Individual Behaviour and Environmental Policy:
Alternative Assumptions

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Abstract

Most insights of environmental economics are based on the standard neoclassical economic model of rational behaviour aimed at maximization of utility in general, or profits in particular. The standard theory of environmental policy is an example in case. However, the maximization hypothesis and its methodological foundation have been criticized on many grounds, related to a lack of either logical or empirical content. Moreover, over the years a great many alternative models of behaviour have been proposed. Both these issues are surveyed here. In the context of environmental economics behavioural assumptions have been most significant for the development of economic valuation and environmental policy theory. Evidently, an exhaustive treatment of both theories is impossible in the present context. Therefore, this paper focuses on the implications of alternative models of economic behaviour for environmental policy theory. The paper can only offer a first step in a comprehensive treatment of this important issue.
**Introduction**

1. Most insights of environmental economics based on the standard neoclassical model of rational behaviour: constrained maximization of utility or profits.
2. The maximization hypothesis and its methodological foundation have been criticized on many grounds.
3. Many alternative models of behaviour proposed.
4. Environmental economics: behavioural assumptions significant for valuation and policy theory.
5. Focus on environmental policy.
6. The paper can only offer a first step.

**Assumptions underlying maximizing behaviour**

1. The marginalist approach to the theory of consumer demand: differentiable utility functions.
3. Preference theory basis of utility theory, which is basis of demand theory.
4. Many microeconomic textbooks devote hardly a single line in support of the maximization hypothesis.

... the consumer chooses ... the optimal consumption bundle ... is ... so reasonable that it needs little discussion

(Russell and Wilkinson, 1979, p. 17).

_A basic assumption of most economic analyses of firm behaviour is that a firm acts so as to maximize its profits; ... This is the behavioural assumption that will be used throughout the book._

(Varian, 1992, p23)

This is all that is said about profit maximization ... and utility maximization does neither receive any motivation.

**Defense by selection**

“Profit seeking” behaviour has been defended by a “selection by markets” argument (Alchian ‘50 and Friedman ‘53). Profit maximization not universal perhaps, but will be the outcome of selection by the market. Winter (1964) criticizes result:

- Using selection analogy from biology without complementing it with a clear inheritance mechanism.
• If lax competition, selective pressure will be weak.
• Other selective forces counteract market forces: institutional constraints.

Moreover, utility maximizing behaviour not saved by selection argument.

**Preference, utility, demand theory: core assumptions**

2. Preferences: complete, reflexive, transitive, regular/continuous, monotonous, non-satiation, convex.
3. Utility functions are non-unique, ordinal and therefore arbitrary representations of preference orderings.
4. “Neoclassical” models: linear budget constraints with fixed, known prices. Deaton and Muellbauer (p87)
5. Fixed preferences and consumer sovereignty: necessary to assess impact of prices on demand.

Many economists regard the assumptions of consumer theory as very weak:

> ... the theory is developed in its most fundamental form, i.e., the assumptions which are made about consumer behaviour are, given the state of the science, very close to the weakest that can be made and still permit an explanation of consumer choice. It is primarily in the area of consumer theory that economists have been most zealous in their application of Occam’s razor to focus on minimum or weakest assumptions to maximize the generality of the abstract theory, for instance, when moving from cardinal to ordinal theories of utility ... as are all assumptions, they are unrealistic in the sense that they are abstractions rather than an attempted description of a very complex set of real phenomena. (Russell and Wilkinson, 1979, p.11).

**Some elaborations of the basic model**

• Separability of utility functions: weak/strong; intertemporally; leisure versus other goods; groups of related commodities; rationed and other commodities.
• Altruism (and envy).
• Household production theory (Becker, Lancaster).
• Nonlinear budget constraints, e.g. due to taxation.
• Other constraints: “time budget”, social rules and norms in, and institutional constraints.
Three types of exogenous information may be made variable or endogenous in the behavioural model:
1. The types of goods: household production theory.
2. The preferences: variable, endogenous.
3. The income: leisure, nonlinear budget constraints.

