Faculty Working Papers

THE WELFARE EFFECT OF AN ADDITIONAL CHILD CANNOT BE STATED SIMPLY

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I. INTRODUCTION

Analyses of the welfare economics of population growth make one or more of the following assumptions: (1) The criterion of social welfare at a point in time is per capita (or per consumer) income. (2) The effect of a given individual upon society is limited to his own impact during his own lifetime. (3) There are no externalities, or—somewhat more weakly—all externalities can be handled by payments between the parents and the community. (4) Welfare is assessed at a single point in time, or at the same rate along a growth path, or without distinguishing between the various periods of his life cycle.

It is the contention of this paper that the magnitude and even the direction of the welfare effect of an added child depends upon each of these assumptions. That is, changing one or more assumptions to equally acceptable assumptions often shifts the welfare effect from positive to negative or the opposite. Therefore, the aim of the paper is to map out the welfare effect of additional children under many different sets of these assumptions.

The strategy of this essay is to disaggregate the problem in two directions. The first disaggregation is over time: Instead of asking for a single time-discounted value that summarizes whether welfare is higher or lower, considering all of the future together, welfare judgments will be discussed for a few separate segments of the future: a) the added individual's

childhood; b) his adulthood; c) after the individual's death: Summary measures will also be considered critically.

The second kind of disaggregation is by groups: Instead of only a single criterion of welfare for the community as a whole, judgments will be shown about a) the individual's welfare; b) the welfare of his parents; c) the welfare of all other persons excluding the added individual; and d) some over-all judgments, as well.

The paper begins with the simplest situation, that in which the individual has no negative or positive effects external to his own family, and where he leaves no negative or positive inheritance of any kind to future generations. Then the paper moves on to situations where there are externalities during his life, and then to situations where there are continuing external effects after his death. These situations are analyzed with various welfare functions, on various assumptions about the directions of the externalities.

The results of the analyses are summarized in Table 1, and the text merely explains how some illustrative results in Table 1 are arrived at. The main point of that table—and of the paper as a whole—is that the welfare effects of an additional person are very mixed and are largely indeterminate; the judgments must depend upon special conditions, assumptions, and choice of welfare functions. The aim is to refute all analyses which purport to arrive at firm scientific conclusions about the welfare effect of population growth without noting the sensitivity of those conclusions to different welfare functions and to various possible economic ramifications of additional people.

The Welfare Effect of an Additional Child with Various Factual Assumptions and Value Judgments

The Welfare Effect of an Additional Child with Various Factual Assumptions and Value Judgments

