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ON PROBLEMS OF
DEVELOPMENT IN SOUTHEAST ASIA

THREE ESSAYS ON THE METHODOLOGICAL ASPECTS
OF INTEGRATING POPULATION PLANNING
INTO GENERAL ECONOMIC PLANNING

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*THREE ESSAYS ON THE METHODOLOGICAL ASPECTS
OF INTEGRATING POPULATION PLANNING
INTO GENERAL ECONOMIC PLANNING*

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The three papers herein were presented by Drs. Eilenstine, Heien, and Blomqvist to the SEADAG Population Panel Seminar on "The Role of Population Planning in General Economic Planning" held at the Sheraton-Palace Hotel, San Francisco, California, from November 14 through November 16, 1973. The views and conclusions of the papers are exclusively those of the authors. The paper may not be quoted or reproduced without the authors' express permission.

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Three papers presented to the SEADAG Population Panel Seminar on "The Role of Population Planning in General Economic Planning", San Francisco, Calif., November 14-16, 1973. The papers may not be quoted or reproduced without the permission of the authors.

The Savings Consequences of Reducing Rates of Population Growth.

Aggregate Effects of Population on Consumption in Developing Countries.

Cost-Benefit Analysis of Family Planning Programs:
Some Methodological Issues

- 1 -

PREFACE

by

*David Horlacher, Chairman**
SEADAG Population Panel

The SEADAG Population Panel sponsored a seminar, held in San Francisco on November 14-16, 1973, to explore the possibilities for integrating population planning into the process of general economic planning. Three of the shorter seminar papers on methodological aspects of the integration process are presented here. The first two, by Donald Eilenstine and Dale Heien, respectively,** are concerned with population growth as a key determinant of the savings factor so important to economic development. The third paper, by A. G. Blomqvist,+ deals with the problem of designing the overall economic plan, using the tools of cost-benefit analysis in such a way as to optimize implementation of the population plan.

Economists hold that the accumulation and allocation of capital goods is the most crucial task of development planning. Population theorists hold that reductions in fertility have a substantial, favorable effect on savings and thus release resources for investment which otherwise would be used for consumption. If both groups are correct, it follows that population planning must be integrated with the capital formation section of the general planning process. The San Francisco seminar raised questions as to the validity of each of these propositions, however. In particular, the contributions of Eilenstine and Heien challenged the view that limitations on the rate of population growth will significantly increase the proportion of income devoted to saving in an LDC. They demonstrated in a most convincing manner that the impact of demographic variables on savings and investment remains an open question.

Eilenstine's conclusions follow from his assumption that the household, rather than the individual, is the crucial decision making unit in the matter of savings. Since population plans bring about a significant reduction in the numbers of households over the next twenty-five

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years, no large increases in savings will result from the implementation of these plans. Furthermore, it is likely that the household will implement its own fertility reduction plans to increase its level of consumption rather than savings.

Heien carried the argument a step further by introducing the life cycle hypothesis of saving behavior. After presenting a methodology for overcoming the problem of aggregating the savings functions of individuals in different stages of their life cycle so that the effects of population growth on the aggregate savings functions could be studied, Heien attempted to demonstrate that changes in population growth rates will affect the relevant planning horizon for savings decisions. In particular, a decrease in fertility would increase the median age of the population. This would shorten the planning horizon of the society as a whole and thus reduce its need to save for the future. This implies that the relationship between fertility and savings may be the opposite of that which had been generally assumed.

Whereas the Eilenstine and Heien papers are concerned with population as an input to the general economic plan, the Blomqvist paper looks at the general economic plan as a possible input to the population plan. Blomqvist points out that family planning programs have two distinct economic functions. They meet the demand for family planning services on the part of the existing population and by reducing fertility they will increase the level of future per capita income. The first of these functions can be dealt with by making use of traditional cost-benefit analysis. But a policy of fertility reduction alters the distribution of income which is generally assumed to be given in cost-benefit analysis. Therefore, in the general development plan fertility reduction must be evaluated relative to capital formation as a device for redistributing income to future generations. Furthermore, such a policy should be implemented by means of tax and subsidy schemes which would depend on the fiscal section of the general economic plan. Finally, Blomqvist holds that because of the long lag between fertility reduction and income effects, the analysis will have to be carried out in the context of long-term planning.

Together these three papers constitute a contribution to our understanding of the complex methodological issues which must be faced before population planning can be fully integrated with general economic planning, not only in Southeast Asian nations but elsewhere as well.

*THE SAVINGS CONSEQUENCES OF
REDUCING RATES OF POPULATION GROWTH*

*Donald Eilenstine
Eisenhower College*

INTRODUCTION

A few years ago Robert Lampman concluded a discussion of the relationship between the rate of economic growth and alternative rates of fertility with the following warning: "It is not true, as some enthusiasts for fertility control sometimes imply, that economic success will automatically flow from reduced population growth."¹ In spite of this warning there is still a widespread presumption that a reduction in fertility rates in the typical LDC (less developed country) will result almost immediately in improved prospects for rapid economic development. The purpose of this paper is to raise some questions about the analysis which underlies the presumption that reduced fertility will by itself lead to an increase in the rate of economic development through an increase in the level of savings.

Despite the thrust of this paper, the author would like to make it clear that the argument which follows should not be interpreted as support for those who would oppose the systematic efforts in LDCs to reduce rates of population growth. Indeed, there are pressing reasons why the birthrate in all countries, whether highly developed or less developed in economic terms, must be reduced. In the long run the only rate of population growth sustainable for the world is zero; consequently, no argument, even one which questions the role of reduced fertility in promoting economic development, can override the necessity for the achievement of ZPG. Rather, this brief paper should be interpreted as an effort to question one basis of the birth control argument so that the fundamentally sound commitment of developmental economists to a reduction in the birthrate will not be injured by claiming more for such a policy than it can hope to achieve.

THE THEORETICAL ARGUMENT

The basis for the widespread belief in the desirability of a reduction in the birthrate as a contributing factor in promoting rapid economic development is the belief that a reduction in the birthrate will have a favorable effect on the flow of savings generated from a given level of national income. And as these savings are transformed into capital formation they promote more rapid growth in the future.

The first step in the typical presentation of this argument is to

1. R. J. Lampman, "Some Interactions Between Economic Growth and Population Change in the Philippines," *Philippine Economic Journal*, No. 6, Vol. 1 (1967), p. 19.

establish the proposition that national income twenty or twenty-five years in the future will be unaffected by a reduction in the birthrate today. The basis for this conclusion is that the reduction in the birthrate will affect the dependency ratio but for a period of a generation will have only a minimal impact on the size of the work force; therefore, national income is normally assumed to be the same over this time period regardless of the fertility rate.² Since a national income of a constant size will be divided among a smaller number of persons, it necessarily follows that per capita income will be greater. In these models savings are normally viewed as being a function of the level of per capita income.³ Consequently, the impact of a reduction in the birthrate will be to increase the volume of savings as a constant marginal propensity to save or, in some versions of the argument, as a constant margin propensity to save plus a constant marginal propensity on the part of the government to tax, are applied to the higher per capita incomes generated by successful programs of fertility reduction. Blunt statements of the latter step in this argument can readily be found in the literature. For example, Edgar Hoover has stated that, "Out of a higher per capital income, more can and will be saved."⁴ Myint has recently also provided us with a blunt statement of this argument when he flatly stated that, "Population control, by reducing the number of new mouths to feed, is an important way of increasing saving."⁵ As Lampman warned, reading this literature almost leaves one with the feeling that if the birthrate could only be reduced the consequences would be the achievement of self-sustaining rates of economic growth.

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2. Typical examples of this kind of argument are found in the following: A. J. Coale and E. M. Hoover, *Population Growth and Economic Development in Low Income Countries* (Princeton: Princeton University Press, 1958), pp. 227-283; P. Demeny, "Investment Allocation and Population Growth," *Demography*, 2 (1965), pp. 203-232; and S. Enke, "The Economics of Government Payments to Limit Population," *Economic Development and Cultural Change*, 8 (July 1960), pp. 339-348; and, Lampman, *op. cit.*
 3. Demeny, *op. cit.*, p. 206.
 4. E. M. Hoover, "Economic Consequences of Population Growth," *Indian Journal of Economics*, 47 (July 1966), p. 6. In another article written by Hoover with Mark Perlman at about the same time a more cautious attitude is expressed: "There is substantial uncertainty about the way in which savings will, in fact, respond to higher levels of individual income." E. M. Hoover and M. Perlman, "Measuring the Effects of Population Control on Economic Development: A Case Study of Pakistan," *Pakistan Development Review*, Vol. 6, No. 4 (1966), p. 553.
 5. H. Myint, *Southeast Asia's Economy: Development Policies in the 1970's* (New York: 1972), pp. 108-109.

