Commentary on Birth and Death

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IN THIS beautiful lecture on optimum population policy, Partha Dasgupta returns to some of the path-breaking themes he touched upon in his Cambridge doctoral dissertation (the central chapter of which was published in 1969), enlightened by his own thinking over the ensuing decades and that of others. It is unfortunate that these topics have not received the attention they deserve, especially as we have become increasingly aware of our planetary boundaries, limitations that standard economists, with their love of constant returns to scale technologies and exponential growth, have consistently ignored.

No question could be of greater economic or philosophical importance than that addressed here, especially now that we have the easy means of controlling our population. Dasgupta devotes much of his attention to some deep philosophical questions about how we should think about an increase in population size, questions that were discussed early on by the utilitarians. A Benthamite, for whom the social welfare function is simply the sum of utilities (and what Dasgupta refers to as Total Utilitarianism), would presumably seek simply to maximize that sum. The resulting calculus is simple: compare the utility of an added individual to the decrement in utility of those previously existing. This requires not only an assessment of marginal utilities, but also of "absolute" utility levels, both of which the New Welfare Economics that came into fashion in the middle of the twentieth century strongly eschewed. Dasgupta provides a persuasive argument against such welfare nihilism.

In these brief remarks, I do not want to comment further on the many philosophical issues that Dasgupta exposits better than I possibly could. Rather, I want to highlight some intuitions and complexities associated with even the simplest utilitarian frameworks. Still, I should emphasize that Dasgupta approaches the problem somewhat differently, from a more philosophical/ethical set of concerns, and accordingly his analysis does not necessarily fit squarely with that presented in these comments.

It is clear that population is an arena where individual rationality cannot be relied upon to generate socially optimum outcomes. Each individual, in making his own decision, presumably focuses on his own well-being, appropriately framed to include his evaluation of the well-being of his descendants and the weight that he gives to their well-being. Even if we assumed a high degree of rationality in that decision-making process, each individual presumably takes prices and the state of congestion of the world as given, taking no account of the fact that, when other like-minded people similarly make decisions, it does affect prices and the state of congestion. In short, what are now referred to as macroeconomic externalities are pervasive.[1]

Wearing another hat, the individual (as a citizen), wishing to maximize some notion of social welfare, might have views that differ from those of the (same) individual, making his own private decisions. That there can be such discrepancies is familiar: in paying my taxes, I may minimize my tax obligations, *given the law*. At the same time, I may vote for laws that result in higher taxes for myself (and other similarly situated individuals). When I don the hat as a voter, I think of what kind of society I want to live in. In this role, I may well put more or less weight on the desirability of having a larger population.

Dasgupta's discussion adds further to the analysis by calling attention to a critical distinction between developing and developed countries and the consequences of the limitations of our biosphere. In developing countries, there are market failures, and children are both

1. Macroeconomic externalities are the extension to macroeconomics of the important microeconomic pecuniary externalities uncovered by B. Greenwald and J. E. Stiglitz (1986), "Externalities in Economies with Imperfect Information and Incomplete Markets," *Quarterly Journal of Economics*, 101(2), 229–264. See the discussion below for a further elaboration on these externalities.

productive assets and a means of reducing the risks associated with old age. In developed countries, children often represent a financial liability, and whatever pleasure they generate for the parents, they surely reduce the levels of "own-consumption" available to the parents. And while children often bear some of the risks associated with old age, much of the burden has shifted to the public. Thus, there is a change in the calculus of child-bearing, reflected in most advanced countries: the demographic transition, resulting in smaller families—indeed, in many advanced countries, below the self-sustaining level.

There is one more important element in the demographic transition: the reduction in uncertainties associated with early death. With a risk-averse utility function, families may target a larger family size to offset the risk that large numbers may die in infancy or childhood. Dasgupta's formal analysis abstracts from these elements of uncertainty.

