Some people justify population control policies on the grounds that population growth reduces economic well-being. It is not clear, however, whether population growth strongly affects such economic variables as prices, incomes, unemployment, balance of trade, saving and investment, and economic growth. Recent assessments find the evidence weak and conflicting (World Bank, 1984; National Research Council, 1986; Kelley, 1988). Of course, many potential consequences of population growth would not be caught in the net of economic statistics, which mainly reflect the goods and services passing through markets. The most serious consequences of population growth may well be those afflicting nonmarket resources, particularly environmental resources and amenities. While pressure on such resources, if unabated, must eventually affect production and the economy, it need not do so discernibly for a considerable time. Analysis is further complicated because many environmental consequences are global and therefore are not evident in international comparisons of performance.

In any event, even if population growth were known to reduce the well-being of future generations, it would not automatically follow that such growth should be slowed. After all, individual couples choose their family size with full knowledge that children are costly, and that more children mean fewer parental resources available for each, and lower per capita income in the household. Is the societal view of the tradeoff between numbers and well-being, now and in the future, anything beyond the sum total of the parental views, which are implicitly represented in their individual decisionmaking about fertility? Some may argue "yes," that society should take a better-informed, less selfish, intergenerationally more egalitarian, and longer run view than individual parents. Perhaps this is so. But we will see that laissez faire in family size can lead to a socially undesirable outcome even when social goals are no different from those of parents.

The discrepancy between the laissez faire outcome and the socially optimal outcome arises because of "externalities to childbearing," that is, costs
and benefits of children that are passed on by the parents to society at large. When all assets are privately owned and there are no public sector and no public goods, then such externalities do not arise. In the real world there are many exceptions to these conditions (see Lee, 1988a), and externalities to childbearing are pervasive. Among the most important are environmental externalities, since many enjoyable and productive aspects of the environment are not privately owned: air shed, water shed, ozone layer, parks, climate, freedom from noise, and so on.

What are the connections among future well-being, family size externalities, and the environment? Garrett Hardin sketched them in a seminal 1969 article, writing eloquently of the “tragedy of the commons” as a metaphor for the population problem. At one time, he suggested, all villagers could freely graze their cattle on the commons. Self-interest led each villager to add more cattle until the incremental private gain to doing so fell to zero. Although each additional cow reduced the food for all other cows and thereby diminished their value, this total reduction was spread thinly over the many individual villagers, so that those adding cows bore only a small fraction of the cost. In this way, the social gains from adding cows were always less than the individual gains, and they turned negative well before the individual gains did. Consequently, the commons was overused and degraded, and each villager fared worse than he or she could have, if use had been generally lower. In this case, even if the social goal is nothing other than maximization of individual welfare, rational individual behavior will not lead to the social optimum, which can be reached only by collective regulation of use.

“Common property resources” are often taken to be those for which markets are absent or poorly developed, as in Hardin’s parable. In fact, in the past such resources have typically been efficiently managed by the communities that shared their use (Runge, 1981). The problems described by Hardin arise primarily after traditional management has been weakened by modernization or after increasing intensity of use, often due to population growth, makes previously abundant resources scarce, or innocuous behaviors harmful. Such is the case today for many resources shared by communities at the local, national, and global level, including water sheds and air sheds. Common property resources have special significance, for when they are present (and ineffectively managed), social and individual interests diverge, and a laissez faire policy does not lead to socially or individually optimal outcomes. Thus Hardin’s metaphor of too many cows on the commons could provide a powerful rationale for an interventionist population policy.