The theoretical solidity of this position, which appears to be so strong at first glance, is, however, subject to serious question if one looks at the argument from the perspective of the household which successfully practices birth control. Consider a family with a household income of \$500 per year and containing four individuals, two adults and two children. Per capita income in this household is therefore \$125. The addition of an extra child in the family will have the impact, *ceteris paribus*, of reducing household per capita income to \$100. In the literature cited above one is left with the feeling that what has occurred is an increase in household per capita income of \$25 rather than the prevention of a reduction of household per capita income of \$25. The immediate economic consequences of the successful prevention of a birth is the prevention of a reduction in household per capita income which otherwise would have occurred. If the household was in an equilibrium position between current and future consumption prior to the successful prevention of a birth it would appear to still be in an equilibrium position after successful practice of birth control. There is nothing in the prevention of the birth which would alter the household's income or change the shape of its indifference curve depicting the utility trade-off between present consumption and savings.

The argument may be reworked in a dynamic sense. Rather than viewing the position of the household immediately after the successful prevention of a birth in terms of static analysis, the argument may mean that as the household's income rises as the economy develops, its increments of income will not be dissipated in providing consumption goods for additional children. From this perspective what is at stake is consumption out of increments of income created by the growth process and not by the family planning program.

When one searches for the antecedents of this argument it is interesting to note that it appears to stem from the "stagnationist" literature of the late 1930s and the early 1940s. Coale and Hoover, in the most frequently referred to work in this area, begin by developing the "stagnationist" position.⁶ They cite the "stagnationist" literature as having established the proposition that a slowing rate of population growth generates problems of aggregate demand for a mature economy because of the level of savings which the older and smaller population produces. Coale and Hoover then proceed to reverse the proposition for the contemporary LDC. Since the LDC needs the flood of savings which create problems for the mature society, the conclusion is extracted that a slowing of population growth for the LDC will have desirable consequences for the rate of economic growth.

It has been discovered, however, that the "stagnationist" position rests on a very shaky empirical position even with regard to mature economies. The literature which established this argument in the discipline was strangely non-empirical, consisting of *ad hoc* generalizations and

6. Coale and Hoover, *op. cit.*, pp. 3-25.

guesses as to probable magnitudes. Recent research would indicate that even the achievement of a stationary population for the United States would not lead to significant reduction in the percentage of household income devoted to consumption purposes.⁷

The second weak link in the theoretical argument which leads to the conclusion that a reduction in the birthrate will induce an increased rate of economic growth for the LDC with a successful family planning program is that such arguments seem almost invariably to be simple applications of Harrod-Domar models to the developmental process. In the context of such a model, capital formation is the prime, sometimes exclusive, determinant of the rate of economic growth with savings functioning as a constraint on the rate of capital formation. However, the trend of recent literature has been to de-emphasize the role assigned to capital formation, at least as traditionally defined to exclude investment in human capital, in the development process. With the weakening of the role assigned to capital formation in the growth process comes a weakening of the presumed impact of a reduction in fertility upon a LDC's growth rate.

Briefly summarized, the argument above would indicate that there is no good reason to expect that in the absence of other developments a reduction in the birthrate would lead to an increase in the volume of household savings in the short run and, secondly, even if a reduction in the burden of dependency did bring an increase in the volume of savings, there is no longer a scholarly consensus that the increased rate of capital formation by itself would automatically lead to an increased rate of economic growth.

A SURVEY OF THE EMPIRICAL EVIDENCE

It would be comforting if one could resolve the theoretical quibbles posed above by recourse to the statistical record. Unfortunately, as a recent review article has made very clear, a multitude of studies on the

7. See D. L. Eilenstine and J. P. Cunningham, "Projected Consumption Patterns for a Stationary Population," *Population Studies*, 26 (July 1972), pp. 223-231, for a review of the stagnationist position and a calculation of the average propensities to consume for both the actual growing population of the United States in 1960 and for a stationary population in the United States in 1960. The computed values for Expenditures for Current Consumption out of Money Income After Taxes were .908 for the growing population and .905 for the projected stationary population.

savings function in contemporary LDCs has not succeeded in producing agreement.⁸

Of the many empirical studies produced in recent years, three would appear to be most relevant. Nathaniel Leff produced a study which addressed itself directly to the question of the impact of the high dependency ratios characteristic of LDCs upon the savings function.⁹ Leff was concerned with explaining the failure of aggregate savings rates to rise as income levels rose. His statistical results appeared to confirm that "the hypothesized link between high dependency ratios and low household savings was...direct,"¹⁰ and that, consequently, "high dependency ratios -- and ultimately high birthrates -- are among the important factors which account for the great disparity in aggregate savings rates between developed and underdeveloped countries."¹¹ Unfortunately, a steady stream of communications relating to Leff's article has tended to reduce the precise results which he stated.¹² Of the criticisms of Leff's results, the most crucial for the present purpose is Gupta's finding that when Leff's forty-seven LDCs are divided into three groups by levels of per capita income, Leff's statistical conclusions hold only for Category III, the group of countries with the highest level of per capita income among the LDCs included in Leff's sample.¹³

Another recent review of a variety of statistical evidence relating population growth and economic development was provided by David

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8. R. F. Mikesell and J. E. Zinser, "The Nature of the Savings Function in Developing Countries: A Survey of the Theoretical and Empirical Literature," *Journal of Economic Literature*, 11 (March 1973), pp. 1-26.
 9. N. H. Leff, "Dependency Rates and Savings Rates," *American Economic Review*, 59 (December 1969), pp. 886-896.
 10. *Ibid.*, p. 887.
 11. *Ibid.*, p. 894.
 12. See K. L. Gupta, "Dependency Rates and Savings Rates: Comment," *American Economic Review*, 61 (June 1971), pp. 469-471; N. A. Adams, "Dependency Rates and Savings Rates: Comment," and "Reply" by N. H. Leff, *American Economic Review*, 61 (June 1971), pp. 472-480; and A. S. Goldberger, "Dependency Rates and Savings Rates: Further Comment," and "Reply" by N. H. Leff, *American Economic Review*, 63 (March 1973), pp. 232-234.
 13. Gupta, *op. cit.*, 470.

Kamerschen.¹⁴ Kamerschen's results indicated general support for Enke-type models;¹⁵ however, Kamerschen himself expressed skepticism about his statistical findings given their reliance upon surrogate variables of dubious validity.

Both of the studies cited above would seem to indicate general support for the common theoretical proposition, even though Leff's results must be modified as noted. A study by Thirlwall, however, found statistical results dramatically at variance with the current theoretical presumption.¹⁶ Thirlwall begins his discussion by observing that the current arguments are seldom "backed by direct empirical evidence...."¹⁷ His effort to confront the prevailing model with direct empirical evidence led him to the conclusion that, "When looked at in the context of a reduced form model there is no support for the view that population growth and the rate of capital accumulation are inversely related in less developed countries."¹⁸

Given the highly inconclusive nature of the empirical evidence discussed above, it is perhaps not inappropriate to suggest a different approach which would focus upon the household instead of per capita aggregative data.

THE HOUSEHOLD, REDUCED FERTILITY, AND THE LEVEL OF SAVINGS

To illustrate the importance of the household as the unit of analysis, hypothetical empiricism of the type characteristic of most efforts to establish the importance of reduced rates of population growth for the savings effort may be used. The demographic analysis is taken from an

14. D. R. Kamerschen, "Population Growth and Economic Development," *Schweizerische Zeitschrift für Volkswirtschaft und Statistik*, 106 (March 1960), pp. 79-90.

15. *Ibid.*, p. 88.