Assumptions About Values and Situation

	No externalities beyond the family; no labor force entry; no siblings, peasant agriculture	Same as 1, but with older siblings	No externalities except labor-force entry. All markets perfect. No end-of-life savings. No direction of knowledge or economies of scale (NET factor).	Same as 3, except savings positive but less than rate of population growth contributed by individual and his children.	Same as 3, except savings equal to contributed population growth rate.	Same as 3, except savings greater than contributed growth rate.	Schooling and child-service externalities, but paid for by parents. Otherwise same as 3	Same as 7 with respect to externalities. Same as 4 otherwise	Same as 7 with respect to externalities. Same as 5 otherwise	Same as 7 with respect to externalities. Same as 6 otherwise.	Same as 7 but externalities not paid for	Same as 8 but externalities not paid for.	Same as 9 but externalities not paid for	Same as 10 but externalities not paid for.	Same as 12 (negative childhood externalities, positive savings but less than rate of population growth, and positive NET effect during childhood)	Same as 14 (negative childhood externalities, positive savings, and positive NET effect during childhood)
	(1)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
In Childhood																
1. Utility to parents of additional person	+ directly by assumption	+	+	+	+	+	same as Column 3	same as Column 4	same as Column 5	same as Column 6	+	+	+	+	+	+
2. additional person's own utility (assumed positive)	+ directly by assumption	+	+	+	+	+					+	+	+	+	+	+
3. Additional person's own utility (not assumed positive or concave)	? depends on family's income	?	?	?	?	?					?	?	?	?	?	?
4. Older siblings' utility (positive concave function assumed)	NA	(+)	-	-	-	-					-	-	-	-	-	-
5. All children to his family including him, consumption per child	NA	-	-	-	-	-					-	-	-	-	-	-
6. All children in his family including him, sum of utilities, assumed concave and positive	NA	(+)	+	+	+	+					+	+	+	+	+	+
7. All children to his family including him, sum of utilities, ~~no assumption made~~ his utility not assumed positive or negative	NA	(+)	?	?	?	?					?	?	?	?	?	?
8. Other persons in community (i.e., beyond the family), per-capita income	+ directly by assumption	+	+	+	+	+					-	-	-	-	-	-
9. Sum of utilities, positive concave function assumed	+ directly by assumption	+	+	+	+	-					-	-	-	-	-	-
10. Sum of utilities, concave function not assumed	+ directly by assumption	+	+	+	+	+					-	-	-	-	-	-
11. Community as a whole including the additional person and his family, per capita income	(+)	-	-	-	-	-					-	-	-	-	-	-
12. Community as a whole including the additional person and his family, sum of utilities, positive concave function	+	(+)	+	+	+	+					(+)	(+)	(+)	(+)	?	?
13. Community as a whole including the additional person and his family, sum of utilities, no assumed constraint on function	(+)	?	?	?	?	?					?	?	?	?	?	?
14. Community as a whole including the additional person and his family, expanded Pareto criterion, assuming positive and concave functions	+	?	+	+	+	+	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	?	?
			aside from siblings													
15. Utility of parents of added person	+	+	+	+	+	+					+	+	+	+	+	+
16. Utility of parents of added person, cumulatively through childhood and adulthood	+	+	+	+	+	+					+	+	+	+	+	+
17. Added person himself, utility assumed positive	+	+	+	+	+	+					+	+	+	+	+	+
18. Added person himself, utility assumed positive, cumulatively	+	+	+	+	+	+					+	+	+	+	+	+
19. Added person himself, utility not assumed positive or concave	?	?	?	?	?	?					?	?	?	?	?	?
20. Added person himself, utility not assumed positive or concave, cumulatively	?	?	?	?	?	?					?	?	?	?	?	?
In Adulthood																
21. Older siblings, total utility, concave positive functions assumed	NA	(+)	-	-	-	-					-	-	-	-	-	?
22. Older siblings, total utility, concave positive functions, cumulatively	NA	-	-	-	-	-					-	-	-	-	-	?
23. All family's children including him, per capita income	NA	(+)	-	-	-	-					-	-	-	-	-	?
24. All family's children including him, per capita income, cumulatively	NA	-	-	-	-	-					-	-	-	-	-	?
25. All family's children including him, sum of utilities, assuming concave and positive functions	NA	(+)	+	+	+	+					+	+	+	+	+	+
26. All family's children including him, sum of utilities assuming concave and positive functions, cumulatively	NA	+	+	+	+	+					+	+	+	+	+	+
27. All family's children, sum of utilities with no assumptions about functional shape	NA	?	?	?	?	?					?	?	?	?	?	?
28. All family's children, sum of utilities with no assumptions about functional shape, cumulatively	NA	?	?	?	?	?					?	?	?	?	?	?
29. All workers in same occupation, per capita income	-	(+)	-	-	-	-					-	-	-	-	-	?
30. All workers in same occupation, per capita income, cumulatively	-	-	-	-	-	-					-	-	-	-	-	?
31. All workers in same occupation, sum of utilities, assuming concave and positive functions	-	-	+	+	+	+					+	+	+	+	+	+
32. All workers in same occupation, sum of utilities, assuming concave and positive functions, cumulatively	-	-	+	+	+	+					+	+	+	+	+	+
33. All workers in same occupation, sum of utilities, no assumptions about functional form	-	-	?	?	?	?					?	?	?	?	?	?
34. All workers in same occupation, sum of utilities, no assumptions about functional form, cumulatively	-	-	?	?	?	?					?	?	?	?	?	?
35. Others in community (excepting only his and his family), per capita income	-	(+)	+	+	+	+					-	-	-	-	-	?
36. Others in community (excepting only him and his family), per capita income, cumulatively	-	-	?	?	?	?					-	-	-	-	-	?
37. Others in community sum of utilities, function assumed positive and concave	+	(+)	+	+	+	+					-	-	-	-	-	?
38. Others in community, no assumptions about functions	-	-	+	+	+	+					-	-	-	-	-	?
39. Others in community, no assumptions about functions, cumulatively	-	(+)	+	+	+	+					-	-	-	-	-	?
40. Community as a whole including him, per capita income	-	(+)	-	-	-	-					-	-	-	-	-	?
41. Community as a whole including him, per capita income, cumulatively	-	-	-	-	-	-					-	-	-	-	(+)	
42. Community as a whole, sum of utilities, functions assumed positive and concave	+	(+)	+	+	+	+					+	+	+	+	+	+
43. Community as a whole, sum of utilities, functions assumed positive and concave, cumulatively	+	+	+	+	+	+					(+)	(+)	(+)	(+)	?	
44. Community as a whole, sum of utilities, no assumptions	?	?	?	?	?	?					?	?	?	?	?	?
45. Community as a whole, sum of utilities, no assumptions, cumulatively	?	?	?	?	?	?					?	?	?	?	?	?
46. Community as a whole, expanded Pareto criterion assuming positive and concave functions	+	?	?	?	?	?					?	?	?	?	?	?
47. Community as a whole, expanded Pareto criterion assuming positive and concave functions, cumulatively	+	?	?	?	?	?					?	?	?	?	?	?
In Posterity																
48. Community as a whole, per capita income	? depends on number of children	-	-	-	-	+					-	-	-	+	?	(+)
49. Community as a whole, per capita income, cumulatively through childhood, adulthood, and posterity	?	?	-	-	-	? depends on discount rate					?	-	-	? depends on discount rate	?	?
50. Community as a whole, sum of utilities, assumed positive and concave	+	+	-	?	+	+					-	?	+	+	?	(+)
51. Community as a whole, sum of utilities, assumed positive and concave, cumulatively	+	+	?	?	+	+					?	?	?	?	?	?
52. Community as a whole, sum of utilities, no assumptions	?	?	?	?	?	?					?	?	?	?	?	?
53. Community as a whole, sum of utilities, no assumptions, cumulatively	?	?	?	?	?	?					?	?	?	?	?	?

