$$

Thus, in the presence of a capital market, those families for whom  $q_1$  or  $q_2$  is sufficiently high will have no children and will transfer present to future consumption via the capital market. Families for whom the expected endowments of their children are sufficiently low may also choose to have no children. Those families for whom the rate of return on investment in children is sufficiently high will not save at all;<sup>2</sup> consequently, they are subject to exactly the same constraint as in the absence of a capital market, i.e., equation (3), and will demand the same number of children. Since some families have no children, total population must be lower with than without a capital market. This is the essence of the "old age security" hypothesis.

Note that, if it is possible to borrow at the same rate as a family can lend, the demand for children is unbounded for those families for whom the net present value of children is positive, and they will want to borrow



indefinitely to finance additional children. Other constraints may come into play (e.g.  $R$  may rise, a credit limit may be imposed, etc.) to ensure a finite population, but, clearly, in this case, the old age security hypothesis is not valid.

### III. WHEN PARENTS CARE ABOUT THEIR CHILDREN

The preceeding discussion assured that neither numbers of children nor children's welfare entered the parents' utility function. If, however, parents do care about their children, which seems plausible, we can show that there is no presumption that the existence of a capital market will lead to a lesser demand for children than in its absence, even if savings are always constrained to be nonnegative.

Suppose then that the utility function is

$$(7) \quad u(c_1, c_2, q_1, q_2, n)$$

so that parents care about the number of their children,  $n$ , and their children's welfare, which, in turn, depends on the children's consumption,  $q_1$  and  $q_2$ .

The parents now choose  $q_1$  and  $q_2$  as well as  $n$ ,  $c_1$  and  $c_2$ .

In the absence of a capital market, parents maximize (7) subject to (1) and (2), where  $s$  is set to equal zero. With a capital market they are not constrained to have  $s = 0$ . The comparison between the optimal  $n$  in these two cases does not yield an unambiguous result. Some insight into the source of this ambiguity may be obtained by assuming that children are born in the second period (i.e.  $q_1 = 0$ ) and  $u$  is weakly separable between  $(c_2, q_2, n)$  and  $c_1$ . That is,  $u$  can be written as

$$(8) \quad u(c_1, c_2, q_2, n) = f(c_1, v(c_2, q_2, n)).$$

In this case,  $c_2, q_2$  and  $n$  must maximize  $v(\cdot)$  for any  $s$  subject to the second-period budget constraint  $R \cdot s = c_2 + n(q_2 - E_2)$ . Thus, one can see that the difference between the optimal  $c_2, q_2$  and  $n$  in the absence of a capital market ( $s = 0$ ) and in the presence of an active capital market ( $s > 0$ ) stems from an income effect only. If we interpret  $(q_2 - E_2)$  as the quality of children, this is exactly the quantity-quality problem studied by Becker and Lewis (1973). They observed that quality is the price of a unit of the quantity of children and, conversely, quantity is the price of a unit of the quality. This is clearly the case in the second period budget constraint. Since these "prices" are control variables, the income effect in this problem is coupled with an endogenous price effect and, in general, no unambiguous conclusion can be reached about the effect of a rise in income on the quantity or the quality of children. Becker and Lewis showed that if the income elasticity of the quality, holding the quantity constant, is larger than the income elasticity of the quantity, holding the quality constant, and if the elasticity of substitution (in the utility function) between the quantity and the quality exceeds unity, then a rise in income will decrease the quantity and increase the quality. In this case the "old age security" hypothesis holds. The reader must, however, realize that this is indeed a special result. In general, if  $q_1 \neq 0$ , or if the weak separability assumption does not hold, or if the aforementioned elasticity conditions are not satisfied, then the introduction of a capital market may well cause an increase in the number of children. For example, if  $q_1 = 0$  and if the elasticities of substitution between  $c_2$  and  $q_2$  and between  $q_2$  and  $n$  are sufficiently low, if a family is induced to save by the introduction of a capital market, that family will also increase  $c_2, q_2$ , and  $n$ .<sup>3</sup> For those families who continue not to save,  $n$  will be unchanged. Thus, total population must increase in the presence of an active capital market in contradiction to the "old age security" hypothesis.

FOOTNOTES

1. For instance, Neher (1971) writes: "... the good asset (bonds) drives out the bad asset (children)."
2. They will hit the constraint  $s = E_1 - c_1 - nq_1 \geq 0$  as they try to increase  $n$ .
3. To see this, take the limiting case for which the relevant elasticities of substitution are zero, i.e.,

$$u = u(c_1, \min \{c_2, \alpha_1 q_2, \alpha_2 n\}).$$

Then  $c_2 = \alpha_1 q_2 = \alpha_2 n$  and all must increase in the same proportion if there is saving.

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