Sustainable Development and Environmental Economics

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For ardent ecologists, only a minimalist development strategy is morally supportable, while other analysts contend that the concept of sustainability contributes little new to economic policy. Sustainable development has two two components: economic growth and environmental protection. In this paper, Myles Clarke balances these objectives and contends that a considerable degree of both is obtainable.

"*Definitions of sustainable development abound. There is some truth in the criticism that it has come to mean whatever suits the particular advocacy of the individual concerned.*"

Introduction

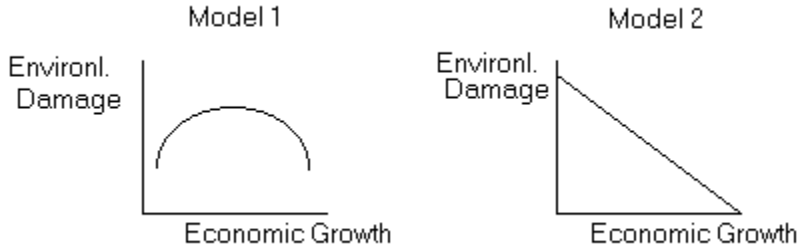
Development can be interpreted as a set of goals or objectives which society aims to achieve. Development is sustainable if it meets the needs of the present generation without compromising the ability of future generations to meet their own needs. It requires that each generation be endowed with sufficient resources to generate its own wealth. However, this agenda has been distorted by a number of factors which this essay will discuss. For instance, current measures of wealth neglect to take account of the value of natural wealth, and hence mislead the policy maker. Despite its inaccuracies, some attempt must be made to estimate the value society places on the environment and incorporate it into economic policy. The endogenising of environmental variables into economic models would reveal the interdependence between the economy and the environment; the healthy maintenance of one being a function of the other. This essay begins by setting the scene in which this discussion has evolved in a macroeconomic context and goes on to illustrate some of the solutions which microeconomic theory suggests.

Simple models have been conjected as possible explanations for the trade-off relationship between economic growth and environmental damage. They ask whether economic growth is compatable with preserving our environment. If not, is it possible to adjust current production processes so as to advance capital wealth alongside a balanced ecology?

Economic Growth vs. Environmental Damage

This model suggests that initially society is unaware of the damage its growth is causing the environment, or at least underestimates the consequences. At some stage, it becomes obvious that unless adjustments are made and contingency plans derived, the damage to the environment may be irreparable. This cycle seems plausible enough, but it is weak in many aspects. While it was derived to reflect US awareness in the 1970s of the damage caused by its growth in the 1950's, it provides little prognosis for developing countries. Although these countries now find themselves in the early stages of revolutionary growth, it is incredulous to suggest that they might be unaware of the consequences for the environment of such change. Furthermore, it takes no account of the environment's assimilative power to absorb a certain amount of growth debris and regenerate its diminishing resources. Nor does this model reflect the time lag between the period in which environmental damage is acknowledged, and the period in which institutional changes actually take impact to stop the damage.

Figure 1.



This second model possesses a stronger policy prescriptive power. It accepts that at the moment, trade-off decisions are biased in favour of growth and against the environment. Accepting this , it also provides a framework for policy makers to shift this bias more in favour of the environment. In relation to the first model, the extreme point on the Y-axis of the above diagram corresponds to the point where policy changes begin to improve the environment. This point would be preceded by a jump off and under the first curve. We start by asking ourselves two questions. Firstly, could any given level of GNP be achieved at a lower level of damage, in other words could the curve be shifted inwards? Secondly, could subsequent growth be less damaging so that the slope of the function begins to fall? Examples of how this might be done are given in the micro section. This function will reach some asymptotic limit representing a level of environmental damage inevitably caused by economic growth. This serves as the policy maker's ideal, and as an objective points policy in the right direction. Yet, we still find ourselves in the early stages of the first model where growth and environmental conservation are incompatible.

Policy makers' attitudes towards environmental damage may be *reactive* or *anticipatory*. It can be argued that each is optimal in different circumstances. However, further research reveals that there are few if any situations in which a reactive mode is optimal, and yet in practice environmental policy is rarely anticipatory. For the sake of further analysis, the introduction of time preference adds a dynamic quality to the argument and helps to determine why this is so. This entails representing the interests of generations which as yet do not exist. Nevertheless, Vilfredo Pareto provides another ideal for policy makers to set their sights upon: the intertemporal allocation of natural wealth will be optimal if no generation can be made better off without another being made worse off.