16. A.P. Thirlwall, "A Cross Section Study of Population Growth and the Growth of Output and Per Capita Income in a Production Function Framework," *Manchester School of Economic and Social Studies*, 40 (December 1972), pp. 339-356.

17. *Ibid.*, p. 340.

18. *Ibid.*

article by Demeny.¹⁹ Demeny's tables are presented below. Table 1 presents the initial population, whereas Table 2 illustrates what the population would look like after the passage of twenty-five years for both the society with unchanged fertility and the society with a fertility reduction program which has succeeded in cutting the Gross Reproduction Rate in half. The demographic consequences of the assumed reduction in fertility are a reduction in the twenty-five year population increase from 81 percent to 49 percent and a decline in the dependency ratio from 2.65 to 2.12. From these demographic shifts Demeny derives certain important economic changes by the simple application of a "Harrodian economic model for projections."²⁰

By building on the demographic analysis provided by Demeny, it is possible to construct, using the household as the unit of analysis, an alternative version of the economic comparisons of the two societies, the one displaying constant fertility and the other displaying reduced fertility. The results of such a comparison are presented in Table 3. Take a group of one thousand households out of the population with unchanged fertility. Given the dependency ratio stated above these one thousand households would contain a total population of 3,650 people. Assuming that the fertility control program has left the propensity to marry or otherwise form households unchanged, there would be 963 households in the population with reduced fertility.²¹ These 963 households would contain 3,005 persons. If we assign an arbitrary household income of \$500 to the households in the society with constant fertility we have a total income for these one thousand households of \$500,000. If we make the further assumption that in as much as there is only a

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19. Demeny, *op. cit.*, pp. 216-219. Demeny's demographic projections begin with a base population typical of LDCs: a Gross Reproduction Rate of 3.00, an initial life expectancy of 35.0, and a masculinity ratio at birth of 1.06. Mortality is assumed to be improving at a rate sufficient to increase life expectancy by 2.5 each 5 years. The decline in fertility is taken to be 50 percent over 25 years at a constant rate of 2 percent per year.
 20. *Ibid.*, p. 218. Demeny derives, under a number of alternative assumptions, the increases of income per equivalent adult consumer which can be achieved by the projected reduction in fertility.
 21. Under this assumption the percentage of households is taken to be determined by the number of males aged fifteen to sixty-four in the population with reduced fertility compared to the number of males aged fifteen to sixty-four in the population with constant fertility. This is the constraint utilized by Demeny in calculating the dependency ratios given above. Statistically it makes little difference whether the total population above fourteen or either the male or female segment of that population is used in the calculation of the number of households which each population would contain.

TABLE 1 AGE AND SEX DISTRIBUTION OF THE BASE POPULATION

Age	Males	Females	Total	Percent
0-14	212,900	205,800	418,700	41.9
15-64	283,200	272,200	555,400	55.5
65 and over	12,000	13,900	25,900	2.6
Total	508,100	491,900	1,000,000	100.0

Source: Demeny, *op. cit.*, p. 217.

TABLE 2 AGE AND SEX DISTRIBUTION AT t_{25}

Age	Males	Females	Total	Percent
(a) Projection I (Constant Fertility)				
0-14	400,700	387,000	787,700	43.4
15-64	494,700	478,100	972,800	53.7
65 and over	24,900	28,100	53,000	2.9
Total	920,300	893,200	1,813,500	100.0
(b) Projection II (Declining Fertility)				
0-14	253,300	244,600	497,900	33.4
15-64	476,500	460,600	937,100	63.0
65 and over	24,900	28,100	53,000	3.6
Total	754,700	733,300	1,488,000	100.0

Source: *Ibid.*, p. 218.

TABLE 3 COMPARISON OF PER CAPITA AND PER HOUSEHOLD RESULTS OF FERTILITY REDUCTION

	Projection I (Constant Fertility)	Projection II (Declining Fertility)
Total Number of Households	1,000	963
Total Population	3,650	3,005
Total Household Income	\$500,000	\$500,000
Income per Household	\$ 500	\$ 519
Income per Capita	\$ 137	\$ 167

minimal difference in the work force of the two societies, the total income of the 963 families representing the society with reduced fertility would also be \$500,000. The per household income for the society displaying reduced fertility would therefore be \$519. Contrast this difference with the per capita difference so commonly utilized in the literature. In our simple illustration the society with constant fertility will have per capita income of \$137 whereas the society with reduced fertility will have per capita income of \$167.²² Compared to a per capita income increase of more than 21 percent, per household income has increased by less than 4 percent. While the argument that a reduction in the birthrate will have dramatic effects on per capita income is clearly illustrated by the simple case analyzed above, recasting the argument in terms of per household income eliminates most of the increase. One reason to be suspicious of the facile conclusion that successful family planning programs will release a flood of savings is that such programs simply do not significantly increase income per household and, therefore, in the absence of other developments, do not provide the basis for increased savings.

There is a second consideration, one that concerns the household's marginal propensity to consume, which arises when the household is adopted as the unit of analysis. Most of the mechanical models of the impact of reduced fertility use a constant and positive marginal propensity to save which is applied to the increased per capita income associated with reduced fertility. It has already been demonstrated that at the household level the increase in income will be minimal. The issue now revolves around the extent to which this minimal increase in per household income will be translated into additional savings. Even the advocates of the application of such models as those discussed above have qualms about the simple assumption that a constant fraction of these increases in per capita income will find their way into increased savings. For example, Demeny includes in his conclusions the following statements: "The incidence of gains consequent upon fertility reduction is such that, relative to the case when no demographic investments are made, income per family would increase perceptibly only after considerable time had elapsed and in many cases would be affected in an adverse direction at the beginning of a costly fertility reducing program...." "Since the per consumption unit income gains incident upon declining fertility as necessarily 'clustered,' the validity of our assumptions concerning savings behavior may be questionable...."²³ Even Enke has admitted, "It has never been seriously argued that all consumption 'released' by a family having fewer mouths to feed will become investment. Most will go for

22. The result would be altered only slightly if the Adult Equivalent Consumer measure is utilized.

23. Demeny, *op. cit.*, p. 229.

increased consumption by the other family members."²⁴

With the foregoing cautions and the inconclusive nature of the aggregative statistical work referred to earlier in mind, it is not difficult to contemplate an alternative argument that the marginal propensity to consume out of the additional income "released" by successful birth control programs will be close to unity. By looking at data from an early assessment of the family planning program in Thailand, some casual support for this viewpoint can be found. The authors of the study referred to addressed themselves to the question of what motivated people to participate in the program and their conclusion was that, "...motivation is basically economic in character. That is, it is concerned with attaining or preserving a viable household economy so that existing members can enjoy a life above the minimum subsistence level."²⁵

Hawley and Prachuabmoh provided a way to approach the issue in their further analysis of a rural district in Thailand. They constructed an index of socioeconomic modernization based on the possession of certain consumer goods.²⁶ When these weights were applied to fertility patterns it was found that women having the highest socioeconomic modernization index had the lowest fertility for their age class. These results would indicate a close relationship between the acquisition of consumer goods and the willingness and ability to control the number of births.²⁷

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24. S. Enke, "Correcting Some Confusions," *Review of Social Economy*, 27 (September 1969), p. 156. Enke was replying to T. R. C. Curtin, "The Economics of Population Growth and Control in Developing Countries," *Review of Social Economy*, 27 (September 1969), pp. 139-153.
 25. W. Asavasena, A. H. Hawley, and J. Y. Peng, "Thailand," in Bernard Berelson, *et. al.*, (eds.) *Family Planning and Population Programs* (Chicago: 1966), p. 104.
 26. A. H. Hawley and V. Prachuabmoh, "Family Growth and Family Planning in a Rural District of Thailand," in Bernard Berelson, *et. al.*, (eds.) *op. cit.*, p. 530. Hawley and Prachuabmoh's list contains the following items, with their weights in parentheses; automobile (15), motorcycle (8), television (7), well-electric pump (6), electric fan (6), electric iron (6), sewing machine (6), radio (5), bicycle (5), newspaper subscription (4), well-no pump (3), sanitary latrine (3), clock or watch (2), and thermos bottle (1).
 27. A study of Taiwan by D. S. Freedman, "The Role of the Consumption of Modern Durables in Economic Development," *Economic Development and Cultural Change*, 19 (October 1970), pp. 25-48, also found a close relationship between various measure of modernity and the ownership of modern consumer durable goods. Interestingly Freedman discovered that savings were positively associated with the ownership of modern con-

