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## SOME NOTES ON RESEARCH POSSIBILITIES

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This is not an essay. It is rather a statement of some of the ways in which population changes, and an indication of kinds of research that might be undertaken on interrelations between movements of population and movements of output.

1. Population may increase (decrease) at a constant rate or at a rate that varies regularly or irregularly. With each constant rate there is associated, when a population has become stable, some age composition. In general, the fraction of persons in the productive age-category, say 15-64, is at or near the maximum in a stable population when its rate of growth is zero; the fraction diminishes with increases in age-specific fertility and hence in the rate of growth. The fraction changes as a population moves from one fertility or growth level to another, whether or not the initial and terminal populations are approximately stable; generally it rises (falls) with a decline (increase) in age-specific fertility.

2. A careful study might be undertaken, in one or more countries with good statistics, of the manner in which additions to the population of working age are actually added to the labor force. It may be that samples particularly intended to illuminate this question would be necessary. Similar studies might be undertaken in Japan or India. Such studies would permit isolation of some of the circumstances favorable (unfavorable) to the absorption of increments to the labor force. Studies may disclose something of the manner in which the labor force, or at least the employed labor force, responds to changes in the rate of natural increase 15 to 20 years earlier, e.g. whether sex composition of the labor force changes, whether hours worked per week per employed person change, or whether new increments crowd unduly into certain more easily entered occupations.

3. It has been maintained (e.g. by Cassel, Myrdal, and others<sup>1</sup>) that, when the urban labor force is growing relatively rapidly in consequence of urban natural increase and of net immigration from rural areas, the amplitude of the trade cycle is greater than when the urban labor force is growing relatively slowly, as it tends to do when urban natural increase is

small, when the rural sector is small compared to the urban, and when net immigration is not adding significantly to the labor force as it has in a few countries (e.g. U.S.A., Canada, Australia). For when the urban labor force is growing at a high rate, activity can continue to rise for a relatively long time before shortage of labor and rising labor costs check the advance. How the amplitude of the cycle is affected by the rate of population growth might be subjected to careful statistical analysis in a number of countries.

4. The demand for capital varies with the rate of population growth, other conditions given. A subject of considerable importance, therefore, and hence one indicated for research, is the way in which the aggregate demand for capital has varied with variations in the rate of population growth, other conditions given. Estimates of the correlation of variation in the aggregate demand for capital with variation in population growth have been attempted by D. C. MacGregor of the University of Toronto and R. J. Lampman<sup>2</sup> of the National Bureau of Economic Research. These studies relate, respectively, to Canadian and American experience. Of interest would be studies of the experience of relatively underdeveloped countries for which fairly satisfactory data are available. It is possible that the data for Japan are in good enough condition to permit such a study over a fairly long period of time.

5. The whole subject of the interrelations of the international migration of people and of capital needs to be re-examined, theoretically and empirically. The main work done in this area has been that of Brinley Thomas.<sup>3</sup> Some has been done also by Kuznets<sup>4</sup> in conjunction with his studies of American growth.

6. A companion investigation might be made of the manner in which the demand for capital fluctuates with variations in the rate at which either the population or the labor force grows as a result of natural increase. Particular kinds of capital requirements and of labor requirements are oriented to particular segments of the population and hence fluctuate as the rate of growth of these segments fluctuates. Thus the demand for capital in the form of school buildings, etc., varies somewhat with the rate of growth of the population of school age; the demand for housing capital and furnishings varies somewhat with the rate of growth of the population of marriageable and household-forming age; the demand for industrial and related forms of capital varies with the rate of growth

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<sup>1</sup>Gustav Cassel, *The Theory of Social Economy*, New York, 1932, Chap. 15; Gunnar Myrdal, "Industrialization and Population" in *Economic Essays in Honour of Gustav Cassel*, London, 1933, pp. 435-457 and Dorothy S. Thomas, *Social and Economic Aspects of Swedish Population Movements, 1750-1933*, New York, 1941, Chap. 3.

<sup>2</sup>R. J. Lampman, "Paying the Price for Higher Fertility," in *Problems of United States Economic Development*, II, Committee on Economic Development, 1958, pp. 339-346.

of the population of working age; etc. Studies of the response of the demand for various such categories of capital to variations in the rate of population growth are indicated.

7. When demands for particular categories of capital, or for the services of particular occupations, are under consideration, it is necessary to distinguish between replacement demand and additions to aggregate demand. This distinction is not, of course, an object of research. It is noted separately here merely because of its importance in the study of the impact of population-growth changes.