The greater awareness of the limitations of our biosphere should also lead to a smaller optimum population—smaller than would be individually rational. It acts much like a congestion externality. Assume that individuals do not like being on crowded beaches. Then an increase in the size of the population lowers the well-being of each individual, an effect which each family does not take into account in making its reproductive decisions (unless it is acting perfectly altruistically). Similarly, if we were all engaged in agrarian activities, and there were a fixed amount of land, increased population would be reflected in a decrease in output per hour worked, and a decrease in standards of living as population increases. Each family (with rational expectations) takes wages and land rents as given, and thus ignores the macroeconomic externality generated as increased population pressure drives down wages (with consequent implications for labor supply).

One more change in our societies that amplifies the effects just discussed is urbanization, the result of the change in the structure of production. We no longer live in an agrarian economy, so the effects just described on wages and agrarian land rents are of less importance, but there are many other aspects of the population pressure on our biosphere. But setting those aside, with urbanization there is now an "artificial" scarcity created by the desire to be, say, near the city center or other locations where economic and social activities occur.

As population increases, these urban land rents increase, and especially so in contexts where there is not an optimum spatial distribution of population and/or there are natural geographical limitations

(e.g., those posed by the island of Manhattan). Again, each family, in making its decisions, ignores these macroeconomic consequences.

The factors just discussed, by themselves, would presumably lead to too large a population (even in developed countries, where not taking into account congestion effects would lead to too large a family). Yet, there are some counteracting forces. A somewhat nationalistic example illustrates: Consider a country worried about conflict with its neighbors, in a world (largely gone by) where victory depends on the (relative) size of the population. As a voter, I would like others to have more children, so much so that I would be willing to vote for a child subsidy. It is clearly possible that in this situation, the optimum population is greater than that which is individually rational. Dasgupta naturally abstracts from such situations in his lecture: he focuses on the problem of the world as a whole.

But there are still other factors that might lead to a too small population, most importantly related to one more aspect of changes in the structure of production: the importance of technological change, whether the result of research and development, learning by doing, or investing (which were discussed by Arrow in his classic 1962 papers[2]). These give rise to a natural non-convexity, increasing returns to scale. The larger the population, the higher the output per capita and/or the rates of increase in output per capita. Think of this most simply: the real advances in standards of living are a result of innovations, breakthroughs in science.[3] Assume that those capable of making such breakthroughs occur at the extreme tails of the distribution; then the larger the population, the larger the number of these "innovation" individuals and the faster the pace of innovation—from which all benefit.

In this perspective in the absence of the constraints imposed by the biosphere or of congestion effects, the larger the population, the

2. K. Arrow (1962), "Economic Welfare and the Allocation of Resources for Invention," in *The Rate and Direction of Inventive Activity: Economic and Social Factors*, ed. R. Nelson (Princeton, NJ: Princeton University Press), 609–626; K. Arrow (1962), "The Economic Implications of Learning by Doing," *Review of Economic Studies* 29(3), 155–173.
3. See, e.g., J. E. Stiglitz and B. Greenwald (2014), *Creating a Learning Society: A New Approach to Growth, Development, and Social Progress* (New York: Columbia University Press). Reader's Edition published in 2015 (originally presented as the first Arrow lecture).

higher the average utility, and so long as, on average, the marginal individual has a positive utility, the greater the population, the higher social welfare. But we cannot abstract away from those effects, and the implication is that there is a population that maximizes average utility (i.e., there is an inverted U-shaped curve of utility as a function of population size; note the contrast between our analysis, balancing the constraints of space and the biosphere and returns to scale in innovation, with the conventional analyses, which simply assume constant returns to scale). Denote the level of population at which average utility is maximized by N^*. So long as the social welfare population assigns some weight to the size of the population (i.e., so long as the utility level of the marginal individual at the optimum is positive), then the optimum population size is greater than that which maximizes (average) utility. Because individuals in their own reproductive decision-making ignore both the congestion and scale effects (negative and positive externalities), the equilibrium population will be at $N = N^*$ (i.e., it is less than the social optimum).