Note: NA = Not applicable

+ indicates positive affect

- indicates negative effect

? indicates indeterminate effect

A circle in a cell indicates that the situation is discussed in text. The Table is intended only to show that there are both positive and negative effects. It is not intended as an exhaustive set of analyses each of which is of special interest.

II. NO EXTERNALITIES DURING OR AFTER HIS LIFE

During His Childhood

If an additional first child in a family has no effects external to the family during its childhood, then the welfare of all other persons in the society is unaffected by his birth—by assumption. The welfare of his parents is increased by the occurrence of an event the parents desire.[1] Beyond this, a variety of welfare judgments is possible even in this very simplest of cases, the judgments depending upon one's assumptions and criteria. (1) To start, the judgment about the welfare of the child himself depends upon one's assumption about the human utility function, together with the facts of the case. According to the assumption made by Meade (1955), Dasgupta (1969), Ehrlich (1968), and others, the welfare of a very poor child is negative (column 1, line 3 in Table 1). But of course one can just as reasonably assume that the child's welfare is neutral or positive when he is very young. (Later, after he is old enough so that one can impute choice to him, we can argue about his welfare in a different fashion, as will be discussed later.) (2) By the test of per capita income, general welfare falls during this childhood period, because the same amount of product (assuming no increase in labor by the parents) is divided among more people (column 1, line 11). (3) If one uses as a welfare criterion the sum of individual utilities, general welfare rises if the additional child's utility is positive. The same conclusion can be reached by a more economical and powerful approach, that of an expanded Pareto optimum: If a person whose utility is positive is added to the society, and if none of the existing people thereby have their positions altered for the worse, this must represent

an increase in the society's utility function. The application of this criterion is unique to the very simple case under discussion, however; even the existence of brothers or sisters makes the criterion inapplicable without further assumptions, as we shall see.

Now for a side-examination of a curious but not-unreasonable implication in this simple situation: Parents have fewer children than would maximize the total utility of the community. The reasoning is as follows.[2] The parent continues to have children until he is at his own margin, indifferent between the birth and non-birth of another child. But an additional child would himself enjoy positive utility, by assumption, and hence his birth would add his own utility to the community's utility, with no net utility change to his parents.[3]

Despite that families do not choose to have enough children to reach the point of zero net marginal social utility, without complete knowledge of people's welfare functions one cannot know how far from the margin is the laisser faire outcome. Hence, it seems that the only sensible course consistent with the above conclusion is to let parents set their own limits on the number of children, subject to consideration of external costs and community values (to be discussed immediately).

With the above analysis in hand, one may judge the welfare effect of contraceptive knowledge and of public health measures to reduce infant mortality. Consider contraception first. In a society where no one dies until old age, the ability to practice contraception increases the welfare of parents because it allows them to achieve the number of children that will maximize their (parental) utility. That is, ability to contracept

increases parents' options, a Paretian basic welfare gain. If lack of contraceptive knowledge leads to more children than the couple wants *ex ante*, this *may* increase the total welfare of the family, and hence of the community. But to argue that people should be hindered from practicing contraception one must argue that a) one knows the parents' and children's utility functions; and b) by overcoming the parents' "selfishness" one forces them to a higher level of community utility. (This is implicitly the position of the Catholic Church, as I understand it.)

