

Environmental and Resource Economics in the World of the Poor

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The Environment in Environmental and Development Economics

Environmental economics, as understood in the West, is a child of Resources for the Future (or RFF, as it is universally known). Pioneering work at this centre in the development of techniques for valuing environmental amenities, social cost-benefit analysis of investment projects, and the cost-effective regulation of pollution set the agenda for environmental economists in the United States and Canada in the 1960s and, subsequently, for those in Europe. These concerns continue to dominate the literature today. The 1992 survey of environmental economics by Maureen Cropper and Wallace Oates reflects this accurately.¹

On Mondays through Wednesdays each week I am comfortable with this state of affairs; but on Thursdays through Sundays I am overcome by doubts. In fact, I have suffered from this particular form of schizophrenia for over twenty years.

Economics is at its most luminous when it emerges directly from life's experiences. This is one reason why the inquiries initiated at RFF decades ago have both compelled and endured. But even if economics is the same everywhere, lives are not; and they are in part not because the environmental backdrop of lives differs across space and time. To be sure, if they differ today between the inhabitants of Los Angeles and those of Bemburu, a village in a micro-watershed of the Alaknanda river in the central Himalayas in India, they differ also between the High Country in Colorado and the urban sprawls of the Eastern Seaboard. Much of the art of practising economics lies in exploring the differing consequences of such differences. In this lecture I will argue, among other things, that the differences in experience between people in the North and people in the South (I am using the terms in their current, geo-political senses) are so great, that the environmental economics to be found in the literature in the North cannot much resonate in the South. So if there is indifference to official environmental economics in universities, research institutes, and government departments in poor countries, there is cause.

¹ See Cropper and Oates (1992).

This said, environmental resources were for long cheerfully disregarded in development economics; in that, until recently if you had wished to locate environmental concerns in the literature on contemporary economic development, you would have been largely unsuccessful. Nor will you even now find in official development economics much concern with the high population growth rates that have been experienced since the 1950s in the Indian sub-continent and sub-Saharan Africa, two regions that are today inhabited by nearly 2 billion people, among whom more than 20 percent earn a monetary income that amounts to less than a dollar a day per person. The 1989 survey article on development economics by Nicholas Stern reflects both unconcerns accurately.²

The neglect of the environment in development economics is ironic, because people in poor countries are in great part agrarian and pastoral. Rural people account for about 65 percent of the population of what the World Bank classifies as low-income countries. The proportion of total labour force in agriculture is a bit in excess of this. The share of agriculture in gross domestic product in these countries is 30 percent. These figures should be contrasted with those from industrial market economies, which are 6 percent and 2 percent, respectively, for the latter two indices. Poor countries are still in substantial measure biomass-based subsistence economies, in that the rural poor eke out a living from products obtained directly from their local environment.

For example, in their informative study of life in Bembru, the (Indian) Centre for Science and Environment (C.S.E., 1990) reports that, of the total number of hours worked by the villagers sampled, 30 percent was devoted to cultivation, 20 percent to fodder collection, and about 25 percent was spread evenly between fuel collection, animal-care, and grazing. Some 20 percent of time was spent on household chores, of which cooking took up the greatest portion, and the remaining 5 percent was involved in other activities, such as marketing. In their work on Central and West Africa, Falconer and Arnold (1989) and Falconer (1990) have shown

² See Stern (1989).

how vital are forest products to the lives of rural people. Poor countries, especially those in the Indian sub-continent and sub-Saharan Africa, can be expected to remain largely rural economies for some while yet. So the categories of natural resources of direct importance to people in poor, agrarian societies would appear to differ from those in advanced industrial countries. Of course, on its own this doesn't tell us much. What we should be inferring from such differences is something I want to explore in this lecture.

A prior question is this: how have development economists for so long managed to ignore the environmental-resource basis of production and consumption?

The following may be a part of the answer:

Barring sub-Saharan Africa over the past twenty-five years or so, income per head has grown in nearly all poor regions since the end of the Second World War. In addition, growth in world food production since 1960 has exceeded the world's population growth; by an annual rate of, approximately, 0.6 percent. This has been accompanied by improvements in a number of indicators of human well-being, such as the under-5 survival rate, life expectancy at birth, and literacy. In poor regions, all this has occurred in a regime of population growth rates substantially higher than in the past. I think these observations have enabled many economists to infer that the high rates of growth of population that have been experienced in recent years aren't a hindrance to economic betterment.

But there is a problem with this argument. Statistics on past movements of gross world income and agricultural production say nothing about the environmental-resource base. They don't say if, for example, increases in gross national product (GNP) per head are not being realized by means of a depletion of natural capital; in particular, if increases in agricultural production are not being achieved by "mining" the soil and by destroying other ecosystem services. Thus, it is today customary for international organizations to estimate social well-being by means of indices that capture the current standard of living (e.g. GNP per head,

life expectancy at birth, the infant survival rate, and literacy rates). But these measures bypass the concerns that ecologists have repeatedly expressed about the links that exist between continual population growth, increased material output, and the state of the environmental-resource base. This is a critical limitation.

Unhappily economists, not just development economists, do not take ecology seriously. For example, ecologists have argued that a more-than 60 percent increase in world population, allied to a near-doubling of gross world product per head, between now and 2020, and a doubling of food production, between now and 2050, would create substantial additional stresses in both local and global ecosystems. Of particular relevance is a study by Vitousek et al. (1986), who estimated that something like 40 percent of the net energy created by terrestrial photosynthesis (i.e. net primary production of the biosphere) is even today being appropriated for human use. To be sure, this is based on rough calculations. Moreover, net terrestrial primary production isn't given and fixed; it depends in part on human activity. Nevertheless, the figure does put the scale of the human presence on Earth in perspective. Recently, a special issue of Science (25 July 1997) has offered a wide-ranging account of the precise sense in which Earth is now dominated by the human species. These findings are not reflected in the living-standard measures that are in current use.