Criticism on the maximization hypothesis
A few relevant insights in the philosophy of science
1. The philosophy of science is dominated by tradition in natural sciences, with an emphasis on controlled and repeatable experiments. But in economics impossible.
2. Social-economic reality subject to quick, historical, irreversible change. Philosophy of science based on evolutionary biology (Ruse ’86; Mayr ’88; Wilson ’98).
3. Popperian falsifiability of hypotheses: debate on neoclassical behavioural assumptions (Caldwell ’84).
4. Duhem-Quine thesis; assumption of fixed preferences.

Popperian falsificationism and maximization hypothesis
Friedman (1953):

> truly important and significant hypotheses will be found to have 'assumptions' that are widely inaccurate descriptive representations of reality, and in general, the more significant the theory, the more unrealistic the assumptions (in this sense).

> The converse of the proposition does not of course hold: assumptions that are unrealistic (in this sense) do not guarantee a significant theory.

> To be important, therefore, a hypothesis must be descriptively false in its assumptions.

Friedman believes the validity of a theory (its non-falsification) depends on its consequences, and the empirical un-realm of its “assumptions” is irrelevant. Musgrave (1981): distinction between negligibility assumptions, domain assumptions and heuristic assumptions.
Neoclassical model: domain assumptions.
Boland (1979, p. 508):
Since no one has yet solved the problem of induction, one is always required to assume the truth of his premises or assumptions.

Implications:
• Every theory requires untestable axioms.
• Instrumentalism: prediction instead of “realism”.
• Rules out falsification.
• Instrumentalism unsatisfactory: looses predictive power when some essential factor, not caught by the respective theory, changes over time (“Lucas critique”).

Methodological individualism / endogenous preferences
Utility maximizing model: methodological individualism.
   ... the task of social theory is to construct and analyse our sociological models carefully in descriptive or nominalist terms, that is to say, in terms of individuals, of their attitudes, expectations, relations, etc. (Blaug, 1992).

Several problems:
1. “Fallacy of composition”: the whole is not the sum of its parts (Keynes).
2. Methodological individualism stops at an arbitrary level.
3. Individuals in economics are usually really groups.
4. Preferences of households making decisions based on the majority rule will not satisfy the transitivity axiom.
5. Welfare is relative and valuation depends on the welfare or income distribution. Non-existence of economic equilibrium (Martinez-Alier and O’Connor, 1998).
6. Consumer sovereignty mentioned as motivation; rather a methodological assumption to define the discipline, i.e. to keep models analytically solvable.
7. Norton et al. (1998): 4 degrees of consumer sovereignty:
   (a) unchanging preferences (Stigler and Becker);
   (b) given preferences (disciplinary boundaries);
   (c) preference evaluation, critique and policy are inconsistent with democratic principles;
   (d) democratic preference change policy.
8. What a person as a consumer would do is not necessarily the same as what that person would do as a citizen (Sagoff, 1988). Political-ethical-cultural context is relevant.

More specific criticism
1. Luce’s paradox (Luce, 1956): sugar in coffee example contradicts transitivity of the indifference relation.
2. Substitutability strong assumption: certain environmental functions have no human made substitutes: climate regulation, hydrological cycles, nutrient cycling, etc.
3. Consumers get satisfaction not only from the good itself (functional demand) but also from social context (nonfunctional demand). Leibenstein (1966): “bandwagon”, “snob” and “Veblen effects”.
4. Nonfunctional demand raises “non-additivity” problem: market demand not aggregation of independent individual demands; e.g., “bandwagon demand curve” more elastic; “snob demand curve” less elastic; “Veblen demand curve” uncertain.
5. Example Veblen effect: Western Atlantic bluefin tuna represents status food in Japan: demand has increased despite the increase of its price (McDaniel/Gowdy’ 98).
6. Intertemporal utility functions assume comparisons of utility over time are possible.

4. Alternative behavioural models
Herbert Simon: bounded and procedural rationality, and satisficing behaviour
Alternative types of rationality:
- Substantive rationality: results of the choice.
- Neoclassical economic analysis based on particular goal: economic actor is substantively rational.
- Procedural rationality: decisionmaking process itself, important in complex situations.
- “Principle of bounded rationality”: capacity of human mind for solving complex problems is small.

In part it is a habitual response by mainstream economic theorists who, having being taught that a key feature of economic life is that all commodities are scarce, regard information to be generally scarce as well. Accepting, however, that crucial information is usually scarce,
the problem is more complex because sense data itself is not in shortage but in over-abundance." (Hodgson, 1988, p9).