Now consider infant mortality. If the main thrust of this section is correct - that welfare is maximized by there being at least as many children as parents desire, subject to community values and external costs - and if parents are able to control fertility accurately, then infant mortality is an unmitigated evil. This is because infant mortality must result in the parents often having more or less children than they desire, with consequently lower utility for the parents. Only by luck will the number of children they desire *ex ante* live to maturity. And even if parents are lucky enough to end up with the number of children they desire, they will have suffered the grief of children's deaths that would not have occurred with a zero infant-mortality regime.

Furthermore, because people are generally risk-averse when it comes to the number of children and to the number of sons they have, the error will likely be on the side of achieving more children than were desired *ex ante*, as has been shown vividly by Heer and Smith (1968) and May and Heer (1969). Infant mortality might increase total utility by offsetting parental selfishness, but it might also reduce total utility by carrying the process beyond the

point of diminishing total utility. Which is true cannot be known *a priori*.

One might fault the above conclusion because the utility function does not take account of such important disutilities as death and suffering. But since we do not have any intimate or metaphysical knowledge of death itself, the only disutilities we can sensibly attach to death are a) the loss of the utility that might have occurred if death did not intervene, which is not an operative argument here; and b) the suffering of survivors. But more children might out-weigh the latter. For example, a family might well choose bearing six children and losing one to accident, in preference to being limited to bearing one child. Hence the omission of the disutilities of death and suffering is not a defect of the analysis.

The above inference that parents have too few children to maximize community utility applies only to the childhood period and may well hold only on the assumptions that (a) there are no other children, (b) utility is positive, and (c) there are no externalities. It *might*, however, hold even if some of the above assumptions were loosened in some ways.

Now let us consider the case in which the additional child's welfare is said to be *negative*. No judgment about the direction of the community welfare effect can then be made without assigning cardinal values to the individual utilities of the additional child and his parents, which trade off if the child's utility is said to be negative (column 1, line 13). And if one considers even more complex welfare functions, containing arguments of per-capita income as well as of total utility or total population size (e.g., Meade, 1955; Votey, 1969), they will *a fortiori* also give indeterminate results in the absence of cardinal specification of the utility function.

When a second or subsequent child is considered to be the additional child, rather than the first child in the family (column 2), things get even more complicated, because consumption by existing children will be reduced by the existence of an additional child. And unlike the parents, there is no reason to suppose that the existing children desire the additional child. Hence, the welfare of the previous children is decreased on balance by an additional child (line 4, column 2). The welfare judgment then must depend upon the assumption one makes about the utility function. If the functions of all the children are assumed positive and concave[4], then the additional child increases total utility of the children in the family (line 6 column 2). If the functions can be negative and/or have inflection points, the welfare effect on the children as a whole depends on the economic facts and the specific utility functions, and is indeterminate without cardinal specifications (line 7, column 2). The effect on the family as a whole, and on the community, must also be indeterminate if the effect on the children is indeterminate (line 12, column 2).

Already we may see that even in the very simplest case, and examining only a single point in time, the evaluation is thoroughly messy and generally indeterminate.

During His Adulthood

During the additional person's adulthood in this simple world of no externalities, his welfare effect depends upon which reference group is being considered, just as it does during his childhood. A peasant in subsistence agriculture affects his brothers and sisters negatively by reducing

their inheritance of land (line 21, column 2), and therefore the expanded-Pareto criterion no longer applies. If, however, one assumes that the utility of all the siblings is positive, and if all their utility functions are concave, the additional sibling would mean a net welfare gain to the people constituting the original nuclear family (line 25, column 2) and thence—by the expanded Pareto criterion—to the society as a whole. But if one assumes that utility can be negative, no such conclusions can be drawn.[5] And of course the per-capita-income effect is negative (line 23).

Now let us leave idealized subsistence agriculture and move to the more interesting, but still simple, case in which the additional person enters the labor force but where all markets are competitive and the individual is paid his marginal output (column 3). From the standpoint of average income, the rest of the community as a whole benefits from the added person's presence (lines 35, 37, 39, column 3) as Berry and Soligo (1969) have shown; the nature of the benefit is exactly the same as the benefit that occurs when one country opens trade with another country. But assuming that the incremental person is a worker, the population of workers as a whole—and especially the workers in the trade he enters—will have lower wages because of him (line 29). And the average income of the entire community including the additional person will fall (line 40). But if one assumes that all utility functions are positive and concave, then the sum of the individual utilities in the community will be higher than before, because total output will be greater (line 42). So again we see that even for a single period—his adulthood—and in the simplest case of no externalities and no inheritances, the welfare effect of an incremental individual can be judged differently

from different points of view. And if one now wishes to combine the judgments about the welfare effect of the added person during his childhood and during his adulthood together, the results are even more mixed.