In delivering the 40th Anniversary Lecture at Resources for the Future, Robert Solow elaborated upon the concept of net national product (NNP), on what it measures, on why we should be interested in it.³ Five years are both long and brief. On the one hand, it is sufficiently long, in that you won't be able to recall his lecture well enough to compare mine with his, a matter of good fortune for me. On the other hand, and this is fortunate for us all here, 5 years is a sufficiently brief period, in that there is no need for me to rehearse his arguments so as to bring out the point to which I want to draw your attention: it is possible for measures of current well-being, such as the under-5 survival rate, life

³ Solow (1992).

expectancy at birth, and GNP per head, to increase over an extended period of time even while NNP per head is declining. We should be in a position to say if this has been happening in poor countries. But we aren't, and this is a reflection of the neglect of environmental matters in economic modelling in poor countries. And this in turn is a reflection of the fact that ecosystem services, even though they are scarce, are routinely a free good.

Orthodox Dichotomies and Their Limitations

Development economics has traditionally been as much concerned with the study of resource allocation mechanisms harbouring large-scale poverty, as it has been with seeking to alter such mechanisms in ways that would enable people to lift themselves out of poverty. If public policy has loomed large in the subject, so has positive analysis of poverty. But as I have just hinted, the social and ecological context in which such analyses have most frequently been undertaken were, until recently, inappropriate. In particular, the links connecting poverty, high fertility and the incidence of undernourishment, on the one hand, and degradation of the local environmental-resource base and civic disconnection, on the other, remained unexplored. This neglect has had unfortunate consequences for the growth in our understanding of economic life in poor countries.

To take an example, orthodox discussions of economic institutions (e.g. Heilbroner, 1993) are conducted in the context of a markets-versus-State dichotomy. This is so restrictive as to be misleading. Societies throughout the world have fashioned intermediate, often criss-crossing institutions, such as the household, extended-family and kinship networks; civic, commercial, and religious associations; charities; production units; and various layers of what is known as government. Each serves functions at which the others are not so good. They differ not only in terms of the emotional bonds that connect members, but also in regard to the information channels that serve them, the kinds of agreements that bind them, and the investment outlays and severance costs that help sustain them.

In a similar vein, orthodox discussions of property rights

(e.g. Heilbroner, 1993) cling to a private-versus-public dichotomy. As we will see, this too is misleading: societies throughout the world have allowed people to hold assets in other forms of ownership, for example, ownership among members of local communities. So when we speak today of the need for institutional reforms and reforms in the structure of property rights, we should be including in it the need for strengthening those institutions that complement the pairs that define the orthodox dichotomies.

There is another dichotomy that has been the cause of mischief. Some (e.g. World Bank, 1986) have located the cause of poverty and hunger at production failure owing to a suppression of markets, while others have identified it with distributional failure (e.g. UNDP, 1994). Among the economic policies that suggest themselves from this dichotomy are, on the one hand, measures that widen markets and reduce traditional distortions, and a variety of "social security" measures, on the other. But these two extreme viewpoints encourage us to regard future well-being and an equitable distribution of current well-being as necessarily consonant with each other. If conducted with care, certain policies that encourage economic growth (e.g. the provision of basic infrastructure) can indeed improve the distribution of well-being. Similarly, certain policies that improve the distribution of well-being (e.g. primary education) do improve overall economic performance. Both theory and empirics testify to them. But the two social goals are not invariably consonant with each other. In those circumstance where they are not, citizens face a tradeoff between them, and a choice has to be made over the combinations that are available.

A central puzzle in contemporary economics should be this: how is it that an economy can grow over an extended period of time and yet harbour a large volume of economically disenfranchised people? Or to put the question another way, how do we explain the persistence of large-scale poverty traps in a growing economy?

I hope you will agree with me in thinking that there isn't likely to be a single answer. What I will do in this lecture is provide an outline of one particular mechanism that does some

explaining for poor countries. Some of this work was developed and synthesized at a sister institution of RFF, the Beijer International Institute of Ecological Economics in Stockholm, in collaboration with the Institute's Director, Karl-Göran Mäler. The mechanism involves the local environmental-resource base.⁴

Communal Rights and the Local Commons

There is a form of asset ownership of particular significance to the rural poor: communal ownership. Garrett Hardin's famous observation on the fate of common-property resources (Hardin, 1968), that they erode because people free-ride on others, was telling for such globally mobile resources as the atmosphere and the open seas. However, the "tragedy of the commons" is not necessarily an apt metaphor for geographically localized common-property resources, such as irrigation water, woodlands and local forests, threshing grounds, grazing fields, inland and coastal fisheries, and swidden fallows. For it has been discovered that, typically, the local commons are not open for use to all. They are not "open access" resources; in most cases they are open only to those having customary rights, through kinship ties, community membership, and so forth. Thus, from the theory of games we have known for some time that the local commons can in principle be managed efficiently by the users themselves: there is no obvious need for some agency external to the community of users (e.g. the State) to assume a regulatory role, nor is there an obvious need for privatising the assets. A large body of recent evidence confirms the theory's prediction, in that members of local communities have often cooperated in protecting their commons from excessive use.⁵

⁴ I have gone into the matters that I will discuss in this lecture, as well as a number of related matters, in greater detail elsewhere. See Dasgupta (1982, 1993, 1995, 1996) and Dasgupta and Mäler (1991, 1995).