Insofar as the material cited above indicates anything systematic, it would seem to point to the distinct possibility that the desire to participate in fertility control programs is associated with a desire to acquire modern consumer durable goods. If, in fact, this is the motivation for birth control, then it is not implausible to argue that the marginal income released by the prevention of births will find its way into expenditures on consumer durable goods, not additional savings.²⁸

One additional consideration weighing against the presumption that a reduction in family size will generate additional savings concerns the scale effects of consumption. Thirteen of the fifteen commodities on Hawley and Prachuabmoh's list and eight of the nine items on Freedman's list are items which would normally be purchased on the basis of one per household. As successful fertility programs reduce the birthrate they inevitably have the impact of reducing the size of the household; as a result, per capita calculations systematically overstate the gains in real income garnered from successful programs of birth control. The impact of scale considerations in consumption will have to be weighed against the gains presumably ensuing in terms of additional savings generated by successful antifertility programs.²⁹

The argument of the last section of the paper, to recapitulate, is that successful programs of fertility reduction will not significantly reduce the number of households within a generation. As a result of the constant fertility and reduced fertility populations having very nearly the same number of households and the same national income, per household income will be changed only in a minor way. Furthermore, there are good reasons to presume that the overwhelming bulk of the additional income released by fertility control will find its way into additional consumption, particularly of durable goods, and not into savings. Another factor weighing against the positive per capita income effects of fer-

sumer durable goods. Freedman considered the following goods, without weights, in the analysis: sewing machine, bicycle, electric rice cooker, electric iron, electric fan, radio, motorcycle, clock, and radio-phonograph.

28. It should be recognized that one of the consequences of a successful program of fertility reduction, if accompanied by a commitment to international specialization on the basis of comparative advantage, is to shift upward the import function with consequent difficulties for the balance of payments.
29. See E. Kleiman, "Age Composition, Size of Households, and the Interpretation of Per Capita Income," *Economic Development and Cultural Change*, 15 (October 1966), pp. 37-58. As Kleiman points out a "... decline in the size of households means that part of the rise in incomes is swallowed by the negative effect of the decrease in scale...", p. 43. For a discussion of scale effects in energy consumption see

tility control is that there will be negative scale effects in the pattern of household consumption and this will accentuate the impact on the demand for consumer durable goods discussed above.

CONCLUSION

This paper is an attempt to sound a cautionary note in face of the enthusiasm for the presumed effects of a reduction in the rate of population growth on the level of savings an LDC can generate. While there can be no denying that a reduction in fertility levels can have dramatic effects on per capita income, these effects are minimal when viewed from the perspective of a household, the locus for decision making relative to present versus future consumption. When this consideration is linked with the probable motivation for participation in family planning programs, it would appear to be highly unrealistic to anticipate that a program of fertility reduction, unaccompanied by other policies, would have the impact of significantly altering the level of savings generated by a LDC. If the case for control of population growth is presented as a "painless" way to achieve economic modernization and, subsequently, proves to have been ineffective in achieving an increase in the society's rate of capital formation then there is the danger that this failure could cripple arguments for population control which rest on a sounder basis. Consequently, great caution should be exercised in stating the probable economic consequences of reduced fertility, particularly as it relates to the level of savings, until such time as systematic information on consumer data from the LDCs enables one to speak with confidence about household responses to smaller spending units.

M. Corr and D. MacLeod, "Getting it Together," *Environment*, 14 (November 1972), pp. 2-9, 45. Preliminary research would indicate that scale effects were a major contributing factor to the economic success of the Oneida Community, the most successful, at least in economic terms, of the nineteenth century American utopian communities.

*AGGREGATE EFFECTS OF POPULATION
ON CONSUMPTION IN DEVELOPING COUNTRIES*

*Dale Heien
Consultant*

INTRODUCTION

The theory of the aggregate consumption function has been the subject of considerable professional concern. Numerous empirical investigations have been conducted on the subject, mainly with a view toward ascertaining the value of the marginal propensity to consume (mpc) out of current income. For developed countries the mpc is a crucial parameter because of the implications for the government spending multiplier and the overall structure of macro models. Mainly, because of the relatively moderate and stable population growth experienced by developed countries, the effects of population change on aggregate consumption expenditures have been ignored. However, consideration of the aggregation problem has forced investigators into making various assumptions regarding the structure of population growth. For example, in their studies on the Life Cycle Hypothesis, Ando and Modigliani were prompted to assume that the age distribution of the U.S. population had not changed over the postwar period.¹ This assumption is sufficiently at variance with the facts as to warrant skepticism concerning the validity of the conclusions reached under the assumption. Recently, Heien undertook an investigation of the determinants of aggregate consumption expenditures which provided a framework for relaxing this assumption in a manner which was consistent with the underlying theoretical structure.²

The purpose of this paper is to outline a methodology for incorporating the effects of population growth in a consumption function model and then to show how this methodology may be applied to developing countries. The analysis will be conducted in terms of the effect of population change on the savings ratio (in view of its importance for developing countries) as opposed to the mpc. Such a framework requires three basic building blocks: a theory of multiperiod consumption, a lifetime income notion, and, a theory of how consumption requirements may vary over the life cycle and over family size.

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1. A. Ando and F. Modigliani, "The 'Life Cycle' Hypothesis of Saving," *American Economic Review*, 53 (March 1963), pp. 55-84.
 2. D. Heien, "Demographic Effects and the Multiperiod Consumption Function," *Journal of Political Economy*, 80 (January/February 1972), pp. 125-138.

A THEORY OF LIFE CYCLE SAVINGS

The Multiperiod Utility Function

The first of these three building blocks is the notion that the individual consuming unit (family) derives utility not only from current consumption, but also from the levels of consumption expected in future periods. This may be formulated in general terms as

$$U = f(C_0, C_1, C_2, \dots, C_{N-1})$$

where C_0 is consumption in the current (present) period, C_1 is consumption in the next period, and so on, and N is the total number of periods under consideration (or the planning period). The actual utility function employed for this analysis is a CES (constant elasticity of substitution) type of the form,

$$(1) \quad U = \sum_{i=0}^{N-1} C_i^\rho$$

$$\sigma = \frac{1}{1-\rho} < 0 \qquad \delta > 0$$

where σ is the (constant) elasticity of substitution between consumption in period i and period $i + 1$. This type of function while having several theoretical drawbacks (homotheticity mainly) is more general than the one employed by Modigliani and Ando and has the advantage of being sufficiently simple to enable analytic derivations. The consuming unit is then assumed to maximize this utility function subject to the wealth constraint which is the subject of the next subsection.

Lifetime Income

Lifetime income V , or total wealth, as it is sometimes termed, is simply the discounted sum of all present and future income of the individuals, or,

$$(2) \quad V = Y_0 + \sum_{i=1}^{N-1} Y_i^e (1 + r_0)^{-i}$$

where Y_i^e is the expected value of income in period i and r_0 is the current rate of interest. Making the assumption that consuming units expect (real) income to remain constant,

$$(3) \quad V = Y_0 \sum_{i=0}^{N-1} (1 + r_0)^{-i},$$

which is the definition of lifetime income used in this paper.

Consumption Requirements

One important consideration in any theory of life cycle consumption is recognition of the fact that consumption "needs" or "requirements" vary over the life cycle of the consuming unit. One way of treating these requirements, which is frequently used in single period consumption analysis, is the specification of so-called subsistence levels of consumption.³ Letting θ_i be the consumption requirement in period i the utility function can now be modified to read

$$(4) \quad U = \sum_{i=0}^{N-1} (C_i - \theta_i)^\rho.$$

According to the above specification, the consuming unit now derives utility from the consumption in excess of the subsistence amount, θ_i . The above function is homothetic with respect to the translated orthant defined by the various θ_i . The effects of family size can then be incorporated into the analysis by letting the subsistence parameter depend on family size, or

$$(5) \quad \theta_i = \gamma \cdot \text{FS}.$$

With this analysis the specification of the life cycle model is complete. The final problem is the determination of the optimum quantities of the C_i to be consumed.

