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Pricing the invaluable: the value of the world's ecosystem services and natural capital

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1. Mixed reactions

It is constructive of *Ecological Economics* to invite comments on this imaginative and stimulating article (*Nature*, 387/15, May 1997) which draws attention to the value of the services provided by ecological systems and natural capital stocks. Such an article should in principle elicit unreserved commendation from ecological economists who are more aware than other specialists of the contribution made by ecological systems to economic activities and human welfare. Nevertheless, I find my own reactions to the article rather mixed. On one level I salute this brave attempt at 'pricing the invaluable', but on yet other levels I have some misgivings which I shall try to summarize below.

The range of valuation offered is considerable ($38 trillion), amounting roughly to two and half times the lower estimate, and exceeds significantly the average estimate of $33 trillion. Such a wide range, while perhaps unavoidable considering the current state of our knowledge, inevitably detracts from the estimates' worth. We are told that these estimates are 'almost certainly' a minimum. Thus there is the possibility that as these initial estimates are scaled upward, the range might broaden still further. That there is a chance of double counting (in that the ecological services here identified must have been, at least in part, already counted in the global gross product) this, while explicitly admitted by the authors, cannot go away, and should perhaps be quantified at a future date and reconciled with the estimates. The importance of this point derives from the fact that a vivid comparison is made between the estimated value of ecosystem services and the global gross national product ($18 trillion)—a comparison apparently made to convey the impression that the value of such services is a multiple of the recorded product.

2. Services and functions

Table 1 appears to make a distinction between ecosystem services and ecosystem functions, listing them under two separate columns. In many

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cases these are described in identical or near-identical terms. For instance, 'water regulation' is listed as a service, and 'regulation of hydrological flows' as a function; 'soil formation' as a service, and 'soil formation processes' as a function; 'pollination' as a service, and 'movement of floral gametes' as a function; etc. While it is useful to enumerate these services/functions to highlight their contributions, presenting them in two separate columns is not perhaps necessary. On the evidence of the language of Table 1, and in light of the environmental literature, one might venture the guess that the authors' service is really a function, and their function is truly a service or product that is normally produced by the function. Such an interpretation would conform with the standard (Hueting, 1980) definition of an environmental function (see especially Hueting's chapters 4 and 5). Hueting is nowhere mentioned in the article, nor his terminology followed. He had defined an environmental function as the current and potential use of an essential part of our biophysical surroundings, for which a portion of current production, given present technology, has to be sacrificed in order to restore the future availability of the function. At low levels of activity, Hueting argued, while the function is still relatively unimpaired, its supply price is zero. But the supply price rises as the function gets progressively scarce. Under pressure of demand, competition among functions will set in, with the use of one function being at the expense of another or even itself. While still abundant, functions are free goods, falling altogether outside the purview of economics, but with expanding demand they gradually become economic goods, commanding a price that rises as their scarcity increases—a price that should be reckoned as a cost of apparent economic growth.

3. Supply and demand

The authors give us Fig. 1, showing supply and demand curves, said to pertain to environmental functions. I find this figure difficult to follow. The empirical derivation of demand at the global level, I submit, is well nigh impossible, and the authors, I believe, drew the demand curve only for illustrative purposes. One is not assured, however, by their reference to contingent valuation, said to be used partly for pricing the functions. Reference to a consumer's surplus (to be read from these macro aggregates) also raises methodological questions and is probably irrelevant in this context. On the supply side, the concept of 'net rent' is equally neither meaningful nor relevant. With no 'producers' it is hard to figure what the authors mean by a producer's surplus even if the supply function is actually as illustrated in Fig. 1.

Rather than depicting the supply function (in the *Nature* article) by a curve that rises throughout its length, I would expect such a curve to lie initially along the horizontal axis from the origin until the function gets threatened, then to rise gradually with demand until it hits a vertical straight line representing saturation or exhaustion. Afterwards the cost of restoring the function increases pari passu with demand pressure. In order properly to illustrate this, Fig. 1 in the original article should have shown not one demand curve, but a family of demand curves. As proposed in my Fig. 1, demand shifts upward to the right as the scale of economic activity rises and demand moves from D_1 to D_2 and D_3.