⁵ Dasgupta and Heal (1979, ch. 3) contains an early theoretical formulation of the commons problem and its various resolutions. Fudenberg and Tirole (1991) has an exhaustive treatment in the context of repeated games. There is now a large empirical literature recording both the successes and failures of

Why should we expect such a marked difference between the fates of local and global common-property resources? One reason is that individual use is more easily observable by others when the resource is not spread out spatially; which means that it is easier to prevent people from free-riding on the local commons. (Contrast the use of a village tube-well with the littering of streets in a metropolis; or cattle-grazing in the village commons with deforestation on mountainous terrains). However, bargaining, enforcement, and information costs also play a role in the relative efficacy of the various rules that can in principle be invoked for sharing the benefits and burdens associated with an efficient use of common-property resources. Thus, it matters whether the users know one another (contrast a village grazing ground with ocean fisheries); it matters whether increased mobility makes future encounters among group members more uncertain (contrast a traditional village with a modern metropolis); and it matters whether population pressure makes transaction costs exceed the benefits of cooperation. The confirmation of theory by current evidence on the fate of different categories of common-property resources has been one of the most pleasing features of modern economic analysis.

Are common-property resources extensive in poor countries? As a proportion of total assets, their presence ranges widely across ecological zones. In India they appear to be most prominent in arid regions, mountain regions, and unirrigated areas; they are least prominent in humid regions and river valleys. There is, of course, an economic rationale for this, based on the common human desire to pool risks. An almost immediate empirical corollary is that income inequalities are less where common-property resources are more prominent. However, aggregate income is a different matter, and it is the arid and mountain regions and unirrigated areas that are the poorest. This needs to be borne in mind when government policy is devised. As may be expected, even within dry regions, dependence on

common-property resource management. Feeny et al. (1990), Ostrom (1990), and Baland and Platteau (1996, chs. 10-13) offer good reviews of the findings.

common-property resources declines with increasing wealth across households.

Jodha (1986, 1995) used data from over eighty villages in twenty-one dry districts from six tropical states in India to estimate that, among poor families, the proportion of income based directly on the local commons is for the most part in the range 15-25 percent. Moreover, as sources of income, they are often complementary to private-property resources. Common-property resources also provide the rural poor with partial protection in times of unusual economic stress. For landless people they may be the only non-human asset at their disposal. A number of resources (such as fuelwood and water, berries and nuts, medicinal herbs, resin and gum) are the responsibility of women and children.

A similar picture emerges from Hecht, Anderson and May (1988), who describe in rich detail the importance of the extraction of babassu products among the landless (and most especially, the women among them) in the Brazilian state of Maranhão. These products are an important source of cash income in the period between agricultural-crop harvests.⁶

So, studies have confirmed that the local commons are quite prevalent in rural areas of poor countries. Empirical studies have also confirmed that resource users in many instances cooperate, on occasion through not undemocratic means, to ensure that the resource base is not eroded. Attempts have also been made by social scientists to explain observed asymmetries in the distribution of benefits and burdens of cooperation in terms of underlying differences in the circumstances of the various parties. For example, in her study of collectively-managed irrigation systems in Nepal, Ostrom (1996) has explained observed differences in benefits and burdens among users (e.g. who gets how much water from the canal system and who is responsible for which maintenance task) in terms of such facts as that some farmers are headenders, while others are tailenders. Ostrom (1990) has also tried to explain why

⁶ For a similar picture in the West African forest zone, see Falconer (1990).

cooperation has failed to get off ground where it did not get established.

Wade (1988) has conducted an empirical investigation of community-based allocation rules over water and the use of grazing land in a sample of forty-one South Indian villages. He found that downstream villages (i.e. those facing especial water scarcity) had an elaborate set of rules, enforced by fines, for regulating the use of water from irrigation canals. Most villages had similar arrangements for the use of grazing land. In an earlier work on the Kuna tribe in the Panama, Howe (1986) described the intricate set of social sanctions that are imposed upon those who violate norms of behaviour designed to protect their source of fresh water.

Behaviour dictated by social norms could seem incongruent with the democratic ideal, but the theory of games has shown that there can be a close connection between the two. The point is that even if a resource allocation rule among members of a community were chosen democratically, there would be a problem of enforcement. Norms are a way the rule could be enforced without the community having to rely on the coercive powers of a higher authority (e.g. the State). Indeed, social norms can be viewed as self-enforcing behavioural strategies: it is in the interest of each party to behave in accordance with a norm if everyone else were to behave in accordance with it.

This said, it is important to caution against romanticising communitarian arrangements over the use of the local commons. For example, McKean (1992) has noted that in common-property systems almost everywhere, entitlements to the products have mostly been based on private holdings. They have thus reproduced inequalities in private wealth. Beteille (1983) contains examples of how access is often restricted to the privileged (e.g. caste Hindus in India). Rampant inequities exist in rural community practices. I am laying stress upon the fact that the local commons are often not unmanaged; I am not suggesting that they are invariably managed efficiently, nor that they are necessarily managed democratically, nor that they are inevitably managed in ways that involve an equitable distribution of benefits and burdens. Good management of

the commons requires more than mere local participation; it needs enlightened government engagement as well.

Not surprisingly, information about the ecology of the local commons is usually in the hands of those who, customarily, have made use of them. This means that as a general rule decisions concerning the local commons ought to be left in the hands of the users themselves. It forms one reason why it is so important that local democracy be encouraged to flourish in rural communities of poor countries.⁷ The local commons will remain the single source of vital complementary and insurance goods for poor people for some time to come. We may conclude from this that one role of the State should be to help develop rural infrastructure and markets for credit and insurance so as to ease a community's reliance on the commons. However, there is little case for centralized command and control over the use of the commons. Quite the contrary, there is a case for helping the growth of local democracy. As women are often the ones to work on the commons, they would be expected to know more than others about the ecological processes upon which their communities depend. This means that the State ought to help women participate in the democratic process. More generally, the State should be obliged to ensure that local decision-making is made in an open way. It would help prevent the economically powerful within rural communities from usurping control over such decisions. This tension - the simultaneous need for increased decentralization of rural decision-making, and for State involvement in ensuring that the seat of local decisions is not usurped by the powerful - poses a central dilemma in the political economy of rural poverty. Local democracy, income security, and environmental protection would appear to be tied to each other. We should not have expected it to be otherwise.

