Commentary on Partha Dasgupta's *Birth and Death*

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Nearly fifty years ago, Partha Dasgupta published a now-classic article on optimal population size, "On the Concept of Optimum Population" (*Review of Economic Studies*, 1969). This was not a trendy subject in economics then (nor is it now), but something about it fascinated Dasgupta, perhaps the way it demands analysis of both an economic and a philosophical sort. And so he has returned to it from time to time over the years (e.g., in "Population Size and the Quality of Life," *Proceedings of the Aristotelian Society*, 1989).

Now, in *Birth and Death*, he has produced a profound and graceful essay that, besides economics and philosophy, brings in quite a bit of ecology too. In fact, the ecological elements give *Birth and Death* a decidedly gloomy cast: Dasgupta argues persuasively that humans are living well beyond their environmentally-sustainable means and that world population should be a good deal smaller than its current level, 7.4 billion, if humanity is to have a long and happy future.

At the heart of his analysis, Dasgupta proposes three formal models – one for a timeless world, one for a two-stage setting, and one for an indefinite succession of generations (the case of most relevance). In this brief commentary, I raise a few questions about the formulations and offer several alternative ways of looking at things.

Dasgupta begins the essay by reviewing how an outside observer of classical utilitarian inclination would choose the optimal population size in a timeless world. If total output available for consumption is $AF(K,N)$, where K is the stock of natural resources, N is population size, A is a scalar, and F is a linear homogeneous and concave production function, then the observer chooses N to solve

$$(*)\ \max_N\ NU(AF(K,N)/N),$$

where U is an individual's utility or "well-being" function (also presumed to be concave). Positive values of U correspond to a "good" life; negative values to a "not-good" life. Individuals are identical (so that formula $(*)$ corresponds to maximizing the sum of individuals' utilities, i.e., maximizing *total* utility).

This optimization entails a trade-off between population and utility: as N rises, U must fall (and vice versa). In particular, Dasgupta shows that if U is sufficiently concave, then the solution implies a large value of N (a big population) and a positive value U near 0 (individuals are leading good lives, but barely). The conclusion follows because for a highly concave U, increasing individuals' consumption more than a little above the zero-utility level doesn't improve their utilities much, but it *does* entail reducing the population considerably. So from the standpoint of *total* utility, it is better to keep utilities low and population high.

Derek Parfit has called this the "repugnant conclusion" - - the idea that individuals' utilities could be nearly zero in what purports to be an optimum - - and accordingly he rejects utilitarianism. Dasgupta counters Parfit by suggesting that once the point of zero utility has been established, we "should acknowledge that life for a person is good at *any* [emphasis added] standard of living exceeding it" (p.26). Dasgupta's logic is unassailable here. But even so I think there may be one (narrow) setting in which Parfit has a valid point.

Suppose that we think of the outside observer as a parent rather than an observer. The population he is choosing are his children (this interpretation seems consistent with the "Genesis Problem" label that Dasgupta gives to optimization $(*)$; think of God the Father doing the choosing). Like parents everywhere, he doesn't want life to be merely good for his progeny, he wants is to be *really* good. Thus, he chooses to bring children into the world only if their utilities exceed some critical level U^c. Dasgupta discusses Critical-Level Utilitarianism in section 4.6 of the essay and doesn't regard it favorably (for good reason). But perhaps under the parent-child interpretation that I am suggesting, it makes some (though limited) sense.

A couple more comments on the Genesis Problem $(*)$. First, let me quibble with the assumption that the function *U* is concave (this grumble is not with Dasgupta's own essay, but with the previous literature). The standard justifications of concavity are (i) inequality aversion and (ii) risk aversion. But I think both rationales are somewhat problematic here.

Inequality aversion is a matter that, in my view, arises when individuals' utilities are combined to produce *social* welfare; if $W\left(U_1,\ldots,\ U_n\right)$ is the social welfare function (where the U_is are individuals' utilities), then we say that society (or the observer) is averse to differences across individuals provided that *W* is concave. That is, inequality aversion is a property of *W*, not of the individual U_is. In Problem $(*)$, however, *W* is *linear;* utilities are simply added together, and so there is no room for inequality aversion.

As for risk aversion, I'm not sure that it has much to do with Problem $(*)$. Yes, an individual's von Neumann-Morgenstern utility function will be concave if he is risk averse, but this vN-M utility need not correspond to his *well-being*. Indeed, in Problem $(*)$ there is no uncertainty at all, and so it is not clear to me why an individual's attitudes toward risk should even be ethically relevant here.