The consuming unit is assumed to maximize the utility function as

3. See, for example, M. Brown and D. Heien, "The S-Branch Utility Tree: A Generalization of the Linear Expenditure System," *Econometrica*, 40 (July 1972), pp. 732-747; and R. Pollak and T. Wales, "Estimation of the Linear Expenditure System," *Econometrica*, 37 (October 1969), pp. 611-29.

given by (4) and (5) subject to the budget constraint given by

$$(6) \quad \sum_{i=0}^{N-1} C_i (1+r_0)^{-i} = V.$$

Doing this results in consumption demand relations of the form,

$$(7) \quad C_i = \gamma \cdot FS + [(1+r_0)^i]^\sigma \left\{ \sum_{i=0}^{N-1} [(1+r_0)^i]^\sigma (1+r_0)^{-i} \right\}^{-1} W$$

i=0, ..., N-1

where

$$(8) \quad W = V - \gamma \cdot FS \cdot \sum_{i=0}^{N-1} (1+r_0)^{-i}.$$

As given by (7) there are N consumption demand equations. However, only one, the current consumption (C_0) demand equation is of interest. This function is given by

$$(9) \quad C_0 = \gamma \cdot FS + \left\{ \sum_{i=0}^{N-1} [(1+r_0)^i]^\sigma (1+r_0)^{-i} \right\}^{-1} W$$

and when aggregated over all individuals is called the aggregate consumption function. When applied to a single individual it will trace out the time path of the savings income ratio over time as interest rates, family size, and in particular the planning horizon N, vary.

AGGREGATION OVER INDIVIDUAL CONSUMPTION UNITS

This section of the paper considers the consequences of aggregating relation (9) over all of the P consuming units in the population. Consider restating (9) as

$$(10) \quad C_{0j} = \gamma_j FS_j + \left\{ \sum_{i=0}^{N_j-1} (1+r_0)^i \right\}^{\sigma-1} W_j \quad j=1, \dots, P.$$

Aggregate consumption C, is given by

$$(11) \quad C = \sum_{j=1}^P C_{0j}.$$

Applying the summation to the right hand side of (10) is impossible because of the nonlinearities and dissimilarities of the parameters involved. If we assume that all individuals have the same parameters (the same σ 's, and γ 's) aggregation of (10) to a manageable expression is still impossible unless the assumption is added that all members of the population have the same time horizon (N_j). This is clearly unrealistic in view of the age structure of any given population. Assigning all individuals the same behavior parameters, but retaining the N_j 's and aggregating yields,

$$(12) \quad C = \gamma \sum_{j=1}^P FS_j + \sum_{j=1}^P \left\{ \sum_{i=0}^{N_j-1} (1+r_0)^{i(\sigma-1)} \right\}^{-1} W_j$$

which again offers no hope in terms of manageability.

One methodology which can be used to overcome this aggregation problem is to specify a "representative" consumption unit whose age, family size, and time horizon parameters are determined by the age structure of the population. The consumption function is now given by

$$(13) \quad \bar{C} = \gamma \cdot \bar{FS} + \left\{ \sum_{i=0}^{\bar{N}-1} (1+r_0)^{i(\sigma-1)} \right\}^{-1} \bar{W}$$

where

$$(14) \quad \bar{W} = \bar{V} - \gamma \cdot \bar{FS} \sum_{i=0}^{\bar{N}-1} (1+r_0)^{-i}$$

and

$$(15) \quad \bar{V} = \bar{Y} \sum_{i=0}^{\bar{N}-1} (1+r_0)^{-i} ,$$

and \bar{Y} is per capita disposable income, \bar{C} is per capita consumption, \bar{FS} is the average family size, and \bar{N} is the horizon of the representative consumer. One way of constructing \bar{N} then would be to compute the median age of the population and subtract this figure from the life expectancy for a person the median age of the population.

Empirical estimation of (13), while possible, is beyond the scope of this paper. However, the derivation of some demographic effects is possible on an *a priori* basis. Consider the effect on consumption, \bar{C} , of an increase in family size, \bar{FS} . This effect is given by,

$$(16) \quad \frac{\partial \bar{C}}{\partial \bar{FS}} = \gamma \left[1 - \left\{ \sum_{i=0}^{\bar{N}-1} (1+r_0)^{-i(\sigma-1)} \right\}^{-1} \left\{ \sum_{i=0}^{\bar{N}-1} (1+r_0)^{-i} \right\} \right].$$

For positive interest rates ($r_0 > 0$)

$$(17) \quad \frac{\partial \bar{C}}{\partial \bar{FS}} > 0$$

for any $\sigma > 0$. Hence, increases in family size will always reduce the savings ratio.

The effect on consumption of increases in the planning horizon, N , must be found by finite differencing since N occurs only as a discrete variable. The expression we wish to evaluate is $\frac{\Delta C}{\Delta N}$, where

$$(18) \quad \Delta \bar{C} = \bar{C}(\bar{N}+1) - \bar{C}(\bar{N}) = (\bar{Y} - \gamma \cdot \bar{FS}) \left[\left\{ \sum_{i=0}^{\bar{N}} (1+r_0)^{i(\sigma-1)} \right\}^{-1} \left\{ \sum_{i=0}^{\bar{N}-1} (1+r_0)^{-i} \right\} \right. \\ \left. - \left\{ \sum_{i=0}^{\bar{N}-1} (1+r_0)^{i(\sigma-1)} \right\}^{-1} \left\{ \sum_{i=0}^{\bar{N}-1} (1+r_0)^{-i} \right\} \right]$$

and $\Delta N = 1$.

For value of $\sigma > 0$,

$$\frac{\Delta C}{\Delta N} < 0$$

so long as $(\bar{Y} - \gamma \cdot \bar{FS}) > 0$. Hence, increases in the planning horizon result in a decrease in aggregate consumption expenditures. For example, based on a per capita income of \$2200.00 and letting $\gamma \cdot FS = 1200$, the elasticity is $-.15$. Increases in the birth rate will tend after say twenty years to lower the median age of consuming units and hence increase N , as will increases in life expectancy.

*COST-BENEFIT ANALYSIS OF FAMILY PLANNING
PROGRAMS: SOME METHODOLOGICAL ISSUES*

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INTRODUCTION

A few years ago, Harvey Leibenstein published a paper¹ in which he raised a number of important criticisms of the methods proposed by Enke and his associates for the analysis of benefits and costs of birth prevention.² One of his principal criticisms was that the welfare criteria underlying the evaluation of benefits had not been well specified, and he concluded that until "a satisfactory set of social welfare criteria for birth prevention" are available, cost-benefit analysis cannot meaningfully be applied in this area.

If this view is accepted, it would appear that one would have to be somewhat pessimistic about the possibilities for integrating population planning with general economic planning. An essential aspect of economic planning can be taken to be the allocation of an economy's resources over some period of time in such a way that they are used most productively. If cost-benefit methods cannot be meaningfully applied in the area of family planning, there would seem to be no way of deciding whether allocation of resources to projects in this area represents a sufficiently productive use of them for the projects to be justified. This would clearly have serious consequences for decision making in the area of population planning.

It seems to the present author that many of the criticisms raised by Leibenstein are indeed valid, as well as his conclusion that much of the work on cost-benefit analysis in the population planning area has suffered from ambiguity in terms of the welfare criteria that have been used. The purpose of this paper is to propose that this ambiguity has resulted from a failure to distinguish between two separate types of economic functions of family planning programs, namely, (1) the function of meeting the demand for family planning services on the part of the existing population, and (2) the function of reducing fertility and the population growth rate and hence increasing the future level of per capita income. As will be attempted to be demonstrated below, if one restricts attention to the first function, the productivity of resources spent on family planning activities can, in principle, be assessed using methods entirely comparable with those used for the cost-benefit analysis

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1. H. Leibenstein, "Pitfalls in Benefit-Cost Analysis of Birth Prevention," *Population Studies*, Vol. 23 (July 1969), pp. 161-170.
 2. S. Enke, "The Economics of Government Payments to Limit Population," *Economic Development and Cultural Change*, Vol. 8 (July 1960), pp. 339-348; "The Economic Aspects of Slowing Population Growth," *Economic Journal*, Vol. 76 (March 1966), pp. 44-56.

of any development project. The second effect, however, is one that relates to the distribution of income over time rather than to allocation efficiency in the ordinary sense; it must therefore be accounted for by other methods than cost-benefit analysis.