Institutional Failure as a Cause of Environmental Degradation

But much has not gone well: case-studies undertaken both in

⁷ In a cross-section study of countries, Barrett and Grady (1997) have identified a positive link between political and civil liberties, on the one hand, and environmental protection of certain kinds, on the other.

the Indian sub-continent and in sub-Saharan Africa have revealed deteriorations in the environmental-resource base in the poorest regions. Why and how have they happened?

A recent intellectual tradition argues that the reason the poor today degrade their environmental-resource base is that their poverty forces them to discount future incomes at unusually high rates (see, for example, Bardhan, 1996: 62). I do not know of much evidence in support of this. In any event, the argument would apply to the poor in the past as well. If the thesis were correct, they would hardly have invested in their resource bases to the extent they appear to have done, the fruits of which we enjoy today. In what follows, I will identify a less parsimonious, but hopefully more persuasive, explanation: low rates of return on private investment in the resource base owing to institutional failure.

There are a number of systematic features of institutional failure in poor countries that have been easy enough to detect. Governments in many poor countries, most especially those in sub-Saharan Africa, have for long discriminated against agriculture, creating strong disincentives for farmers to invest in it. Export quotas, over-valued exchange rates, and state marketing boards purchasing agricultural produce at artificially low prices have ensured that something like 50 percent of the agricultural income of poor countries has been transferred to the rest of their economies through the years.⁸

Peasants' property rights to the agricultural-resource base have also been insecure in many poor countries (e.g. China). This has created further disincentives for farmers to invest in the land they till. Over the past 10 years, grain production per head in China has reached a plateau. China's grain imports have risen with

⁸ See Krueger, Schiff and Valdes (1988). The classic on the errors of state marketing boards is Bauer and Yamey (1968). Pinstrip-Andersen (1994) contains an excellent summary of the current food situation in the world. There are other, systemic reasons, having to do with the structure of social life, why there is little scope for individual initiative to be rewarded in sub-Saharan Africa's rural economies. Platteau and Hayami (1997) offer an account of them and argue that they in large measure explain the economic decline of that region over the past twenty-five years.

her income, and a natural question, "Who will feed China", now appears routinely in publications (e.g. Brown, 1995). Prosterman, Hanstad and Li (1996) trace China's faltered agricultural performance to the weaknesses in the structure of property-rights in agricultural land. Farmers' rights in China to the land they till even now do not extend beyond some 15 years. So they have little incentive to engage in long-term agricultural investment.

There is another type of institutional failure that disenfranchises the poor from an economy even while in the aggregate the society of which they are members enjoys economic growth: breakdown of communitarian management of the local resource base. The point is that if you are steeped in social norms of behaviour and understand community obligations, you do not calculate every five minutes how you should behave. You follow the norms. This saves on costs all round, not only for you as an "actor", but also for you as "policeman" and "judge". It is also the natural thing for you to do if you have internalized the norms. But this is sustainable so long as the background environment remains approximately constant. It will not be sustainable if the social environment changes suddenly and trust is broken. You may even be destroyed. It is this heightened vulnerability, often more real than perceived, which is the cause of some of the greatest tragedies in contemporary society.

There are other, related sources that trigger the process of resource degradation and economic disenfranchisement among the poor. For example, an erosion of the local commons can come in the wake of shifting populations accompanying the development process itself. As economic opportunities outside the village improve, those with lesser ties (e.g. young men) are more likely to take advantage of them and make a break with customary obligations. Those with greater attachments (e.g. women) would perceive this and thereby discount at a higher rate the benefits that could be expected from complying with agreements. Either way, norms of reciprocity could be expected to break down, making certain groups of people (e.g. women) worse off.

But an erosion of the local commons can also come about in the

wake of technological change, an increase in population (and the consequent pressure on these resources), unreflective public policies, and more directly, predatory governments and thieving aristocracies. There is now an accumulation of evidence on this range of causes. In what follows, I will present a sketch of three findings.

1. In his work on a sample of villages in the drylands of India, Jodha (1986, 1995) noted that over a twenty-year period, starting in the early 1960s, there had been a 25-60 percent decline in the area covered by the commons. This was in part due to the privatization of land, a good deal of which in his sample had been awarded to the rural non-poor. In an earlier work, Jodha (1980) identified the rise in the profitability of land from cropping and grazing as a central reason for increased desertification in the northern state of Rajasthan. Jodha argued that, ironically, it was government land reform programmes in this area, unaccompanied by investment in improving the productive base, that had triggered the process.

2. In an earlier work on the Amazon basin, Feder (1977) described how massive private investment in the expansion of beef-cattle production in fragile ecological conditions had been supported by domestic governments in the form of tax concessions and provision of infrastructure, and loans from international agencies such as the World Bank. The degradation of vast tracts of forests was accompanied by the disenfranchisement of large numbers of small farmers and agricultural labourers from the economy. At best it made destitutes of traditional forest dwellers; at worst it simply eliminated them.⁹

This said, I am not advocating a mono-causal explanation of the depletion of the Amazon forests. In a wider discussion of the conversion of forests into ranches in the Amazon basin, Schneider (1995) has demonstrated that the construction of roads through the forests (an instance of integration with outside markets) has been a potent force. The construction of roads greatly reduced transport

⁹ See also Hecht (1985).

costs between outside markets and the resource base in the Amazon. This in turn vastly increased individual incentives for opportunistic behaviour in a world with unsettled property rights.

3. In a summary of research findings on local irrigation in Nepal, Ostrom (1996) has noted that systems that had been improved by the construction of permanent headworks were not only in worse repair, but that they delivered substantially less water to the tail-end than to the head-end of the systems and had lower agricultural productivity than the temporary, stone-trees-and-mud headworks that had been constructed and managed by the farmers themselves.