Crowding of cities, highways, and parks, pollution of air and water, overfishing, deterioration of the ozone layer, global warming from the greenhouse effect—these problems, which are certainly exacerbated by population growth, testify to Hardin’s insight. For many, they appear sufficient
reason for policies to limit fertility and population. Yet the logic is not entirely clear, and this view is open to a straightforward rebuttal: that the problems are not caused by population growth per se, but rather are due to faulty institutional arrangements. They arise because many common property resources are anachronistically treated as free access, with the predictable consequence that they are overused and degraded. Rather than tackle these problems indirectly and inefficiently through population policy, which is highly uncertain and at best brings change only in the long run, we should tackle them directly through optimal resource management. This might take the form of privatization, or imposition of user fees, or rationing and licensing, taxes and subsidies for users, or outright legislated levels of use. According to this view, once the common property resources are optimally managed, they pose no greater problem for laissez faire reproduction than do privately owned resources. Why not, then, adopt policies of the sort just listed and allow people to make their own fertility decisions unhindered?

In fact, though, there are two distinct problems, two tragedies of the commons. The first problem is that with a given population size, a free-access resource is subject to overuse and degradation, such that the existing population could be made better off on its own terms if use of the resource were limited. This problem arises because of the institutional arrangements and can best be addressed by altering these arrangements to establish the optimal level of use. Once this is done, however, a second problem remains, for even if the level of use is regulated for the existing population, there is still free access to the resource through reproduction. The optimal level of use per person depends on the number of people. Under optimal management, when the population is larger each person will be entitled to use the resource less—to visit Yosemite less often, to turn up the volume on his stereo less high, to burn less firewood, to discharge less waste. Furthermore, with a larger population, the optimal level of total use will generally be slightly higher (although less than proportionately so) and so each person will have to live with slightly more congestion, pollution, and degradation. Because each additional person is born with a birthright to public resource use, each birth inflicts costs on all others by reducing the value of their environmental birthright. Free access through reproduction is the second tragedy of the commons.

I have said that the first tragedy of the commons is appropriately remedied by direct policies restricting access, such as user fees or regulation. What of the second? We must pause here to consider how we may evaluate the tradeoff between numbers of people and quality of life, for pointing out that a tradeoff exists does not establish that smaller populations are better than larger ones. Much has been written on this issue, but one appealing approach is to view the tradeoff through the eyes of the parents (see Nerlove et al., 1987). This approach also permits the problem to be formulated in
much the way in which Hardin originally formulated the tragedy of the commons. We assume that parents care about both the number of children they have and the future welfare of their children. Thus parents, in deciding how many children to have, take into account the consequences for the future welfare of their children, and strike a balance between conflicting aims, a balance reflecting their own values and circumstances. The societal goal is taken to be nothing other than to benefit the current generation of parents on the parents’ own terms, and therefore to care about future welfare exactly to the extent to which they do. Under certain circumstances, including private ownership of all resources, it can be shown that no divergence of social and private interests occurs in this case; that is, individuals cannot, through collective decisionmaking, improve on the laissez faire outcome. When there are common property or free-access resources, however, the laissez faire outcome is suboptimal, and collective decisionmaking about reproduction will enable all parents to achieve a higher level of satisfaction by restricting fertility, just as the cattle owners in the original tragedy of the commons could all do better by collectively agreeing to reduce their herds.

Some economists have argued that the problem of free access through reproduction is effectively remedied by optimal resource management policies for the existing population, say user fees. A stiff charge for the use of Yosemite National Park, for example, would convey to all potential parents a message about the constraints their children would face, and this message would provide the optimal disincentive to reproduce. But this argument is fallacious. The user fees provide no childbearing disincentive, since they are a fee on use and not on procreation. The prospective child’s net wealth is not reduced by the fee he or she will pay in the future, for the fees, once collected, must be used to defray park management costs or general governmental costs, or be returned to the public in one way or another. These fees simply substitute for taxes that would otherwise be raised by some other means. This point is developed in more detail in the appendix.

If the optimal management policy does not also constitute an optimal fertility policy, then some other policy must be found. Many kinds are possible, but if a financial disincentive is chosen, it must be applied directly to the fertility decision: that is, it must be a tax of some sort on births. The appropriate level of the tax would depend on how much an additional birth reduces the satisfaction of all other persons through their use of nonprivate resources, and on the number of people so affected. This point is also developed in more detail in the appendix.