We shall here end the story of the man who does not affect society beyond his family, either during or after his lifetime, with positive or negative savings[5a] of any kind, except by working in a perfect market.

III. EXTERNALITIES DURING HIS LIFETIME AND BEFORE HIS CHILDREN'S ADULTHOOD

In societies that have advanced economically beyond family subsistence agriculture, an incremental child usually causes effects external to the family. These externalities can be distinguished into two sorts: those whose effects can be appraised and compensated for by way of markets, and those that cannot. The former are treated in the next section, and the latter are treated in the section after that.

Where There Are Compensable Externalities

The main "compensable" externalities are in the labor market, and in social-welfare expenditures, e.g. schooling.[6] The nature of the effect through the entrance into the labor force of an additional worker would be difficult to agree upon. But both the labor-force and social-welfare effects of additional children are calculable in principle even if we cannot now agree on how to calculate them. Standard welfare-economics arguments suggest

that the total utility of all adults in a society at a given time will be maximized if families pay for all the services used in raising children, and to neutralize any labor-market effect. That is, if one considers a median-income family with more than the average number of children, it would pay taxes to cover the "extra" child-raising services plus the labor-market effect of the "extra" children. The proof of the optimality of this policy is the same as that for other cases of external effects, as shown in a simple way by Coase (1960). As long as the parents pay the full market value of these external effects, a larger number of children produced by a family cannot be said to reduce community utility. And after the labor-force and social-welfare externalities are taken care of, and the utility of existing adults may be assumed to be maximized, the expanded Pareto criterion again may be applied; after compensation no one except older siblings would be made worse off by the added person (line 14, column 7-10). Hence, if the additional person's utility is assumed to be positive (and with respect to the first child only), parents stop having children before the community's welfare would be maximized, by the same argument as was given earlier. (If the added person's utility is not assumed to be positive, or if other children in the family are considered, no such conclusion can be drawn.)

A technical difficulty which turns into a major political problem arises with respect to compensable externalities, however. It is all very well to talk of parents paying <u>now</u> for the <u>future</u> effects of their children. But such payments would have to be discounted for futurity. The community would have to decide on an appropriate discount rate, because economic logic alone reveals none (or a multitude of them). Even if the community were to

eventually arrive at agreement on such a discount rate, there would be major conflicts of interest. Old people without children would want a low discount rate and high sums paid immediately. Parents with many children would want the opposite. It might be suggested that the externalities be paid for as they occur; this might work for schooling and medical care, but it would not be feasible for the children's labor-force effect. So, because of this discount-rate problem, together with the difficulty of estimating the future effects of the children, it is quite possible that the community would not arrive at agreement on an externality-neutralizing agreement. If so, it would not be possible for an additional child to effect a Paretian welfare increase, and the total cumulative effect-in his childhood plus his adulthood-is Parentian indeterminate (line 14, columns 11-14). And if externalities are not neutralized, the welfare effect by a total-utility criterion is also indeterminate during his adulthood, and hence indeterminate for his life as a whole (lines 12 and 43, columns 11-14).

Now let us consider the per-capita-income effect of an additional individual where there are externalities in child-services and labor markets. The classical diminishing-returns analysis (same total capital and more labor yields a smaller average product) tells us that the effect is negative during his adulthood, as it was during his childhood, and the Berry-Soligo analysis does not alter this conclusion. But in the more-developed world, it is not only possible but likely (Kuznets 1960, Simon, 1971) that after some time in the labor force an additional person will cause enough new knowledge and enough economics of scale so that per-capita income is higher than it would otherwise be.[7] If so, by a per-capita income welfare standard the additional

person's effect is positive for at least the latter part of his adulthood (column 15). And the effect may be sufficiently great to make his lifetime effect positive (line 41, column 15). But given that per-capita income is lower during his childhood because of him, to reckon the lifetime per-capita-income effect one would have to specify the effects for each year and choose a discount rate. A high enough discount rate could of course be chosen so that the later positive effect would matter little, and hence the lifetime effect would be negative. But with a lower discount rate the lifetime effect might well be positive if there are positive externalities from knowledge and economies of scale during the additional person's adulthood--as there is reason to believe there are.

Non-Market Externalities and Community Values

Still confining the discussion to the lifetime of the additional person, let us now consider externalities that realistically would not be compensated through taxes and subsidies.