Ostrom has an explanation for this. She suggests that, unless it is accompanied by counter-measures, the construction of permanent headworks alters the relative bargaining positions of the head- and tail-enders, resulting in so reduced a flow of benefits to the latter group that they have little incentive to help repair and maintain the headworks, something the head-enders on their own cannot do. Head-enders gain from the permanent structures, but the tail-enders lose disproportionately. Ostrom (1996) also notes that traditional farm-managed systems sustained greater equality in the allocation of water than modern systems managed by such external agencies as the government and foreign donors.

The sources that were identified in these sets of studies, as in the many other studies that I cannot report here, as having had a debilitating effect on the local environmental-resource base differ considerably. Therefore, the pathways by which the transformation affected those with customary rights were different. Since the impact of these pathways on the poorest of the poor are confirmed by economic theory, the findings of these case-studies are almost certainly not unrepresentative. Many of the studies suggest that privatization of village commons and forest lands, while hallowed at the altar of economic efficiency, can have disastrous distributional consequences, disenfranchising entire classes of people. The point is a simple one: unless an appropriate fraction of the rents earned from the resource-base subsequent to privatization are given to the customary users, they become worse

off. Ironically, case-studies also show that public ownership of such resources as forest lands is by no means necessarily a good basis for a resource allocation mechanism. Decision-makers are in these cases usually far removed from site (living as they do in imperial capitals), they have little knowledge of the ecology of such matters, their time-horizons are often short, and they are in many instances overly influenced by interest-groups far removed from the resource in question.

All this is not to suggest that rural development is to be avoided. It is to say that resource allocation mechanisms that do not take advantage of dispersed information, that are insensitive to hidden (and often not-so-hidden) economic and ecological interactions, that do not take the long-view, and that do not give a sufficiently large weight to the claims of the poorest within rural populations (particularly the women and children and the old in these populations) are going to prove environmentally disastrous. It appears that, during the process of economic development there is a close link between environmental protection and the well-being of the poor. We should have expected this too to be not otherwise.

Fertility Behaviour and the Structure of Households

But there are problems within problems in the economics of the environment. Both the Indian sub-continent and sub-Saharan Africa have experienced unprecedented growth in their populations since the early 1960s. (In this period the annual percentage rate of growth of population in the two regions have been approximately 2.3 and 2.9, respectively.) But the regions' demographic patterns have displayed substantial differences as well (see the accompanying table). Is there a resource basis for the character of these experiences?

In recent work economic demographers have identified gender-inequalities as important components of the population problem in poor countries. In this regard, the focal point of the United Nations Conference on Population and Development in Cairo in September 1994, namely, women's reproductive rights and the means (e.g. women's education) by which they could be protected and

promoted, is consonant with this new perspective. But the Cairo Conference came very near to treating the problems as identical. This was unfortunate, because it has lulled many into thinking that there is a single cause for pro-natalist behaviour in those regions. But there must be more than one cause: differences in women's educational attainments cannot explain the sharp differences in fertility rates between the Indian sub-continent and sub-Saharan Africa. There is more to the population problem.

This will come as no surprise to historical demographers. In a famous analysis of fertility differences between seventeenth- and eighteenth-century Northwest Europe, on the one hand, and modern pre-industrial societies, on the other, Hajnal (1982) drew upon the distinction between "nuclear" and "joint" household systems. He observed that in Northwest Europe marriage normally meant establishing a new household, which implied that the couple had to have, by saving or transfer, sufficient resources to establish and equip the new household. This requirement in turn led to late marriages. It also meant that parents bore the cost of rearing their children. Indeed, fertility rates in France dropped before mortality rates registered a decline, before modern family-planning techniques became available, and before women became literate (Coale, 1969). Hajnal contrasted this with the Asiatic pattern of household formation, which he saw as joint units consisting of more than one couple and their children.

Hajnal's explanation is not without problems, especially when applied to the contrasting experiences of the Indian sub-continent and sub-Saharan Africa. It can be argued, for example, that the rules of inheritance are a critical factor governing interpersonal relations, and that differences in inheritance rules help explain why households in sub-Saharan Africa are strikingly dissimilar to the "joint" household system that has for long been taken to be the hallmark of the Asiatic form. Of course, inheritance rules themselves require explanation, and it is tempting to search for this in the mode and technology of agricultural production (e.g. hoe versus the plough), and thereby in ecological factors (e.g. soil quality, population density, rainfall, and the availability of

domesticatable animals). These are delicate matters of historical analysis, and the causal links are not well-understood. But Hajnal's account offers hints that are of relevance. To put it in the language of economists, the relative costs and benefits of procreation to the various agencies differ much across societies.

One prominent motive for having children arises from their being an end. This motive has been much studied in economic demography (Becker, 1981). Other motives involve viewing children as productive assets. For example, in rural economies where the avenues for saving are highly restricted, or where public support for the elderly are weak, parents value children as a source of security in their old age (Cain, 1981). In poor countries children are also useful as sources of current income. This provides households in those parts with another motive for procreation. It has possible consequences that have only recently been explored in theoretical analyses. Let us see what they are.

There are several pathways by which reasoned fertility decisions at the level of every household (whether the decision is based on the desire to have children because they are ends, or because they are productive assets) could lead to an unsatisfactory outcome from the perspectives of all households. One such pathway arises from the fact that traditional practice is often perpetuated by conformism. Procreation in closely-knit communities is not only a private matter; it is also a social activity, influenced by the cultural milieu. In many societies there are practices encouraging high fertility rates which no household desires unilaterally to break. Such practice may well have had a rationale in the past, but not necessarily any more. It can then be that, so long as all others follow the practice and aim at large family sizes, no household on its own will wish to deviate from the practice; however, if all other households were to restrict their fertility rates, each would desire to restrict its fertility rate as well. In short, there can be multiple social outcomes, and a society may get stuck in a self-sustaining mode of behaviour that is characterized by high fertility and low educational attainment, even when in principle this "same" society could have sustained a mode of

behaviour characterized by low fertility and high educational attainment.