There are still other complexities. Dasgupta rightly, in my judgment, emphasizes the importance of sustainability, using a more general social welfare criterion focusing on relative well-being. If individuals, in making their own reproductive decisions, focus less on the well-being of future generations than society as a whole would and should, then individuals will pay insufficient attention to how decisions today decrease future well-being; but this is even true if individuals and societies use the same criterion, simply because individuals fail to take into account the macroeconomic externalities associated with their decisions. This restores the presumption that there will be excessive population.

The discrepancy will be especially large if there are large nonlinearities in the stresses population imposes on the biosphere, in the absence of adequate regulatory and pricing systems. Individuals at time t may decide to have a population at time $t + 1$ that is greater than the tipping point, at which there is systemic collapse, described so vividly by Jared Diamond (2005). If that is the case, the approximations provided by Dasgupta on the extent of overpopulation may not be valid. And this may be especially so if there are stochastic fluctuations in reproduction (given any set of reproductive decisions) or the biosphere's carrying capacity.

An important question that follows from any analysis suggesting that the population is likely to be too large is whether there are policy

interventions that could correct the market distortion. The answer is probably yes, especially given recent evidence that, in advanced countries, family decision-making is resulting in reduced populations. Making families bear more of the costs of children and imposing charges to reflect macroeconomic externalities can help align private and social costs. However, especially the former can have large implications for societal equity. Regulatory measures, such as softer versions of China's one-child policy, may be more equitable, but in democratic societies they are socially distasteful.

One of the hardest issues raised by population ethics concerns equity: when families bear some of the costs of child-rearing (and children are not productive assets), then richer families have an opportunity set that may "allow" them to have more children than poor families; for instance, if parents have to pay for the education of their children, and basic decency requires them to provide a minimum level of education to each child, then a poor family might be able to afford at most one child, while a rich family is unconstrained. Specific egalitarianism (Tobin, 1970) argues that there are certain goods to which access should be given regardless of income. The constitutions of many countries recognize this principle in terms of basic rights (e.g., the right to access to health care). The right to have at least two children may be viewed by some to fall within this rubric. Thus, measures to discourage excessive populations must be progressive. This can be achieved by combining per-child transfers to families for up to, say, two children, with the charges described in the previous paragraph. But this puts some of the burden of population policy on the children of lower-income parents who decide to have larger families. It may well be argued that it is unethical to make these children pay for the "sins" of their parents.

The use of the utilitarian calculus, even the subtle and important variants explored by Dasgupta, raises difficult issues once we depart from models in which all individuals in all generations are assumed to be the same, or sufficiently similar, to represent their well-being (at least from the perspective of Dasgupta's Decision-Maker) by the same utility function. For just as we can ask how do we weigh the current generation against the future, we need to ask how do we weigh the well-being of some within the current generation against others. And then we need to combine the two. Upon first reading Edgeworth's (1881) discussion of optimum population decades ago, I was deeply disturbed,

and upon rereading it in preparing for these comments, I remain so. Edgeworth notes differences in productive and consumption capacities of different individuals, and that there is intergenerational transmission of these capacities. He asks, "*not* assuming that all sections multiply equally, [how do we] . . . find the average issue for each section, so that the happiness of the next generation may be the greatest possible?" After showing that, in the presence of resource constraints (i.e., the limited biosphere), population should be limited, he concludes with an extreme eugenic/Spencerian solution: "the average issue shall be as large as possible for all sections above a determinate degree of capacity, but zero for all sections below that degree."

In short, the implementation of optimum population policies raises a hard set of philosophical and ethical issues, perhaps as complex as those posed by the analysis of optimum population itself. That these questions are difficult is not a justification for not facing up to them; whether we like it or not, there will be profound implications for our society today and the future if we neglect to confront them head on.

For all the niceties I have raised in these comments on Dasgupta's Arrow Lecture, the central message, I believe, is correct: Societies, on their own, are likely to arrive at a population that is greater than the social optimum.

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