As Professor Arrow has made clear, there may be "a difference between the ordering of social states according to the direct consumption of the individual and the ordering when the individual adds his general standards of equity (or perhaps his standards of pecuniary emulation)." (1951-1969, p. 153). The latter states Arrow calls "values", in contrast to the former which he labels "tastes". And the "market mechanism...takes into account only the ordering to tastes". Hence it may be appropriate for the community, acting together, to make such laws - which may include taxes on or subsidies for children - as will achieve the sort of society that its members want. For example, someone might suggest that the community hold a referendum as

to whether there should be a tax of 100 shekels, say, on parents for each child after the third. People might rationally vote for such a measure if they believe that a lower birth rate will increase the rate of economic development[8] and if they put a positive value on economic development; or if they believe that infant mortality will decrease if each family has fewer children and they get disutility out of neighbor's children dying; or if they get disutility out of other people's children, e.g. because of the noise; or other reasons. If people vote unanimously for the tax it would imply that each person would be willing to have fewer children if his neighbors also had fewer children.

Similarly, a community might have a positive value for a larger number of children in the community than people otherwise choose to bear, given their own tastes. Israel may be an example: Jews there may feel that the continuation of the historical tradition and the values of Judaism can be better served by more people rather than fewer, and they may be prepared to vote subsidies to children, just as a man may try to bribe his married son to have more children to carry on the family name. If people get positive utility out of their neighbors' children and so vote, a subsidy on children would be indicated. Or, people may believe that a larger population will contribute to economic growth within a short enough time span so that their subjective discount rate (which might be zero, as was Frank Ramsey's) will make the immediate social costs less than the discounted benefits; this is now the state of belief in Australia, as it was in the Western United States in the past.

The mechanism for decision--majority vote or monarchy or whatever--will depend upon the group's constitution. Any population policy may then be consistent with welfare economics, if voted in accordance with the constitution. The likeliest cause of distortion with respect to a democratic constitution is a population policy initiated and executed by bureaucrats who impose their own values upon the community while asserting that the rationale for the policy is the "scientific" finding that the policy in question is "provedly" better than non-interference and governmental neutrality with respect to parental decisions about family size. I believe that this danger is great because the officials or legislators may not recognize that their beliefs and values are values and beliefs and are not scientifically proven truths.[9] In the past decade so many scientists have made it clear that they favor lower birth rates that one can easily come to think that lower birth rates have indeed been shown to be scientifically better for society in every way, though in fact no such finding has been or could be scientifically arrived at because of the value considerations involved.

IV. EFFECTS AFTER THE ADDED PERSON'S LIFETIME

Just as a person may affect his society for good or bad during his lifetime, so may he have effects after he dies. Economists are accustomed to dismissing very-long-run effects because of their small weight in calculations made with interest rates of 15%, 10%, or even 5%. But the society itself is more ambivalent about the long-run future and sometimes gives relatively heavy weight, as the current environmental controversy shows.[10] It may well be that the

average man's total effects on posterity are more important than his total effects on his contemporaries--who are, after all, smaller in number than his posterity.

There are many sorts of effects one can have on posterity. The simplest and most surely positive is the savings that one leaves to his heirs; usually they exceed his debts, as we know from the fact that society's total capital generally grows over time. One may also leave knowledge behind him;[11] the knowledge _might_ be satanic, but usually knowledge is positive for the economy, as we know from the higher rate of productivity now than in former millenia. Still another effect is the children that the added person leaves. At first the effect of children seems very complicated. But consider that the effect of each child is expected to be the same as the effect of the added parent _aside from_ his children. Therefore, the welfare judgment one makes about the added person is not changed by his having children--aside from their different positions in history, of course, which can be ignored unless there is special information about the course of history.

Another post-life factor is the delayed economies-of-scale effect associated with the creation of additional infra-structure, and with changes in the nature of society--perhaps especially in less-developed countries. As an example, the population-density-induced changes in land-tenure laws and cropping systems shown to occur by Boserup (1965) can have long-run positive effects on productivity.

Let us now get more specific in welfare terms. If the added man leaves anything at all to posterity and if he has no children--that is, if his contribution to subsequent economic growth exceeds his contribution to

population growth, then his welfare effect on posterity is positive (column 16, lines 48 and 50). If he does have children, and he and his lineage add proportionately more to saving than to population growth, then the effect on per capita income of posterity is positive. If he and his heirs each leave something positive, but what they leave contributes less (marginally) to growth than this lineage contributes to population growth, the effect on posterity then is negative in terms of per capita income unless during his lifetime he contributed greatly in knowledge and otherwise. In such a case, the effect in terms of total utility is likely to be positive, however, given a reasonable distribution of income and no negative utilities. If the additional individual leaves a negative inheritance, then his effect on posterity is negative.