This does not mean that society will be stuck with it forever. As always, people differ in the extent of their absorption of traditional practice. There are inevitably those who, for one reason or another, experiment, take risks, and refrain from joining the crowd. They are the tradition-breakers, and they often lead the way. A concerted social effort (for example, a massive literacy and health-care drive) can help dislodge such a society from the rapacious hold of high fertility rates to another equilibrium mode of behaviour where fertility is low. Exposure to other ways of living, through the media of radio and television, have also been found to be effective.

But there are other pathways that lead to pro-natalist behaviour. Parental costs of procreation are relatively speaking low when the cost of rearing the child is shared among the kinship. In sub-Saharan Africa, "fosterage" within the kinship is a commonplace: children are not raised solely by their parents, the responsibility is more diffuse within the kinship group (Goody, 1982; Bledsoe, 1990). Fosterage in the African context is not adoption. It is not intended to, nor does it in fact, break ties between parents and children. The institution affords a form of mutual insurance protection in semi-arid regions. There is some evidence that, as opportunities for saving are few in the low-productivity agricultural regions of sub-Saharan Africa, fosterage also enables households to smoothen their consumption across time.¹⁰ In parts of West Africa upto half the children have been found to be living with their kin at any given time. Nephews and nieces have similar rights of accomodation and support to biological offspring. There is a sense in which children are seen as common-responsibility. However, the arrangement creates yet another free-rider problem if the parents' share of the benefits from having children exceeds their share of the costs. From the

¹⁰ This latter motivation has been explored by Serra (1996).

point of view of the parents, taken as a collective, too many children would be produced in these circumstances.

Related to this is a phenomenon that has been observed by Guyer (1994) in a Yaruba area of Nigeria. In the face of deteriorating economic circumstances, some women are bearing children by different men so as to create immediate lateral links with them. Polyandrous motherhood enables women to have access to more than one resource network.

In sub-Saharan Africa, communal land tenure of the lineage social structure offers yet another inducement for men to procreate. In addition, as conjugal bonds are weak, fathers often do not bear the costs of siring a child. Anthropologists have observed that the unit of African society is a woman and her children, rather than parents and their children. Often, there is no common budget for the man and woman. Descent in sub-Saharan Africa is, for the most part, patrilineal and residence is patrilocal (an exception are the Akan people of Ghana). Patrilineality, weak conjugal bonds, communal land tenure, and a strong kinship support system of children, taken together, are a broad characteristic of the region (Caldwell, 1991). In principle they provide a powerful stimulus to fertility. Admittedly, patrilineality and patrilocality are features of the northern parts of the Indian sub-continent also. But conjugal bonds are substantially greater there. Moreover, as agricultural land is not communally held, large family sizes lead to fragmentation of landholdings. In contrast, large families in sub-Saharan Africa are (or, at least were, until recently) rewarded by a greater share of land belonging to the lineage or clan.

Population, Poverty, and the Local Environment

I noted earlier that the poorest countries are in great part biomass-based subsistence economies. Much labour is needed even for simple tasks. Moreover, households there do not have access to the sources of domestic energy available to households in advanced industrial countries. Nor do they have water on tap. In semi-arid and arid regions water supply is often not even close at hand. Nor is fuel-wood near at hand when the forests recede. This means that

the relative prices of alternative sources of energy and water faced by rural households in poor countries are quite different from those faced by households elsewhere. In addition to cultivating crops, caring for livestock, cooking food and producing simple marketable products, members of a household may have to spend as much as five to six hours a day fetching water and collecting fodder and wood. These are complementary activities. They have to be undertaken on a daily basis if the household is to survive. Each is time-consuming. Labour productivity is low not only because capital is scarce, but also because environmental resources are scarce. From about the age of 6 years, children in poor households in poor countries mind their siblings and domestic animals, fetch water, and collect fuelwood, dung, and fodder. Children are then needed as workers by their parents, even when the parents are in their prime. Children between 10 and 15 years have been routinely observed to work at least as many hours as adult males.

The need for many hands can lead to a destructive situation, especially when parents do not have to pay the full price of rearing their children, but share those costs with their community. As we noted earlier, in recent years mores that once regulated local resources have changed. We noted also that the very process of economic development can erode traditional methods of resource control, say, by way of increased urbanization and mobility. Social norms are also endangered by civil strife and by the usurpation of resources by landowners or the state. As norms degrade, parents pass some of the costs of children on to the community by over-exploiting the commons. Indeed, even a marginal decline in compliance in agreements can trigger a process of, what the late Gunnar Myrdal called, "cumulative causation". As the community's natural resources are depleted, more hands are needed to gather fuel and water for daily use. More children are then produced, further damaging the local resource base and in turn providing the "household" with an incentive to enlarge. When this happens, poverty, fertility, and environmental degradation reinforce one another in an escalating spiral. By the time some countervailing

set of factors - whether public policy or diminished benefits from having further children due, say, to a scarcity of land - stops the spiral, millions of lives may have suffered through worsening poverty.

Cleaver and Schreiber (1994) provide evidence for this thesis in the context of rural sub-Saharan Africa, and Filmer and Pritchett (1996) for the Sindh region in Pakistan. They report positive correlations between fertility and deterioration of the local environmental-resource base. Such data cannot reveal causal connections, but they are not inconsistent with the idea of a positive-feedback mechanism such as I have described. Over time, the spiral would be expected to have large effects, as manifested by battles for resources (Homer-Dixon, Boutwell and Rathjens, 1993). Civic disconnection, a powerful destroyer of property rights, can vastly reduce the rate of return on private investment in the local environmental-resource base. We should not be surprised, therefore, that it too is associated with degradation of the resource-base (Deacon, 1994). Historical evidence on the way pressure of population led to changes in the organization of production, property rights, and ways of doing things, which is what Boserup (1981) studied in her far-reaching work on the positive effect of population growth on the standard of living, does not seem to speak to the population problem as it exists today in sub-Saharan Africa and the northern parts of the Indian sub-continent.