Of course, *U* may turn out, in reality, to be concave for other reasons. I'm merely suggesting that the two conventional rationales for concavity are questionable.

Second, let me suggest that the assumption that, holding *K* fixed, the production function *F* is concave – although also standard – may be doubtful on a macro level. As the population grows, we typically expect there to be more goods available and (as Adam Smith explained vividly) more specialization of labor. But this implies that *F* should not be concave in *N*, but rather *convex* up to the point where natural resource constraints kick in. Now, because *F* will *eventually* be concave, none of Dasgupta's conclusions will be affected by allowing for a region of convexity. Nevertheless, once such a region is introduced, it becomes interesting to explore *average utilitarianism* à la John Stuart Mill – in which *U*, rather than *NU*, is the maximand –as an alternative to Dasgupta's total utilitarianism. Average utilitarianism in such a setting implies a finite and positive population size, but one considerably smaller than that under total utilitarianism (Dasgupta rightly dismisses average utilitarianism as unworthy of analysis when *F* is concave throughout, because it then produces the absurd result that $N = 0$).

When Dasgupta moves from the static setting of the Genesis Problem to a world with multiple generations of individuals, he reasons – convincingly– that the ethically relevant frame of reference is no longer that of an outside observer but rather that of those currently alive. Adapting the agent-centered prerogative advocated by Samuel Scheffler, furthermore, he makes a strong case that the current generation should give less weight to people not yet alive than to themselves.

Actually, it might be interesting to go even *farther* than Dasgupta in exploring Scheffler's principle that individuals should favor themselves over others. In the Dasgupta formulation, all existing people in an individual's cohort get the same weight as she does, and other (potential) individuals get less. But an alternative – and perhaps more purely "Schefflerian" – approach would be for a single (existing) individual (rather than the entire current generation) to perform the population optimization. This individual would put less weight on *all* other people, existing and potential. In the population 0/ population 1 model of section 7.1, an individual in existing population 0 of size N_0 would choose N_1 (the number of additional people to create) to solve

$$(**)\quad \max_{N_1}\ (1+\mu(N_0-1+N_1))U(AF(K,N_0+N_1)/(N_0+N_1)),$$

where μ is the weight placed on other people (notice that because all individuals in population 0 are identical, the solution is the same for all of them). This contrasts with formula (20) in Dasgipta's text, in which population 0 chooses N_1 to solve

$$(20)\quad \max_{N_1}\ N_0U(AF(K,N_0+N_1)/(N_0+\mu))+\mu N_1U(AF(K,N_0+N_1)/(N_0+N_1)).$$

I'm not in favor of replacing (20) with $(**)$. But a comparison of the two formulations may warrant some attention.

Dasgupta's final – and most important – model is one with a potentially infinite sequence of generations. I have two thoughts about it.

First, Dasgupta is utterly cogent on the point that the current generation should not seek to choose population sizes for generations beyond the next one; that is for future people to do. He views intertemporal population choices to be the *equilibrium outcome* of a game played amongst the generations. I agree completely with this perspective. However, rather than adopting the concept of *Nash* equilibrium here (as Dasgupta proposes on p.45), I would recommend *subgame perfect* equilibrium. To be more specific, Dasgupta has the current generation taking future generations' choices *as given* in equilibrium. Yet, if the current decision about population were to change, those later choices would likely change too. In other words, later choices should be thought of as *functions* of the current generation's decision. And it is this functionality that subgame perfect equilibrium delivers (and that Nash equilibrium doesn't).

Second, let's consider what happens if we adopt a fully individual-centered Schefflerian reformulation of the third model (by analogy to my reformulation $(**)$ of the second model). Notice that each individual in the current generation will put more weight on his own children than on those of others. So, if the choice of how many children to have is made family by family (rather than collectively), then the reformulated model will result in *higher* population levels than in the original model. This is because the modified model implies that a family will give less weight to the negative externality that more children imposes on others. This externality may be worth exploring further.

Even if we disregard other aspects of the essay (for example, its highly original ecological arguments), the models developed in *Birth and Death* already mark it as a major contribution to the ethics of population. If any of my remarks on modeling are worthwhile, perhaps they can help enrich the lively discussion that will surely follow the essay's publication. I hope they will.