The organization of the remainder of the paper is as follows. The next section considers the cost-benefit analysis of a family planning program which is simply organized to meet a given demand for family planning services. This is the case that would most closely correspond to the "normal" situation in which cost-benefit methods could be used without conceptual ambiguity. In the following section of the paper, however, it is argued that one of the important aspects of a family planning program is to set up a system through which information on methods of family limitation and its consequences can be disseminated to the public, thereby increasing the demand for family planning services. How this aspect of a program can be evaluated from a cost-benefit point of view, and how it will influence the profitability analysis of the provision of services, is briefly considered. Then there is a discussion of the difficult but nevertheless crucial question whether a fertility reduction should be considered an economic benefit, and hence whether it is justifiable on economic grounds to attempt to enhance the effectiveness of a family planning program by providing economic or other incentives to induce people to have fewer children; as already noted, this is considered a problem of income distribution rather than of economic efficiency. Although it is not possible to provide more than an exploratory discussion of the difficult issues in this area, the conclusion at this stage is that some form of such incentive is likely to be economically justifiable in many low income countries. The question how such a scheme will influence the profitability of family planning projects is dealt with briefly. The last section of the paper is devoted to a summary and some qualifying comments.

THE PROVISION OF FAMILY PLANNING SERVICES

The normal method of cost-benefit analysis of a project consists in evaluating its monetary costs and benefits over time and, through a discounting process, finding the net present value of benefits minus costs³ (and, of course, assessing the project as profitable if the net present value is positive). When the output of a project is small

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3. An equivalent criterion which is sometimes used is to find the ratio of discounted benefits to discounted costs; a project will then be considered profitable when its cost-benefit ratio exceeds unity.

enough in comparison with the existing flows of the commodity in question, the project output may simply be evaluated at the prices at which the commodity will actually be sold in the market. When this is not the case, that is, when the output of the project is large enough so that it will substantially affect the market price of the commodity, this method underestimates the flow of benefits. A theoretically accurate measure involves the evaluation in money terms of the additional consumer's surplus generated by the project as an additional benefit.⁴ As an approximate way of taking this into account, the output flows are sometimes evaluated at a unit price halfway between the market prices that would prevail with and without the project output.

In principle, the evaluation of the social profitability of a family planning program, which at this stage is taken simply as consisting of the provision of various types of family planning services to meet an existing demand, could be carried out using this type of cost-benefit methodology. The benefits would consist in the value to consumers of the increased quantities of the various types of such services, given the demand for them at the fees which were to be charged. Generally, the market price method would not be applicable, because a family planning program normally involves the provision of a variety of goods and services which had not previously been available, or available only in small quantities and at relatively high prices. Finding the appropriate price at which to evaluate the benefits will become quite difficult in these situations; for example, for a previously unavailable service, the relevant price would be about midway between the fee charged under the program and the lowest price at which the demand for the service would equal zero: clearly the estimation of the latter will be essentially an arbitrary guess.⁵ In addition, the prediction of the quantities of services demanded in future time periods may be especially difficult in this area. Changes in people's attitudes regarding reproductive behavior are notoriously difficult to forecast, as is the impact the existence of a family planning program may have on the speed with which these attitudes change. In spite of these practical difficulties, however, one may take the view that there is essentially no qualitative difference between the measurement of benefits from the provision of family planning services and similar measurements for other types of projects.

The estimation of the costs of a family planning program also involves complicated practical problems despite its conceptual straight-

4. See, for example, E.J. Mishan, *Cost-Benefit Analysis* (London: George Allen and Unwin Ltd., 1971), Chapter 7 and Note B.

5. It may be worth noting that this method can be applied even when the market price of the output of the project is zero, as would be the case if one were to assess the value of the services of a park or the value of water provided free of charge.

forwardness. In the first place, there are the usual difficulties associated with an accurate estimation of the social opportunity costs (that is, the relevant shadow prices) of the resources to be used. In the area of family planning, particularly complex problems would be involved in the evaluation of the appropriate opportunity costs of the services of doctors, nurses, and midwives in situations where the salaries of such personnel bear little relation to the value to the public of the services they perform; on the other hand, direct measurement of this value is difficult when no fees are charged for medical services or where fees are set at highly subsidized levels. Secondly, in situations where the provision of family planning services is part of a more comprehensive program of medical services, it may not be easy to separate out those portions of total program costs which are due to the family planning component.

As was noted above, one of the factors that would influence the estimate of the benefit stream over time would be the fee charged for the provision of a particular type of family planning service. Not only would the fee level affect the valuation of a given quantity of services, it would also help determine the size of the program to the extent that the demand for family planning services is related to their cost to the user. To the cost-benefit analysts, therefore, the question of what constitutes an appropriate set of fees for different services is a highly important one. If a family planning program is considered simply as the activity of providing services in response to an existing demand for them, most economists would hold that the fee for each type of service should be approximately equal to the incremental cost of providing it, that the principle of marginal cost pricing should be applied. This means that users of family planning services should generally be charged at least the full cost of any birth control devices, as well as for the services of medical personnel.⁶

Whereas it might be somewhat difficult to apply this principle in a precise way due to problems with the estimation of incremental social cost, it might generally be expected that its use would imply considerably higher fees than are normally charged in family planning programs in low income countries at the present time. To the economist, this would be an indication that excessive resources have been allocated to these activities, in the sense that at the margin, a transfer of resources to other uses would yield goods and services of a higher value than

6. For expositions of the marginal cost pricing principle see, for example, the introductory essays in R. Nelson (ed.), *Marginal Cost Pricing in Practice* (New York: Prentice Hall, 1964) or O.E. Williamson, "Peak-Load Pricing and Optimal Capacity Under Indivisibility Constraints," *American Economic Review*, Vol. 56 (1966), pp. 810-27, reprinted in R. Turvey (ed.), *Public Enterprise* (Penguin Modern Economic Series, 1968), pp. 64-85.

the marginal value to the users of the family planning services. The extent of this discrepancy would be greater the larger the elasticity of demand for the services, that is, the greater the extent to which people would discontinue the use of family planning services in response to higher fees.⁷

It has been noted several times, however, that the view taken of family planning thus far in the discussion has been a narrow one; that its benefits simply consist in providing family planning services in response to an existing demand based on existing individual preferences. This view implicitly assumes that the price people are willing to pay for a commodity can be taken as a true reflection of its social value. If it can be demonstrated that this is inappropriate in the case of family planning, certain modifications of the cost-benefit methodology may be necessary. Thus, in what follows, two types of reasons why the existing demand for family planning services cannot be taken as reflecting its social value will be discussed: on the one hand, the lack of information regarding methods of family limitation, and, on the other, the impact of family planning on the intertemporal distribution of welfare.

FAMILY PLANNING INFORMATION

Strictly speaking, the principle of estimating the marginal social value of a commodity by the price that individuals are willing to pay for it at the margin assumes that individuals are fully aware of the alternative choices open to them. There are of course many instances where this assumption represents a gross distortion of reality; for example, where a project involves making a new technology or a new commodity available. Clearly a family planning program, which to a large extent involves making available previously unknown techniques of fertility control, is such a case. The question then arises whether the cost-benefit methodology becomes inapplicable as a consequence of this fact or whether it can be modified to take into account the dissemination of family planning information, as well as the provision of services, as objectives.

To some extent, the rate of dissemination of the knowledge of family planning techniques must be implicitly taken into account even when one uses traditional cost-benefit methods, since this rate will

7. This reasoning, of course, does not imply that a family planning program needs to be financially profitable in order to be socially profitable; profitability and pricing should be based on social costs and benefits which may differ considerably from financial costs and revenues.

influence future demand for family planning services and hence the future stream of benefits. The interesting question, however, is whether it is economically justified to spend additional resources specifically for the purpose of spreading such information. Although this is not a type of problem which has been extensively treated in the literature, it would seem that the logic of cost-benefit analysis lead to a positive answer, provided that the increase in the discounted value of the benefits were sufficiently high to offset the combined cost of the informational activities and the extra resources required to provide the additional services. The increased benefits represent increases in human welfare as a consequence of people having been made better aware of their alternatives through family planning information, so that one can argue that resources spent for this purpose contribute just as much to welfare as resources spent on direct provision of goods and services for which there already exists a demand.