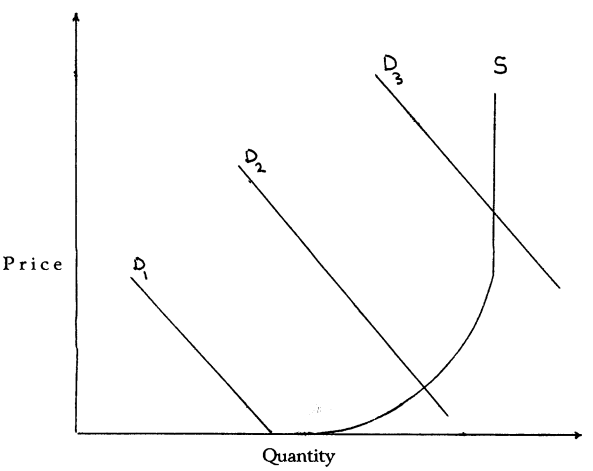

Fig. 1. Supply of and demand for an ecological function. A suggested graphical illustration.

4. Oscar Wilde's cynic

The classical economists had battled with the notion that some very useful goods (e.g. water) command prices, or 'values in exchange', lower than those of others (such as diamonds) which apparently are 'less useful' and whose utility, or 'value in use', is perceived as distinctly lower (Daly, 1998). It was not until the last decades of the 19th century, however, with the advent of 'marginalism' (involving the application of calculus to economic functions such as costs and utilities) that this apparent 'paradox' was solved. Total and marginal valuations were distinguished one from the other, and it became obvious that while a commodity may have a high total (use) value for its buyers, its marginal value can be low in reflection of its relative abundance.

The marginalist revolution was to lead to the supply–demand apparatus and neoclassical economists moved from explaining the determination of prices to elaborating how the supply–demand model would function under different market structures: perfect and monopolistic competition; monopoly; duopoly; oligopoly; monopsony; bilateral monopoly; etc. Much less effort began to be expended by economists on the determination of actual prices and the (theoretical) 'theory of value', a basic part of microeconomic teaching, came to dominate price analysis to such an extent that Paul Samuelson, an outstanding leader of the economics profession, once playfully suggested that the economist had become the inverse of Wilde's cynic: he knows the value of everything but the price of nothing! The *Nature* article evidently goes in the opposite direction, thus should commend itself to Samuelson!

5. Other comments

Let me in conclusion mention two methodological reservations. Under 'Sources of error', the authors argue that current market prices may be distorted by virtue of the exclusion (inter alia) of 'household labor and the informal economy' from GNP estimates. In this, they give the impression that since these services are not valued in the national accounts, they somehow distort market prices, not realizing that the sheer existence of such activities bears unavoidably on market price determination, whether or not they are counted ex post in the national product.

The other reservation concerns the authors' suggestion in the section labeled 'Discussion' to inflate conventional GNP by the values they quantify for ecological system services, presumably in order to record their decline when they deteriorate. As the scarcity of these services rises their unit price is also bound to rise, thus offsetting or more than offsetting their volume fall and possibly indicating a value that may be read as indicating an improved situation. Valued in money, the effect on GNP would be obscured or, worse, give spurious confidence in the integrity of the ecological systems. Estimation in physical units may be sufficient to bring their decline to the attention of citizens and politicians, and even economists. It would be useful, nevertheless, to attempt such monetary exercises in analytical studies outside the national accounts orbit, while probing their implications for sustainability and market behavior and valuation. This, of course, is what the authors of the *Nature* article, I believe, set out to do. The article is clearly thought-provoking and should be seen not as an end, but a beginning that would serve as a useful foundation on which to build improved future estimates.

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