Each of the sorts of impacts classified above could be combined with impacts of the same or opposite sign in earlier periods; if the latter, the overall evaluation of the added man's welfare impact is indeterminate without numerical specifications of all impacts and an explicit choice of discount rates.

One might ask whether the possibility of a positive inheritance, and expecially an inheritance proportionately as large as the population growth he causes, is just a theoretical nicety which may be disregarded.[12] I think the answer is clearly "No," the inheritance effect may not be disregarded. In less-developed countries, of which pre-20th century China is the best documented example at present, per-capita income remained at much the same level secularly over 700 years, though it sank seriously during some periods of rapid population growth. This suggests that the added person set in

motion trains of events that increased saving temporarily. And at some time later, posterity was no worse (by a per-capita-income test) for the added person's having lived. On the other hand, it is also possible that in some places increased population keeps an economy in stagnation, preventing change and improvement.

In more-developed countries there is secular growth in per capita income. If population had not grown to something like present population size, contemporary per-person income would be far lower in more-developed countries than it now is. That is, people leave an amount of productive power to the next generation that is proportionally greater (perhaps two or three times greater) than the population increase they leave behind.[13] This means that the added man could leave an inheritance considerably smaller than average and still leave proportionally more than the population growth his lineage contributes.

This raises the question of whether the added man would contribute an inheritance anywhere near as great as the average person would contribute without him, i.e. whether the marginal contribution to posterity is far below the average contribution. First of all, there is no reason to suppose that he himself is less endowed with intelligence or chance in life than is the average person, unless one assumes that he is—and I can think of no special reason for assuming so. If his endowment is average, then the only factor causing him to lower the average inheritance would be the lesser physical and educational capital endowment per person at labor force entry that population growth probably implies. Given that the average rate of inheritance in more-developed countries is much greater than the rate of population growth (in proportional terms), this classical capital-diluting effect could be

of sizable magnitude without making the marginal inheritance smaller than the population growth contributed by the added person. Furthermore, there are very solid reasons to agree with Kuznets, as noted earlier, that the knowledge and economies-of-scale effects lead to a higher per-capita income before the end of his work life than if he had not been born. If so, the average inheritance left at the time of his death will be greater than if he had not been born, which is a positive effect on posterity by any welfare test. Of course this happy result is much less likely in a less-developed country than in a more-developed country, but this only proves once again the impossibility of making sound a priori welfare judgments about population effects without detailed specification of the conditions, assumptions, and criteria.

V. SUMMARY AND CONSLUSIONS

There is no single calculable welfare effect of an additional person. The welfare effect depends upon which point in his life-cycle one refers to, whether he is expected to have a positive effect upon his particular sort of economy and society during and after his lifetime, and most of all, on the kind of welfare function used. Furthermore, no matter which welfare function is used, the welfare effect of an added individual summarized over time is even more sensitive to the particular assumtpions made.

Footnotes

1. Here and elsewhere in this paper it is assumed that children are brought into life because their parents desire them, and no more children are born than parents want. To persuade the doubter of the reasonableness of this assumption takes more evidence and argument than I have room for here. The interested reader may, however, consider Firth (1939, pp. 36-37), Carr-Saunders, (1922, p. 230), Krzywicki (1934), or my survey (Simon, 1971a). The monetary and psychic costs of controlling fertility are ignored here. I also ignore non-economic welfare benefits such as the value of liberty.

2. Notice that the grounds used here to reach this conclusion are quite different than the grounds on which Phelps (1969) reached a somewhat similar conclusion from a welfare function that would maximize utility of the parental generation. His grounds were essentially a Berry-Soligo-type international-trade argument plus consideration of savings ratios.

3. Now in a matter that may be passed over by all except the most demanding reader: In a full formal treatment it is necessary to distinguish between (i) the utility that the parents get <u>from the utility the children get from consuming resources</u>, and (ii) the utility of the children to the parents <u>for the parents' own sake</u>. The distinction might be phrased as the difference between the parent's utility from the parent's "consumption" of the child, and the parent's utility from the child's own consumption. For example, a father takes pleasure in his newborn son, it would seem, not because he believes that the child now enjoys life, but for the father's own sake. On the other hand, it is clear that parents can feel