8. The composition of gross national product and of additions to the stock of durable or reproducible wealth tends to be affected by variations in the rate of population growth, since capital cannot be formed rapidly enough to satisfy the demands for all forms of it. This has been brought out by some of Kuznets' studies<sup>5</sup> and it can also be seen from data available on the composition of the gross national product in many countries. Changes in composition are interesting not only because they provide evidence of the scarcity of savings. They are also of significance for study of the rate of growth of national income. For, given even little difference in capital-labor ratios, marked differences in output-capital ratios are likely to be encountered, since some forms of capital investment are much more productive than other forms. Accordingly, with other conditions given, the rate of growth of output is greater (less) as increments to capital are made to assume more (less) productive forms. Research into the effect of variations in the rate of population growth upon the composition of increments to the stock of capital and hence upon the rate of growth are indicated.

9. Usually, when the impact of population growth upon the demand for capital is studied, it is taken for granted that the character of the capital remains unchanged. This assumption may not be valid. If income and savings are limited, increased pressure on income arising from population growth may result in the purchase of less expensive forms of equipment. This is what E. Schiff<sup>6</sup> found about housing demand some years ago. When family size increases beyond some point, the demand for capital (e.g. housing) can no longer be increased because income is limited; accordingly, less expensive equipment (say housing) is utilized and the

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<sup>5</sup>Brinley Thomas, *Migration and Economic Growth*, Cambridge, 1954.

<sup>4</sup>Simon Kuznets, "Long Swings in the Growth of Population and Related Economic Variables," *Proceedings of the American Philosophical Society*, February 1958, pp. 25-52.

<sup>5</sup>Kuznets, *op. cit.*, pp. 31-36, 49-50; also Simon Kuznets and Raymond W. Goldsmith, *Income and Wealth of the United States; Trends and Structures*, Bowes and Bowes, 1952, pp. 180, 190, 202 ff.

<sup>6</sup>E. Schiff, "Family Size and Residential Construction," *American Economic Review*, March 1946, pp. 97-112. See also R. A. Gordon, "Population Growth and the Capital Coefficient," *ibid.*, June 1956, pp. 307-322.

aggregate demand of the family for the kind of capital in question no longer increases with family size. Research is needed on the manner in which family expenditure upon housing and home-oriented durables responds, quantitatively and qualitatively, to increases in family size.

10. It has been contended that capital tends to be formed, within limits, at a higher relative rate in societies in which the population is growing than in those in which it is not growing, on the grounds that the time horizon of growing populations is longer. Yet, statistical studies have revealed that, with other conditions given, the amount of saving done in relation to income varies inversely with family size. There is need for a careful study of the impact of population growth upon the rate of saving and the rate of capital formation. Account needs to be taken of the fact that a great deal of the capital formation that takes place does so independently of the kinds of motives that underlie response of family saving to changes in family size. Account needs to be taken of the composition of capital formed within households compared with that formed in other sectors.

11. Since a population can choose between adding to its flow of goods and services, or to its numbers, or to its leisure, an increase in population operates, other conditions given, to diminish the consumption of leisure or at least to make it less than it otherwise would have been. Inquiry may be made, therefore, into the impact of variations in the rate of population growth upon the tendency to reduce the length of the working week, other conditions given.

12. It has been noted, by implication, that *ceteris paribus* the age composition of underdeveloped countries is much less favorable (10-15 per cent perhaps) to production per capita than is that of developed countries. The relative smallness of the number of persons of working age seems to be compensated in part by the early age of entry into the labor force. Inquiry is indicated regarding the extent to which such early age of entry is attributable to unfavorableness of age composition rather than to other circumstances. Other impacts of unfavorable age composition may be studied.

13. In general, educational conditions in underdeveloped countries, though subject to much variation, are quite inferior to those of more advanced countries. It is also evident that the ratio of persons aged, say, 20 to 64 years to those aged, say, 5 to 19 is much lower in underdeveloped than in developed countries. Inquiry is indicated regarding the degree to which the inferior quality of provision for education in underdeveloped countries is attributable to unfavorable age composition.