In the case of scarce resources whose exhaustion is irrevocable, an anticipatory policy should certainly be favoured. For instance, there is an unstable critical level of equilibrium fish stock, below which it is unable to sustain itself. In this instance a reactive policy will simply be too late. Indeed, such a policy can justify current levels of consumption only if expected improvements in technology are sufficient to offset future scarcity. In the case of depletable resources like oil and gas, this belief would only be tenable if substitutes which are currently uneconomical were expected to become financially viable as scarcity raised price and innovation reduced costs. This outlook can be reversed to favour an anticipatory policy if we consider that the myopia of the current generation is negated by the their risk averseness, causing them to discount heavily such technological possibilities. Furthermore, an anticipatory environmental policy is more compatable with sustainable development. Together they ensure successive generations are endowed with as much natural wealth as the current generation inherited.

Anecdotal evidence such as the depletion of the ozone layer, dead Swedish

lakes and diseased woodland in the Black Forest suggest that a reactive attitude has been adopted. But even this reactive approach has been ineffective. Authorities may be drawing up the correct legislation but it may lack the credibility necessary to make firms adhere to its regulations, or provide the incentives which should lead to research development in less "dirty" technology. The more genuine and earnest the motivations for creating the legislation are, the more credible it will be in the eyes of managers, thus leading them to search for the best least cost abatement technology available. It is more productive for a firm to utilise its resources in this fashion, rather than wasting them on rent seeking activities like circumventing legislation by finding loopholes in its stipulations.

If authorities invested more funds into research which identifies earlier how the environment would react to current trends of growth, it could prepare preemptive legislation which restricts the damage this growth might cause. Furthermore, the sooner firms can be informed of the new conditions on production, the less costly the necessary adjustments will be. An anticipatory policy would lend more credibility to legislation as firms could endogenise the imposed constraints into decisions about expanding operations in their own market or entering a new market. *Ex ante* preparation is more efficient than *ex post* alteration. It costs more for extant firms to adapt their processes to new conditions than for new firms to accommodate the same conditions before investing heavily into projects requiring long term commitment. However, if enough firms have been allowed to extend their time horizons due to effective anticipatory policy, then subsidising the alteration costs of the residual firms will cause a negligible distortion to competition. The following anecdote illustrates the significant distortions which "incredible" environmental legislation may cause in the market place. If firms are explicitly aware of a reactive environmental policy, they have the opportunity to create unfair competitive advantages. Large firms in the U.S. do this by investing in trying to predict how the environment will react in the future, given current industrial practice, and hence the legislative steps that a reactive policy would take. They then prepare for the inevitable changes which the legislation will impose but which will be difficult for smaller firms to predict. Even more resources are wasted by engaging in lobbying activities which try to speed up the legislative process and increase the benefits a firm derives from being prepared. If the market acknowledges the environmental damage of production before the relevant authorities, or at least before the authorities have time to prepare the necessary legislation, larger firms will find it rewarding, to set an asymmetric information barrier between themselves and their competitors. It is obviously worth policy makers' time and effort to invest more resources in anticipating the legislation that will be needed to handle future environmental damages sooner and accelerate the legislative process.

Microeconomic conventions have been used to establish markets for resources where they did not exist or where their existence was not evident. Secondly, they identify the role of price as the medium through which resources are allocated efficiently over time. I will proffer that in the case of certain zero priced open access resources, a market will inevitably fail. Most of the literature in this area finds provenance in the U.S. where a more informed public were aware of the damage their consumption habits caused the environment, primarily because those habits were so excessive. Moreover, the size and ecological variation one finds in the U.S. required a single federal body to monitor and regulate firms behaviour. The Environmental Protection Agency (EPA) was established with this very task in mind. It is noteworthy that while the EU has legislated its own directives, it lacks the federal power to enforce them effectively. This point demands more attention if there is the intent to create a more integrated and federal Europe.

In the case of pollution, the challenge before micro analysis is to provide incentives for firms to employ least cost structures which internalise environmental considerations. Because pollution is a negative externality, the costs of production to the firm are below the social cost, resulting in overproduction. The two most popular methods of achieving this are taxation and permit programmes. The EPA adopted the latter method. The criteria which such an institution would use when choosing any method is defined along the following lines. An important requirement it should fulfil is economic efficiency. This subsumes three divisions of efficiency: it is allocative efficient if the marginal social cost of production equals the marginal social benefits, it is cost efficient if the marginal abatement costs to each firm of meeting the given standard is the same, and it is technologically efficient if firms are given the incentive to invest resources into the R&D of cleaner, cheaper technology. These concepts will become clear when we extend them to the example at hand. There are two further important criteria. Firstly, low information requirements impose potential restrictive measures which are crucial to hit the target level of pollution accurately. Secondly, some sense of equity between consumer and producer is preserved, in other words, that the burden of the cost of the firm in adhering to these restrictions is not easily transferred to the consumer. Ultimately, it is the credibility, adaptability and dependability of the chosen policy which determines its success.