Satisficing principle:

- Trying to attain acceptable levels of welfare or profit.
- Motivation: transaction costs, information gathering, limited human brain capacity.
- Reflects a sort of cost-minimizing approach.

Lexicographic preferences


1. Not worry about higher needs until lower ones are satisfied (hierarchy).
2. Higher needs do not appear before lower needs are covered (satiation).
3. Lower needs covered before higher needs appear.
4. Some goods generate no utility below a minimum quantity.
5. Some goods cannot be substituted.

“More material goods is always better” (indirectly related to monotony of preferences) in growth debate. Not supported by Max-Neef (1995) “threshold hypothesis” and corrected GNP (Daly and Cobb, 1989). Consistent with lexicographic preferences: more material consumption, a higher need, has gone at the cost of some lower needs (personal contacts, serenity, safety).

Individuals cannot continuously trade-off between environmental functions and economic goods: no WTP measure (Spash and Hanley, 1995; Stern 1997).

Habitual behaviour

Small changes in consumer spending: support for stable preferences or for habitual behaviour? Neoclassical household production with durable goods and human capital can generate habitual behaviour. Nelson and Winter (1982) have developed the notion of “routines” as the organizational memory of the firm. Habits and routines are a straightforward approach to meet complexity and uncertainty. Routines may also be regarded as consistent with procedural rationality.

Behaviour and decisions under risk and uncertainty

Expected utility maximization (V. Neumann/Morgenstern)
Axioms of the case under certainty are adapted to the case where lotteries - i.e. combinations of outcomes with respective probabilities - do exist (Luce and Raiffa, 1989).

Alternative decision theories based on risk and uncertainty:
2. Regret theory (Loomes and Sugden, 1982)
3. Prospect theory (Kahneman and Tversky, 1979)

The foregoing theories emphasize, among other things, asymmetry between attitudes towards beneficial and harmful uncertain outcomes

4. Mimetic behaviour and Girardian economics (Orléan, 1988) Behaviour in the face of pervasive uncertainty:
   • Imitation: panic selling, spiralling inflation, speculation;
   • Desire for wealth, insurance to reach self-sufficiency.
   • Goal of wealth leads to envy (see Roe, 1996).

Other models and ideas about behaviour
• Changing and endogenous preferences.
• Unconscious, non-purposeful actions, due to psychological states: stress, fear, surprise, excitement, aggression, depression, grieve, social pressure, blind rage, etc. (Hodgson 1988, pp. 10, 11, 57)
• Cognitive dissonance: preferences adapt to decisions.
• Natural sciences: sociobiology and ethology (“Consilience”, Wilson, 1998)

Alternative theories of firm behaviour:
1. Leibenstein (1966) has proposed X-inefficiency: information imperfect: intra-plant motivational efficiency; and nonmarket input efficiency.
2. Principal-agent theory: asymmetric information; incentive schemes.
5. Various contractual theories (Foss, 1993).

Environmental policy: some preliminary implications of dropping neoclassical assumptions and using alternative models of individual behaviour
1. 1st and 2nd welfare theorem lost: no direct relation between market equilibrium and social welfare.

2. Marginal value concept loses relevance: valuation and CBA less accurate; price policies lose attractiveness.

3. Even if price policy affects choices, no clear relationships anymore (demand and supply functions) if maximizing behaviour does not apply. No “optimal policy”.

4. Utility maximization surrounded with more uncertainty than profit maximizing. Environmental policy aimed at efficiency should focus on producers, not consumers. Dutch energy tax focusing on small-users, mainly consumers, is inefficient and ineffective.

5. Coasian negotiation and endogenous social optimum not realized if individuals not maximizing utility or profits.

6. Taxes less attractive than tradable permits; standards more attractive, from the perspective of effectiveness.

7. Transaction costs: relevant from the perspective of satisficing and routine-like behavioural models.

8. Relocation by firms less significant in models of satisficing or routine-like behaviour.

9. Satisficing: cost-effectiveness, i.e. minimizing costs to attain a given goal: tradable permits and individual standards attractive.