14. It has been maintained, e.g. by A. A. Young,<sup>7</sup> that increase in

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<sup>7</sup>A. A. Young, "Increasing Returns and Economic Progress," *Economic Journal*, December 1928, pp. 527-542.

size of population is favorable to growth of output per capita because it makes possible ever greater division of labor. It has been maintained by others that a country like the United Kingdom could maximize its economies of scale, division of labor, etc., with a population much smaller (say 20 million) than that currently found in that country. Inquiry is badly needed into the limits to division of labor and into the extent to which growth of numbers can or does make for increasing division of labor and higher output per capita. Such inquiry would be pertinent not only to advanced countries, but also to Latin American countries which are still "free" to decide how large their populations are to be.

15. It is widely believed that population growth makes for rising per capita income by keeping the demand for capital abreast of voluntary savings at full employment, and by giving maximum incentive to entrepreneurs to introduce the best methods available, since if population is growing rapidly the market will always be large enough presently, if not at the moment, to absorb whatever is produced. In the United States today, for example, probably no factor is given greater weight in producing "prosperity" than population growth. Trade cycle and development theory need to be carefully canvassed and tested empirically insofar as possible to assess the validity, if any, of this belief. It should also be noted how the degree of validity of this belief, if it be found partly valid, varies with the manner in which an economy is organized, whether it is less valid, for example, in a mixed than in an essentially free-enterprise economy.

16. A corollary to point (15) is inquiry into the extent to which population growth generates inflation. In general, inflation takes place because investment outruns saving and the difference is financed through recourse to additions to the money supply. As has been noted above and as is further noted below, population growth requires and absorbs capital and thus increases the pressure of investment upon the necessarily limited supply of savings. Population growth thus makes more intensive the pressure toward inflation arising from development in general. This pressure is more conducive to inflation in less developed than in developed countries, moreover, other conditions given, since in underdeveloped countries bottlenecks are more numerous and the mobility of factors among places and occupations may be relatively low.

17. Population growth is usually accompanied by increasing concentration of population in cities, since indexes of concentration appear to be increasing functions of population size. Such concentration gives rise to certain economies. It also gives rise to certain costs which may not be adequately taken account of by the manner in which gross and net national product are computed. Because of increasing population size and concentration, the amount of "free" income per head tends to fall. Various costs, connected with rising transport and service outlays, tend to increase.

The problem has been dealt with by Kuznets<sup>8</sup> and others when comparing income in advanced and underdeveloped countries; but it has not been examined in terms of the impact of population growth itself in particular countries. The inquiry is pertinent to underdeveloped countries in that they may be able to regulate somewhat the degree to which their populations become concentrated and thereby economize on the use of capital.

18. Careful estimates are needed of the cost of population growth in terms of per capita income foregone when, with returns constant, population continues to grow. The effect of age composition has been noted in point (12). More important is the fact that capital which might have been used to increase mental and physical equipment per head is used to outfit new increments. It has sometimes been said that 3 to 5 per cent of a nation's net national product is needed to offset a one per cent per year rate of population growth, given the forms which additions to reproducible wealth typically assume. This figure may be translated into terms of per capita income foregone. Other costs might be similarly transformed.

19. Particular studies of particular underdeveloped countries are indicated, since there is in some quarters a foolish disposition to suppose that, because Western Europe was able to develop when its population was growing at less than one per cent per year and its rate of capital formation was under ten per cent, densely populated underdeveloped countries growing at two or more per cent per year and forming capital at small rates can develop after the manner of the West. This disposition is even supported financially by the United States. A model study is that by A. J. Coale and E. M. Hoover<sup>9</sup> of the alternatives confronting India, and of the great gain in per capita income to be had from a rapid reduction of age-specific fertility. Similar studies might be made of a number of underdeveloped countries in Asia and North Africa. Several might also be made of Latin American countries where, although the man-land ratio is much superior to that found in Asian countries, population is growing at unprecedentedly high rates which, if continued, must eventually affect per capita income adversely.

20. In the past, population projections have been based upon the supposition that GNP would increase sufficiently to accommodate the postulated population growth. Output projections have been based on the supposition that numbers, manhours, and output per manhour would grow at postulated rates. Each type of projection has failed to take explicitly into account that growth of numbers is a function of growth of output and vice versa. Models might be contrived that took into account this functional interdependence under varying conditions. The applica-

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<sup>8</sup>Simon Kuznets, "National Income and the Industrial Structure," in his *Economic Change*, Norton, 1953, pp. 145-191.