The U.S. adopted a command and control approach to its pollution problem beginning with the 1970 Clean Air Act. The EPA primarily set emission standards at a 'suitable' level of pollution, and distributed the corresponding number of permits to firms, each permit allowing a certain amount of pollution to be discharged. The permits were administered to firms with respect to the amount of pollution they historically discharged (known as "grandfathering") as long as they employed the best available control technology (BACT), and kept emissions down to their lowest achievable rate (LAER). The firms could bank, transfer, merge, or, depending on relative cost structures and technological levels, trade permits with other firms. A market had been created for pollution and by the Coase Theorem , identifying the right to pollute as being initially with firms would ensure a significant degree of efficiency. It was technologically efficient in that firms who reduced their costs would be able to produce more without needing to purchase extra permits or could maintain the same level of output and sell the excess permits. It was equitable in that consumers could buy permits themselves, reflecting their willingness to prevent pollution.

The permit programme was a success to the extent that it did result in an overall reduction in industrial pollution. But some vital considerations were overlooked. These must be highlighted if EU policy is to extrapolate any relevant lessons from the U.S. experience. First of all, it was necessary in 1977 to introduce a non-compliance penalty to consolidate the Clean Air Act. Up to this point there were no sanctions in place to enforce firms to fully comply with the BACT and LAER conditions which permit ownership stipulated. The penalty was estimated as the extra profits that a firm earned which could be attributed to non-compliance. Secondly, the permit programme violated the cost efficiency criteria discussed above. While the EPA insisted that firms used the BACT, it completely ignored the costs involved in switching technology. This 'at all cost' approach was crudely inefficient and meant the same or greater improvements in pollution levels could have been achieved at less cost. It furthermore distorted the equalising of the marginal abatement costs to firms on which the restrictions were imposed. It is debatable whether the Europeans have the free market attitude to accept such a *laissez-faire* approach to what is considered an issue which is beyond the realm of economic value. Taxation has been the preferred option. But in a dynamic context, and if the above anomalies are rectified, then

permits are the clear winners. The chosen tax levy is a function of the static conditions in the period of its inception. Over time, as more firms enter the industry, and as inflation erodes the real value of firms' tax burden, the total amount of pollution created will exceed the associated emission standard. The tax has to be adjusted continuously to accommodate the changing conditions of which it is a function. Permits, on the other hand, automatically absorb such vacillations through their pricing mechanism, thus reflecting the forces at work in the market.

While the Coase Theorem was briefly mentioned above, the significance of property rights and their correct identification if a market is to operate efficiently can be revealed by the study of an open access common property case, and explains why the free market offers no solution to such complex problems. The smog problem in Dublin in the late 1980s caused by domestic fires provides an apt example. All the characteristics of private consumption break down. Firstly, no one person can claim direct ownership over the air, so it is a non-universal good. Secondly, any improvement in air quality will benefit a whole range of agents regardless of whether they switch to smokeless fuel or not. This means air does not enjoy exclusivity. While the pareto optimal situation is that everyone benefits by switching to smokeless fuel, the threat of the free rider means that non-cooperative Nash Equilibrium prevails. While this game theory framework is simplistic in its assumptions, useful insight is given into what has become to be known as the "tragedy of commons". In this case it seems to be the responsibility of Government to take action on behalf of society, geared with the knowledge that it is in at least the majority's best interest. Yet bituminous coal consumption in the Dublin area was only banned (1990) when the public's complaints became sufficiently vociferous for the government to take credible action.

Conclusion

This essay has shown that it is possible for substantial economic growth to be achieved in harmony with an almost untainted environment. In the long run, it is in both the industrialists' and the conservationists' interests that these two variables be maintained, after all, conservationists are consumers too, and entrepreneurs, as society members and as directors of labour, benefit from a healthy environment. However one must take account of the value the environment holds for society and adopt an anticipatory approach to implement 'greener' policies. This anticipatory approach, or any for that matter, will fail unless firms consider the consequences of non-compliance seriously. To start with, we could at least rectify our national income account anomalies which I mentioned at the outset. Under current practice, an environmental catastrophe will be recorded as a gain in national income accounts equal to the income earned by the factors used to clean up the aftermath. This kind of valuation is highly subjective, but its inconsistencies do not justify its complete abandonment. It at least provides a benchmark for achieving the goal of sustainable development using well grounded microeconomic foundations.