happy because they believe that the children are happy, e.g., the sensation the parent feels as the child eats a piece of cake. "I feel happy for you" is the expression we use to describe this situation. I shall assume that the utility a parent gets from the utility the child derives from consumption of the income the child uses is <u>less</u> than the child's own utility from that consumption. This need not be true a priori, of course. A parent might believe very strongly in the value and importance and joy of life, and hence bring a child into the world despite the fact that the parent himself does not expect to get any personal pleasure from beholding the child, but on the contrary, expects the child to be only a burden to the parent. If in fact that child also gets little joy from his life, one could imagine that the child's positive utility is less than the parent's negative utility from the child, giving a net negative balance. But it seems reasonable to me that a parent generally gets less utility from a child's consumption of resources than does the child himself, which justifies this assumption. I am painfully aware that this distinction is vague, perhaps impossible to measure sensibly, and at least bordering on the metaphysical. But one cannot get around such a distinction unless one wishes to assume that the parent's utility from the child is all his own pleasure of the senses in "consuming" the child, rather than "indirect" utility derived from the child's pleasure in life. And if one does wish to so assume, all conclusions of this paper are the same as otherwise, and are arrived at even more directly.

4. Such an assumption is not at all inconsistent with the Friedman-Savage hypothesis, as those authors themselves agree (1952).

5. I think that the notion of negative utility is quite indefensible after a person is old enough to make serious choices, for technical and empirical (as well as moral) reasons. Meade's concept (1955, Chapter VI) of a "welfare-subsistence level" of income, below which a person is assumed to have negative utility, is inconsistent with consumer-preference theory. By the standard logic of consumer-preference theory, the available evidence tells us plainly that life does have positive value, because people almost invariably choose life in preference to death, no matter what their economic circumstances. Life seems to have more value than does death for a destitute toothless widowed crone who lives -- until the police evict her -- in a rag-and-newspaper tent by the side of the road in India, just as your life seems to have value for you. The rate of suicide is everywhere sufficiently low that it is clearly an exception when life ceases to have positive value. Therefore, to assume that some people are sufficiently poor that their lives have negative value is quite incompatible with the basic concept of modern economics: That which is chosen is defined to be better. Without this concept all modern welfare economics falls apart. This should be reason enough to eschew Meade's point of view in a discussion of welfare economics. But for me as for many others, the positive value of all human life, adults and children, too, is also a point of faith.

5a. If he is paid his marginal output, there is some increase in total productivity minus his consumption. Hence, total saving will rise somewhat, but this can be disregarded for now.

6. I assume here that the society charges the full cost for all consumption products, including the cost of physical pollution prevention and removal. This assumption may be well on the way to becoming fact.

7. This <u>includes</u> the use of natural resources as raw materials in production, and is supported by the finding by Barnett and Morse (1963) of no increase in natural-resource scarcities. The over-all basis for the positive effect of more people in more-developed countries is the "residual," which at once sums up the effects of natural resources, knowledge, and economics of scale. For a quantitative estimate of the interaction of this force with the classical capital-dilution effect, see Simon (1971).

   One might argue that the concept of GNP, which underlies all previous reckoning, does not measure over-all economic utility sufficiently well, because it leaves out some "quality of life" features. Perhaps so. But in the absence of calculations, or at least cogent reasoning, about the results of using the wider measure, there is no reason to assume the results would be different in any particular way from work based on GNP.

8. Please notice that though the effects people are interested in may occur after the added person's lifetime is over, the values of other people are held and acted upon during (or before) his lifetime. Hence the placement of this discussion in this section.

9. "There is a personal bias that colors one's view of the (relatively) poor which comes from appraising others' incomes against the standard of one's own aspirations. This bias is implicit in many conventional economic-welfare judgments, and it seems to me to be both indefensible and in fact without defenders. This is merely shoddy practice, not doctrine." (Weckstein, 1962, p. 137.)

10. Many of the long-run worries of the contemporary environmentalists may not be real threats, of course, as was the coal shortage foreseen by Jervons (1865). The point here is, rather, the social discount rate.

11. The argument that some classes of people are likely to contribute to knowledge, while others are not, will not be considered here. One reason is that, as a first approximation, this paper assumes the same proportional change in fertility for all classes of the society; this is certainly not unrealistic for the U.S., where the poor clearly do not account for most of population growth. A second reason is that I have been persuaded by Kuznets' argument (private communication) that all segments of a society are crucially implicated in the growth of knowledge, and not just the intellectual elite.

12. In fact, the opposite possibility -- that more people now mean a negative inheritance for the future -- is simply assumed by such writers as Meade (1955) and Votey (1969).

13. Growth theory assumes that savings equal population growth. But the life cycle is usually not distinguished into parts in such growth analysis, so that work can mostly be disregarded here.

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