A related question of considerable interest is whether the information aspect of family planning programs might justify a departure from the principle of marginal cost pricing in the early stages. Again the answer would appear to be in the affirmative. Subsidized fees for family planning services may increase the rate at which they are used, and if this has a demonstration effect so that the future demand for the services becomes greater than it otherwise would have been, there may result as increase in the future net benefits of the program which is sufficient to offset the real cost of the subsidy.⁸

Thus it appears that the cost-benefit methodology can be extended in such a way that it can be applied to the information component of a family planning program. This is of particular importance for the evaluation of the profitability of programs which represent early stages of a family planning policy, such as are currently being implemented in many low income countries where the existing demand for family planning services is not great; a large proportion of the resources tend to be devoted to information and propaganda in such cases. Using the criterion given above, programs of this sort can only be economically justified if the increase in the discounted net benefits in the future are enough to offset the cost of these resources. Needless to say, the practical application of this criterion will involve a great deal of guesswork as it involves forecasting the demand for family planning services, perhaps into the distant future, as well as of the impact of information and propaganda on this demand. Nevertheless, it represents a conceptually unambiguous method whereby the profitability family planning projects can be compared with other development projects.

8. The real cost of a subsidy scheme consists of the welfare losses inherent in the fact that with a subsidy, some of the resources used in the early stages have an opportunity cost in excess of the marginal value of the services produced.

*FERTILITY REDUCTION AND THE INTERTEMPORAL
DISTRIBUTION OF WELFARE*

The foregoing discussion has rested on the assumption that a family planning program can be considered simply as an activity which will increase welfare by providing a set of services for which a demand already exists or for which there would be a demand if the public were informed about the advantages of fertility limitation. It was further argued that the social profitability of providing such services should be evaluated using the same type of cost-benefit methodology as is applied to the analysis of projects aimed at providing any other type of commodity. However, in much of the literature dealing with the relationship between population growth and economic welfare, the view taken of the profitability of family planning activities has been quite a different one. It has been shown that a lowering of fertility and hence of the population growth rate will yield benefits in the form of higher levels of per capita income in the future. Generally speaking, the objective of a family planning program has therefore been seen as that of reducing fertility in order to achieve future benefits, rather than that of satisfying a spontaneous demand for family planning services. The general nature of the method suggested for evaluation of the profitability of a program has been that of comparing the discounted value of the increased income resulting from a given amount of fertility reduction with the costs of achieving it.⁹ An interesting question which now arises is the extent to which these two approaches to the profitability question are consistent with each other, or, more generally, whether a proper cost-benefit analysis requires that the two approaches be combined in some manner. This question is discussed in the following paragraphs.

In general, the application of traditional cost-benefit methods is designed to achieve an optimal allocation of an economy's resources over

9. Coale and Hoover, in their pioneering study, analyzed the relationship between fertility and future per capita income for the case of India. A. J. Coale and E. M. Hoover, *Population Growth and Economic Development in Low-Income Countries* (Princeton, New Jersey: Princeton University Press, 1958). S. Enke's work on cost-benefit analysis of fertility reduction is well-known. See in addition to the sources cited in note 2, the paper prepared for the Agency for International Development by TEMPO, General Electric's Center for Advanced Studies under the general supervision of Enke, *Description of the Economic-Demographic Model* (Santa Barbara, 1968). See also A. C. Blomqvist, "Foreign Aid, Population Growth, and the Gains from Birth Control," *Journal of Development Studies*, Vol. 8 (October 1971), pp. 5-22

time, given the distribution of welfare. The latter condition must be imposed to ensure that the amount of money that individuals are willing to pay for a commodity can be taken as an unambiguous reflection of its social value in the evaluation of the benefits from a project. In the discussion of cost-benefit analysis of family planning services in the previous section, any impact on the distribution of welfare was disregarded; it was implicitly assumed that welfare redistribution was not in itself an objective of such programs. However, if the objective of population policy is seen as that of fertility reduction, the distributional considerations cannot be disregarded: indeed, the essence of a policy aimed at reducing fertility can be seen as a desire to influence the distribution of welfare between present and future generations. If a society wishes to redistribute welfare toward future generations, it may do so by diverting a larger share of the economy's resources toward physical capital formation, thereby stimulating economic growth and achieving higher levels of consumption in the future; an alternative method which leads to similar results is to institute some type of policy to reduce fertility. One might argue that a policy of the latter sort makes possible a lower level of physical capital formation, and hence a higher level of present consumption, without reducing per capita income in the future, and that a fertility reduction policy therefore meets the test of Pareto optimality. But this already presupposes that some given level of future income is desired, that society has some objective with respect to the intertemporal distribution of income. If this argument is correct, however, it follows that an application of cost-benefit methods to fertility reduction programs in fact requires explicit introduction of distributional criteria; the fact that this has not been well recognized in some of the work in this area seemed to have been one of the main points of Leibenstein's paper referred to in the introduction.

Most people would probably recognize, however, that increasing future income levels, even at the cost of present sacrifices, is a social objective in most low income countries. If this is the case, the question arises whether a policy of fertility reduction is more effective at the margin than a high level of physical capital formation in achieving such a redistribution of welfare toward future generations. The analysis required to answer this question, and hence to assess whether a fertility reduction incentive scheme is economically justified, is extremely complicated. Such a scheme might involve some type of tax or subsidy payments which would increase the opportunity cost to parents of raising children, as well as the provision of family planning services. It has been argued by Enke that at a given time, a tax or subsidy program of this kind essentially involves a redistribution of resources within the economy, and therefore does not represent a real resource cost.¹⁰ However, if one takes into account the utility that

10. S. Enke, "The Economic Aspects of Slowing Population Growth," *op. cit.*

parents derive from having children, one can easily show that with a tax or subsidy scheme which brings the private cost of child-rearing to a level above the opportunity cost of the resources used in this activity, a real welfare loss will result. In Figure 1, on next page, N denotes the number of children desired by a representative couple, and C stands for the discounted opportunity costs (in terms of consumption foregone) of raising a child. Line DD represents the number of children parents would like to raise at different opportunity costs. Suppose, for example, that this cost in the absence of a tax/subsidy scheme is constant at C_0 . Parents would then strive to achieve a family size given by N_0 . If a tax/subsidy scheme is imposed, the opportunity costs might rise to C_1 , say, and the desired family size would decrease to N_1 . An approximate measure of the welfare loss is then given by the shaded triangle in Fig. 1.¹¹ Furthermore, a scheme of this kind will represent a redistribution of income at a given point in time away from families with many children; this clearly will be regarded as undesirable in a society in which a high degree of equality of income is an objective, so that this effect may be regarded as a welfare cost as well.

An analysis of the optimal combination of fertility reduction and physical capital formation as methods of raising future income would thus involve, on the one hand, weighting of the welfare costs just discussed against the increases in future income and, on the other hand, a comparison with the same effects when the rate of physical capital formation is increased. It is quite obvious that, at the present time, a lack of information on the economic relationships involved as well as on the relative weights that are attached to the different distribution objectives in a given society, precludes a precise comparison of this nature. At least to the present author, however, the considerable amount of work that has been done on the problem of assessing the long-term effects of reduced fertility on the level of per capita income provides a convincing demonstration of the potential effectiveness of

11. Since this is analogous to the standard analysis of the welfare costs of the imposition of a tax on the consumption of any commodity, it is implicitly assumed that decisions with respect to fertility can meaningfully be analyzed in economic terms. Although some recent work appears to indicate that this is an empirically useful assumption, it is clearly not a universally accepted one. See T. W. Schultz, *et al.*, "New Economic Approaches to Fertility," proceedings of a conference sponsored by the NBER and the Population Council, *Journal of Political Economy*, Volume 8, No. 2 (March/April 1973). Somewhat different types of welfare losses will be involved in such policies as payments to induce men to have vasectomies or women to avoid pregnancy through the use of some forms of contraceptive techniques; however, they could be analyzed in a similar manner.