Some Tentative Conclusions

This lecture has been about the links that appear to exist in contemporary poor countries between poverty, high fertility and undernourishment, on the one hand, and degradation of the local environmental-resource base and civic disconnection, on the other. While some of the policy implications of the findings are commonplace enough (e.g. the need for secure property rights), others are not so, at least they were not a commonplace until recently (e.g. the need for strengthening local democracy, and that direct measures for poverty alleviation are not necessarily incongruent with measures that enhance aggregate economic

performance).

The new perspective I have tried to present here takes high fertility rates in sub-Saharan Africa and the Indian sub-continent seriously and links it to deterioration in the environmental-resource base. It suggests that the most potent avenue open for bringing down fertility rates in the semi-arid regions of these continental masses involves the simultaneous deployment of a number of policies (there is no single panacea), and that the relative importance of the various prongs would depend on the community in question. Thus while family-planning services (especially when allied to public-health services) and measures that empower women (through both education and improved employment opportunities) are certainly desirable policies, there are others, such as those that involve the provision of infrastructural goods (e.g. cheap sources of household fuel and potable water), and measures that directly increase the economic security of the poor. The aim should not be to force people to change their reproductive behaviour; rather, it should be to identify policies that would so change the options men and women face that their reasoned choices would involve a lowering of their fertility rates to replacement levels and a sustainable use of their resource base.

While I have stressed the importance today of local democracy for the protection of the local environmental-resource base, there is evidence that even at the national level, political and civil liberties are positively correlated with improvements in income per head, life expectancy at birth, and the infant survival rate, and are negatively correlated with fertility rates.¹¹ We are, therefore, encouraged to think that political and civil liberties have instrumental value, even in poor countries; they are not merely desirable ends. But each of the prescriptions offered by the new perspective is desirable in itself and commends itself even when we do not have the population problem or environmental degradation in mind. It seems to me this consonance of means and

¹¹ See Dasgupta (1990), Przeworski and Limongi (1995), and Barro (1996).

ends is a most agreeable fact in what is otherwise a depressing field of study.

References

Baland, J.-M. and J.-P. Platteau (1996), Halting Degradation of Natural Resources: Is There a Role for Rural Communities? (Oxford: Clarendon Press).

Bardhan, P. (1996), "Research on Poverty and Development Twenty Years after Redistribution with Growth", Proceedings of the Annual World Bank Conference on Development Economics, 1995 (Supplement to the World Bank Economic Review and the World Bank Research Observer), 59-72.

Barrett, S. and K. Grady (1997), "Freedom, Growth and the Environment", mimeo., London Business School, London.

Barro, R.J. (1996), "Democracy and Growth", Journal of Economic Growth, 1(1), 1-27.

Bauer, P. and Yamey, B. (1968), Markets, Market Control and Marketing Reform (London: Weidenfeld & Nicolson).

Becker, G. (1981), A Treatise on the Family (Cambridge, MA: Harvard University Press).

Beteille, A. ed. (1983), Equality and Inequality: Theory and Practice (Delhi: Oxford University Press).

Bledsoe, C. (1990), "The Politics of Children: Fosterage and the Social Management of Fertility Among the Mende of Sierra Leone," in W. Penn Handwerker (ed.), Births and Power: social change and the politics of reproduction (London: Westview Press).

Boserup, E. (1981), Population Growth and Technological Change (Chicago: Chicago University Press).

Brown, L.R. (1995), Who Will Feed China? Wake-Up Call for a Small Planet (New York: W.W. Norton).

Cain, M. (1981), "Risk and Insurance: Perspectives on Fertility and Agrarian Change in India and Bangladesh," Population and Development Review, 7, 435-74.

Caldwell, J. (1991), "The Soft Underbelly of Development: Demographic Transition in Conditions of Limited Economic Change," Proceedings of the Annual Bank Conference on Development Economics 1990 (Supplement to the World Bank Economic Review and the World Bank Research Observer), 207-54.

Cleaver, K. M. and G.A. Schreiber (1994), Reversing the Spiral: the population, agriculture, and environment nexus in sub-Saharan Africa (Washington, D.C.: World Bank).

Coale, A.J. (1969), "The Decline of Fertility in Europe from the French Revolution to World War II," in J. Behrman, L. Corsa and

R. Freedman (ed.), Fertility and Family Planning: a world view (Ann Arbor, Michigan: University of Michigan Press).

Cropper, M. and W. Oates (1992), "Environmental Economics: A Survey", Journal of Economic Literature, 30(2), 675-740.

C.S.E. (1990), Human-Nature Interactions in a Central Himalayan Village: A Case Study of Village Bembru (New Delhi: Centre for Science and Environment).

Dasgupta, P. (1982), The Control of Resources (Cambridge, MA: Harvard University Press).

Dasgupta, P. (1990), "Well-Being and the Extent of its Realization in Poor Countries," Economic Journal, 100 (Supplement), 1-32.

Dasgupta, P. (1993), An Inquiry into Well-Being and Destitution (Oxford: Clarendon Press).

Dasgupta, P. (1995), "The Population Problem: Theory and Evidence", Journal of Economic Literature, 33, 1879-1902.

Dasgupta, P. (1996), "The Economics of the Environment", Environment and Development Economics, 1(4), 387-428.

Dasgupta, P. and G. Heal (1979), Economic Theory and Exhaustible Resources (Cambridge: Cambridge University Press).

Dasgupta, P. and K.-G. Mäler (1991), "The Environment and Emerging Development Issues", Proceedings of the Annual World Bank Conference on Development Economics (Supplement to the World Bank Economic Review and the World Bank Economic Observer), 101-132.