So many problems pertain to a heavy tax on childbearing that I believe it is useful only as a conceptual tool, and not as a practical policy. Yet the idea might provide a useful guide to thinking about alternative, more practical policies. Here are a few of the problems raised: Would such a tax leave the rich free to have as many children as they wished, and deter only the
poor? Would it be applied globally? Should the same tax be levied on a birth in Bangladesh as in the United States?

Certainly the environmental impact of a birth would depend on the wealth of the parents to whom it was born, and therefore the tax should vary with social class and nationality. Also, while the appropriate tax might make children very costly indeed, it would also lead to a disbursement of funds to the population. Other things equal (including fertility), the poor would gain at the expense of the rich, for the tax and transfer system should recognize that the children of the rich would consume a disproportionate share of the environmental birthright of the poor. Within each income stratum of each nation, income would be redistributed from those with many children to those with few; and across strata and across nations, income would be redistributed from the rich to the poor.

Herman Daly (in this volume) asserts that “the market cannot find an optimal scale any more than it can find an optimal distribution” and suggests that in a finite world, public policy should recognize explicitly the limits of resources and the environment and choose an optimal sustainable scale for the global economy. It is not clear what “optimal” would mean in this context. Given any sustainable level of aggregate consumption, one would still have to choose the appropriate population size and corresponding per capita level of consumption. Such decisions would be very difficult to make, defend, and enforce. But setting aside the question of optimality, it is certainly not true that the market economy is indifferent to scale. The classical economists described the convergence of the economic system to the stationary state, at which population, capital, and incomes would all cease to grow. This convergence depended on assumptions about the behavior of parents and capitalists. Many neoclassical theoretical systems likewise converge to stationary states when they include natural resources, although in fact they often ignore such resources. Assumptions about the reproductive behavior of parents would determine the qualities of the endpoint of economic growth, and under the assumption of inclusive markets and altruistic parental choice, the endpoint could indeed be claimed to be an optimal scale. In this view, parents vote on the optimal scale through reproductive choice, and we, unlike Malthus in his early writings, may hope that this decision is governed by rational minds, concerned about the future welfare of their children. However, in the presence of environmental (or other) externalities, the outcome of the vote would not have optimal properties—and this is the thrust of Hardin’s story of the commons, and of the argument I have advanced here.

Imagine, now, a policy equivalent to the hypothetical system of taxes on births, with taxes chosen to internalize the environmental costs of childbearing. Individual couples could choose a number of children consistent with their individual tastes, values, and circumstances. No particular sus-
tainable population size or individual level of fertility would be imposed by central authorities. It is not immediately clear to what kind of equilibrium size and level of economic activity such a policy would steer the population. For that matter, it is not clear that the long-run outcome would be a stationary state at all. Whatever its nature, the evolution of the system would ultimately reflect the preferences of the people in it. Whatever the tradeoff implicitly chosen between numbers and environmental quality of life, it would be theirs. This much cannot be said of the current situation, in which we are ineluctably driven to an environmental standard lower than we would choose for our descendants if we were able.

Appendix: Fertility choice and policy with a congestible free-access resource

Consider the following example of a collective externality, based loosely on Willis, 1987, pp. 666–668. Suppose a fixed homogeneous population of $N$ people has free access to a resource. Each derives satisfaction, $u$, from a level of use, $e$, but satisfaction is diminished by the amount of aggregate use of the resource by others, $Z = Ne$. Thus individual utility is given by $u(e, Z)$ with $u_1 > 0$, $u_2 < 0$. In the laissez faire outcome, each individual uses the resource to such an extent that its marginal utility falls to 0 (the price of use) and accepts whatever level of $Z$ the behavior of others imposes. (A small congestive effect on individuals arising from their own use can be ignored here when $N$ is large.)

The optimal level of use of the resource, however, will be less. A planner would maximize the individual utilities by choosing $e$ such that $U_e = -U_2 N > 0$, thus taking into account that each unit of additional consumption of $e$ by an individual imposes a cost $U_2$ on each of the $N$ members of the population. The planner could appropriately regulate use by establishing a user fee (for each unit of $e$) equal to $-U_2 N$. In any case, with or without optimal management, population growth worsens the problem, since $Z$, which yields disutility, increases monotonically with the population size. The overuse of the resource under laissez faire is the first tragedy of the commons, and its remedy is appropriate management.