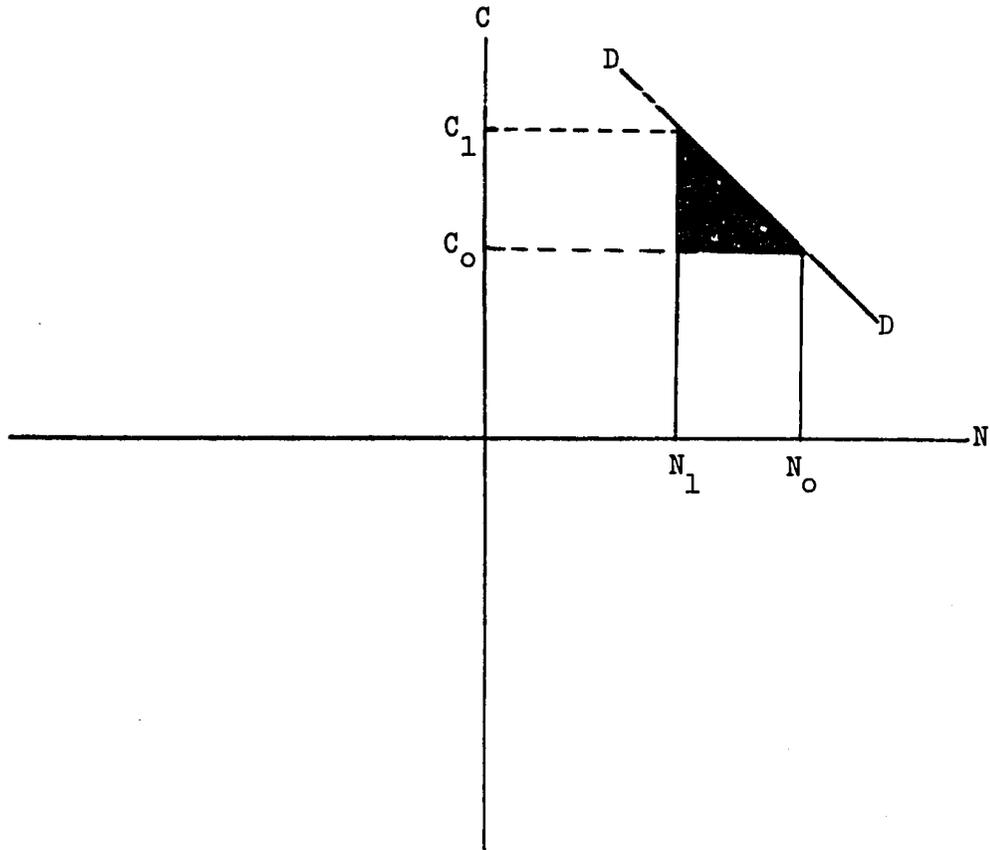


FIGURE 1. Relationship Between Number of Children Desired (N) and Discounted Opportunity Costs (C).

this type of policy as a way of redistributing welfare toward the future. Given that such a redistribution is an objective, it therefore seems likely that there are many countries in which some form of incentive policy is justified.¹²

Thus far in the discussion, the attempt has been made to separate what the author believes to be two logically distinct objectives of a population policy -- the objective of meeting a given demand for family planning services and that of intertemporal distribution. It has been argued that different welfare criteria are appropriate depending on whether a particular project or policy is considered as having one or the other objective. In "real world" population planning, however, both objectives tend to be present simultaneously, and there is a great deal of interdependence between projects involving the provision of family planning services and policies aimed at reducing fertility.¹³ The question therefore arises what analytical methods and planning procedures should be used in order to formulate an integrated policy which is optimal from the point of view of both objectives.

In general, a policy of subsidizing a particular technique of population control as a means of reducing fertility will be an inefficient way of achieving this objective. As Leibenstein has stressed,¹⁴ such

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12. In spite of this, there is little evidence of tax policies designed to provide incentives to reduce fertility in low income countries, other than subsidized family planning services in some countries. See H. Brown and A. Sweezy, *Population: Perspective, 1971* (San Francisco: Freeman, Cooper, and Company, 1972); and United Nations, *Measures, Policies and Programmes Affecting Fertility, with Particular Reference to Natural Family Planning Programmes* (New York: Department of Economic and Social Affairs, Population Studies No. 51, E 72.XIII .2, 1972). Income tax statutes typically provide for deductions for dependent children, and perhaps more importantly, the provision of services such as free schooling and health care considerably lowers the private cost to parents of raising children. Nevertheless, one may perhaps expect that as the long-term economic effect of policies of this nature become more widely appreciated, there will be some tendency to modify them.
 13. In fact, Enke has generally focused his analysis on programs involving the provision of family planning services, but the objective he has considered has been the intertemporal distribution one.
 14. H. Leibenstein, *op. cit.*, p. 166.

a measure may not have much of a net impact on fertility but may instead simply cause substitution between different types of population control. It seems clear that an efficient policy for reducing fertility would involve some form of tax/subsidy scheme which directly impinges on the opportunity cost to parents of raising children, leaving individuals free to choose the particular method to be used in the light of their preferences and the cost of different methods.¹⁵ Because of the long time lags between a fertility reduction and some of its effect on the level of income, the economic analysis of such a tax/subsidy scheme will necessarily involve a lengthy time horizon, and should ideally be carried out within the context of general long-term development planning. At this stage, it would be unrealistic to try to formulate detailed plans for the provision of different types of family planning services, even though rough estimates of their cost and availability will be required in forecasting the response to incentives toward fertility reduction.

If a policy of this nature is implemented specifically for the purpose of influencing the intertemporal welfare distribution, then it is logical to argue that decisions on individual projects involving the provision of family planning services should be made taking this distribution as given. But in those circumstances, the prices people are willing to pay for such services can be taken as an accurate reflection of their social value, as noted above, and cost-benefit analysis of the projects concerned can be carried out using the methods already discussed. Clearly, an interdependence exists between the profitability of providing family planning services and the policy with respect to fertility reduction incentives, in the sense that the demand for the former will be heavily influenced by the latter. But the point is that given the demand, the evaluation of the benefits of family planning projects can be carried out using normal cost-benefit methods. It may be argued, in addition, that the pricing of family planning services should essentially be based on the marginal cost principle discussed earlier; in a situation where direct incentives are used to encourage reduced fertility, there would generally be no economic justification for implicitly subsidizing any particular method of fertility control by pricing it below cost.¹⁶

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15. It may nevertheless be the case that a policy of subsidizing particular techniques may be better than no policy at all, at least if there is some net fertility reductions. It can be shown that such a policy will have a greater welfare cost, for the same fertility reduction, than a "direct" tax/subsidy scheme.
 16. See, however, the section of the present paper, entitled *Family Planning Information* for a possible exception to this principle, that is, when the public has insufficient information on family planning techniques.

SUMMARY AND CONCLUSION

The main points of the paper may be summarized as follows. In the introduction, it was argued that some of the weaknesses in existing attempts to apply cost-benefit methods in the area of population policy, as noted by Leibenstein, arise because of a failure to distinguish between two separate objectives of such policies, namely, (1) to meet the existing demand for family planning services, and (2) to use population policy as a means of influencing the intertemporal distribution of welfare. The paper next discussed the application of cost-benefit methods to projects involving the supply of family planning services to meet an existing demand, that is, projects designed to meet objective (1). The conclusion was that these methods can be validly applied in exactly the same way as for a project supplying any other commodity.

In the discussion of population policy as an instrument for redistribution welfare over time, it was argued that though there is now considerable evidence that a policy aimed at reducing fertility is in general an efficient way of achieving such a redistribution, the subsidization of particular kinds of family planning services does not represent an efficient implementation of such a policy. The appropriate type of incentives would instead be taxes or subsidies which directly influence the private cost to parents of raising children without regard for the particular method of fertility control. Given a decision to implement an incentive scheme of this kind, the design of an economically efficient system for the provision of family planning services, including the choice of methods of fertility control to be offered, geographical distribution of family planning facilities, and the like should be made using the normal type of cost-benefit criteria in order to ensure that efficient use is made of the resources employed in these activities, given the demand for different types of services and their relative costs.