<sup>9</sup>*Population Growth and Economic Development in Low-Income Countries*, Princeton, 1958.

bility of such models might then be tested against, say, British, or American, or other experience, much of which seems to have been characterized by long-run swings in rate of growth of both population and output per head. The studies of Kuznets<sup>10</sup> and Brinley Thomas<sup>11</sup> have already revealed the swing-like character of these movements. Conceivably these movements might be simulated and their determinants sequestered through use of electronic or other computers.

21. It is supposed correctly that a growing population is more flexible, or adaptable to change, than one that is not growing. The question should be, however, how much more flexible. Thus it is said that shifts in demand are harder to adjust to in a stationary population because they are not cushioned by growth of population. This statement may be true, but how important is it? Much capital has many uses and is subject to high rates of depreciation. Of the labor force component in a given occupation, a considerable fraction is likely to be mobile, and, as life-table analysis indicates, a considerable fraction is soon removed by death, disability, and retirement. A study of the degree of flexibility characteristic of the stock of capital and of the labor force, respectively, together with applications of its findings, might permit an effective assessment of the extent to which an economy's flexibility, or adaptability to change, varies with rate of population growth.

22. There is a disposition today to play down the role of renewable (i.e. water, agricultural) and nonrenewable (i.e. principally mineral) resources. This disposition has been fed by the fact that outlay on resources constitutes a diminishing fraction of GNP and input per unit of output of various forms of produce or raw material has been greatly reduced in recent years. It is overlooked that the supply of renewable resources is subject to upper limits, set by accessible land and water; and that the nonrenewable resources come from a diminishing stock which may or may not be replenishable through the discovery of suitable substitutes in abundant supply. It is also overlooked that the capacity of a country to import a great many raw materials is subject to what Walter Isard calls the "friction of distance." It is essential that the role of resources in income formation be studied, and that the impact of population growth upon this role be examined. Considerable information has been and is being assembled and analyzed by or for Resources for the Future, Inc. A part of this inquiry might be directed to separating out the impact of population growth upon resource use and prospects. A careful companion study of the experience of Japan, whose situation has been well described by E. A. Ackerman, and another of the experience of Britain might also be undertaken; such study would add greatly to our knowledge of the costs and problems found by countries highly dependent upon foreign resources.

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<sup>10</sup> See footnote 4 above.

<sup>11</sup> See footnote 3 above.

23. In nineteenth century Western European countries population seldom grew as much as one per cent per year, even though, with the exception principally of France, natality did not begin to fall continuously until the closing quarter of the century. Net emigration reduced national growth somewhat. In Eastern Europe where natality was much higher than in the West, high mortality and, later in the century, heavy emigration kept down the rate of population growth. This rate remained relatively high, however, and its height may have accentuated other forces retarding economic development in these parts. In the United States population grew about 3 per cent per year between 1800 and 1860, but thereafter advanced at a lower rate despite the heavy inflow of immigrants; for the American birth rate, which exceeded 50 around 1800, fell continuously, much as in France. It may be said, in general, that natality did not always fall in the West as industrial development proceeded and that when it did begin to fall, it usually fell slowly, starting from levels much lower than those in the underdeveloped world. There are, in short, no grounds for drawing the inference from Western experience that natality will fall rapidly in underdeveloped countries; nor does Japan's demographic history support such an inference.

The introduction of death control has reduced mortality in underdeveloped countries to levels attained only in recent decades in the West. Meanwhile, with the exception of Japan and several Latin-American countries, the underdeveloped world continues to be characterized by birth rates of the sort that have always prevailed, that is, rates ranging from the high 30's to the high 40's and even into the 50's. Nor is there much, if any, evidence to suggest that declines in natality are imminent. Unprecedentedly high rates of natural increase, rates of 2-3 per cent or more, rates often higher than that found in nineteenth century America, are the result. With these rates, there can be but limited long-sustained improvement in per capita income, if even that much.

Inquiry is indicated into the local circumstances underlying this very high age-specific fertility in various underdeveloped countries, into the values and institutions that are ultimately responsible, and into alternative means of dissipating the forces making for this high natality.

24. A study of the impact of American governmental expenditures in underdeveloped countries upon population growth in these countries might be attempted by someone with an interest in this topic.

25. A study is indicated of the role of the world's leading religions in fostering population growth. In the beliefs and practices of some religions there seems to lie a major deterrent to bringing numbers under effective control. This may or may not be the case. At all events, careful inquiry is indicated, because of the influence of natural increase upon the movement of per capita income.