The second tragedy of the commons arises when the population size is not fixed, but rather depends on the fertility decisions of the current generation. Suppose the utility of potential parents is given by $u(c, n, e, Z)$, where $c$ is their consumption now, $c_r$ is consumption by their average child in the future, $n$ is the number of children, and $e$ and $Z$ are defined as before, and refer to the children's future use of the free-access resource. (The current population's use is irrelevant and is ignored.) The current generation seeks maximum utility subject to the constraint that consumption is limited by $W = c_r + nc$ (where $W$ is the wealth available for both generations and can be stored without interest for the next generation).

The first-order condition on parent's fertility under laissez faire is $u/c = c_r$; that is, the private cost of a child equals the child's future consumption.
which must come out of W. But the planner will also take into account that an incremental child imposes congestion costs on all others. The planner's first-order condition would be: \( u_2/u_1 = e - (u_2/u_1)N e \). The difference between the two, \( (u_2/u_1)(N - 1)e \), is the cost imposed \( u_2/u_1 \) on all other parents \( (N - 1) \) by the future resource use of each additional child \( e \). To provide the correct incentive for optimal fertility, the planner may impose a tax on each birth equal to \( (u_2/u_1)(N - 1)e \), where these quantities should be evaluated at their optimal levels. Now this tax is quite similar to the optimal user fee (ignoring the denominator, \( u_1 \), which converts the amount from utilities to consumption units), and indeed it is the same if we multiply the expected level of use of the next generation's children, \( e \), by the user fee. It might appear, therefore, that the optimal user fee would also provide the optimal fertility disincentive.

The problem is that the user fees which are collected must also be disbursed, and each child should receive a share precisely equal to the amount the child has to pay in user fees (since all children are identical in tastes and income). Therefore, while the user fee does provide a disincentive for use of the resource, it does not provide any disincentive whatsoever for fertility, since it cancels out of the budget constraint of current parents. An optimal user fee will not suffice to avoid the second tragedy of the commons, and it is necessary to alter childbearing incentives directly by imposing a birth tax.

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**Notes**

1. Actually, even in this case externalities may arise because the birth rate alters the population growth rate and age distribution, which influence the rate of interest. See Lee, 1980 and 1988b and Ecksstein and Wolpin, 1985. However, when a recursive altruistic utility function is assumed, as in Willis, 1987 and Nerlove et al., 1987, externalities do not occur in this case.

2. That is, to a Pareto optimal outcome, in which no one can be made better off without making someone else worse off. This sort of optimality leaves aside the question of income distribution and focuses instead on efficiency.

3. A number of economic analyses have concluded that externalities to childbearing do not occur when all resources are privately owned (Ng, 1986; Willis, 1987; Nerlove et al., 1987; Lee, 1988a). Of course, externalities transcending national borders require international cooperation on policymaking and enforcement.

4. Historically, it appears that common property resources were communally managed in one way or another, to avoid such problems. In other words, common property resources were not free access resources.

5. See, for example, Willis, 1987, p. 671 and Ng, 1986.

6. Of course, the environmental cost of childbearing is only one of many costs, both positive and negative, that are not borne by the parents. In a recent paper I have attempted to address more generally the issue of externalities to childbearing (Lee, 1988a).

7. Daly goes on: "The latter requires the addition of ethical criteria; the former requires the further addition of ecological criteria .... In theory whether we double the population and the per capita resource use rate, or cut them in half, the market will still grind out a Pareto optimal allocation for every scale. Yet the scale of the economy is certainly not a matter of indifference."

8. See Pritchford, 1974 for a detailed discussion of these issues.
References


———. 1988b. "Declining fertility and aging population: Consequences for intergenerational transfers within and between households," manuscript of the Graduate Group in Demography, University of California, Berkeley.