Dasgupta, P. and K.-G. Mäler (1995), "Poverty, Institutions, and the Environmental Resource-Base," in J. Behrman and T.N. Srinivasan (ed.), Handbook of Development Economics, Vol. IIIA (Amsterdam: North Holland).

Deacon, R.T. (1994), "Deforestation and the Rule of Law in a Cross Section of Countries", Land Economics, 70(4), 414-430.

Falconer, J. (1990), The Major Significance of 'Minor' Forest Products (Rome: FAO).

Falconer, J. and J.E.M. Arnold (1989), Household Food Security and Forestry: An Analysis of Socio-Economic Issues (Rome: FAO).

Feder, E. (1977), "Agribusiness and the Elimination of Latin America's Rural Proletariat", World Development, 5(5-7), 559-571.

Feeny, D. et al. (1990), "The Tragedy of the Commons: Twenty-two Years Later", Human Ecology, 18(1), 1-19.

Filmer, D. and L. Pritchett (1996), "Environmental Degradation and the Demand for Children", Research Project on Social and Environmental Consequences of Growth-Oriented Policies, Working Paper No. 2, World Bank, Washington, D.C.

Fudenberg, D. and J. Tirole (1991), Game Theory (Cambridge, MA: MIT Press).

Goody, E. (1982), Parenthood and Social Reproduction: Fostering and Occupational Roles in West Africa (Cambridge: Cambridge University Press).

Guyer, J.L. (1994), "Lineal Identities and Lateral Networks: The Logic of Polyandrous Motherhood," in C. Bledsoe and G. Pison (ed.), Nuptiality in Sub-Saharan Africa: contemporary anthropological and demographic perspectives (Oxford: Clarendon Press).

Hajnal, J. (1982), "Two Kinds of Preindustrial Household Formation Systems," Population and Development Review, 8(3), 449-94.

Hardin, G. (1968), "The Tragedy of the Commons", Science, 162, 1243-1248.

Hecht, S. (1985), "Environment, Development, and Politics: Capital Accumulation and the Livestock Sector in Eastern Amazonia", World Development, 13(6), 663-684.

Hecht, S., A.B. Anderson and P. May (1988), "The Subsidy from Nature: Shifting Cultivation, Successional Palm Forests and Rural Development", Human Organization, 47(1), 25-35.

Heilbroner, R. (1993), 21st Century Capitalism (New York: W.W. Norton).

Homer-Dixon, T, J. Boutwell, and G. Rathjens (1993), "Environmental Change and Violent Conflict," Scientific American, 268(2), 16-23.

Howe, J. (1986), The Kuna Gathering (Austin, Texas: University of Texas Press).

Jodha, N.S. (1980), "The Process of Desertification and the Choice of Interventions", Economic and Political Weekly, 15(32), 1351-56.

Jodha, N.S. (1986), "Common Property Resources and the Rural Poor", Economic and Political Weekly, 21(27), 1169-81.

Jodha, N.S. (1995), "Common Property Resources and the Environmental Context: Role of Biophysical versus Social Stress", Economic and Political Weekly, 30(51), 3278-83.

Krueger, A.O., M. Schiff and A. Valdes (1988), "Agricultural Incentives in Developing Countries: Measuring the Effect of Sectoral and Economywide Policy", World Bank Economic Review, 2(3), 255-272.

McKean, M. (1992), "Success on the Commons: A Comparative Examination of Institutions for Common Property Resource Management", Journal of Theoretical Politics, 4, 256-68.

Ostrom, E. (1990), Governing the Commons: The Evolution of Institutions for Collective Action (Cambridge: Cambridge University Press).

Ostrom, E. (1996), "Incentives, Rules of the Game, and Development", Proceedings of the Annual World Bank Conference on Development Economics, 1995 (Supplement to the World Bank Economic Review and the World Bank Research Observer), 207-34.

Pinstrup-Andersen, P. (1994), "World Food Trends and Future Food Security", Food Policy Report, International Food Policy Research Institute, Washington, D.C.

Platteau, J.-P. and Y. Hayami (1997), "Resource Endowments and Agricultural Development: Africa vs. Asia", in M. Aoki and Y. Hayami (ed.), The Institutional Foundation of Economic Development in East Asia (London: MacMillan), forthcoming, 1998.

Prosterman, R.L., T. Hanstad and Li Ping (1996), "Can China Feed Itself?", Scientific American, 275(5), 70-77.

Przeworski, A. and F. Limongi (1995), "Democracy and Development," Working Paper #7, Chicago Center on Democracy, University of Chicago.

Schneider, R. (1995), "Government and the Economy on the Amazon Frontier", World Bank Environment Paper No. 11, World Bank, Washington, D.C.

Serra, R. (1996), An Economic Analysis of Child Fostering in West Africa, Ph.D. Dissertation, Faculty of Economics, University of Cambridge.

Solow, R.M. (1992), "An Almost Practical Step Toward Sustainability", Resources for the Future, Washington, D.C.

Stern, N. (1989), "The Economics of Development: A Survey", Economic Journal, 99, 597-685.

UNDP (1994, 1995), Human Development Report (New York: Oxford University Press), published annually.

Vitousek, P., A. Ehrlich, P. Ehrlich, and P. Matson (1986), "Human Appropriation of the Product of Photosynthesis," BioScience, 36, 368-373.

Wade, R. (1988), Village Republics: Economic Conditions for Collective Action in South India (Cambridge: Cambridge University Press).

World Bank (1986, 1990), World Development Report (New York: Oxford University Press), published annually.

Total fertility rates in the late 1980s

	Total Fertility Rate
Sub-Saharan Africa	6 - 8
India	4.2
China	2.3
Japan, and Western industrial democracies	1.5 - 1.9

(Note: The total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her child-bearing years and bear children at each age in accordance with prevailing age-specific fertility rates.)

Source: World Bank (1990).