10. Lexicographic preferences: no optimal trade-off exists. no substitution and zero price elasticities over some ranges of change. Complementarity emphasized (valuation research and policy).

**Endogenous preferences and environmental policy**

- Preferences are not invariant and endogenous.
- Stable and sovereign preferences are inconsistent with long-run goals of sustainability.
- Changing consumers’ preferences as an instrument for environmental policy via “moral suasion”: education, advertisement, etc.

The main question is how preferences change.

- Economists no expertise: multidisciplinary research.
- “Coevolution” notion useful to consider endogenously changing preferences in cultural, social, economic and environmental contexts (Norton et al., 1998).
- Coevolution consistent with lock-in, path-dependence, a lack of (static or dynamic) optimality, and feedback between evolving subsystems.
Norton et al. (1998): fear for a “totalitarian government” by following preference changing policies unnecessary:
1. Preferences are already unconsciously manipulated by all sorts of policies, including the standard set of instruments proposed by environmental economists;
2. Preferences are influenced purposefully “behind the scenes” by all sorts of stakeholders, ranging from regulators to interest groups;
3. Commercial companies have since long understood that preferences can be influenced via the media and have done this out of pure profit motivation: widely accepted.
4. Preference-influencing environmental policies may be based on democratic decisions.

Social context, endogenous preferences and self-regulation
Rauscher (1997): Voluntary emission reductions socially rewarded, but if laws, additional abatement not any social reward. Social determinants of behaviour: environmental policies may undermine socially desirable behaviour. The traditional approach to human behaviour can lead to misleading results: Pigouvian tax rate no longer optimal.
Garvie (1997): Analysis of self-regulation of industrial emissions. Endogenous preferences: if consumers better informed about environmental consequences of products, wtp higher for less pollutive products, and more so if toxic pollutants are involved. In such a case, firms can create market power by voluntary codes.

Uncertainty, behaviour and environmental economics
Economic-environmental interactions (Froger and Zyla 1997; Froger and Munda, 1998):
- Complexity and strong irreversibility.
- No simple stationary stochastic process.
- Range and distribution of environmental effects uncertain.
- No simple expected utility or Bayesian learning.

Uncertainty in environmental policy decisions; asymmetric perspective on gains and losses:
- Coasian negotiations between polluters and victims.
- negotiations between countries (agreements).
- negotiations on initial distributions of permits.

Uncertainty, Girardian economics, and sustainable development
Pervasive uncertainty implies mimetic behaviour and uniformity. This model can be applied to sustainable development (SD) (Roe, 1996):
• SD is a social convention which for a time stabilizes decision-making under high uncertainty;
• The response should be to reduce uncertainty that drives the crises of undifferentiation (uniformity) due to imitation.

Some specific elements of an SD strategy are:
• Buffer or decouple resource systems and their managements from environmental uncertainty.
• Discourage uniformity and encourage diversity, via evolution of more than one kind of SD; and treating SD on a case-by-case basis.
• The latter links to the discussion on biodiversity, where maximum diversity keeps most options open and maximizes resilience of any system.

Conclusions
Many traditionally educated economists perhaps sceptical:
• But the neoclassical assumptions of economic behaviour are never tested (although often applied).
• Some starting points untestable: intellectual honesty requires room for sensitivity analysis and pluralism.

Alternative models of individual behaviour:
satisficing, lexicographic preferences, habitual behaviour, uncertainty models, and variable preferences. Some of the implications (habits) can also be obtained with particular maximizing utility models, but this still leaves the problem of unrealistic assumptions; so why not immediately adopt the implied results, without specifying restrictive starting points.

Environmental policy insights alternative models:
• price based policies less attractive
• focus policy on producers
• moral suasion aimed at long-run sustainability
• self-regulation, social context and preference change.
• uncertainty: imitation; pursuing of wealth; strive for diversity.
In this paper mainly qualitative results. Analysis of formal models with alternative behavioural assumptions seems worthwhile pursuing.
Literature


## Taxonomy of alternative behavioural assumptions and environmental policy implications

<table>
<thead>
<tr>
<th>Type of theory</th>
<th>Environmental policy features</th>
<th>Preliminary insights</th>
</tr>
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<tbody>
<tr>
<td><strong>Consumer behaviour under certainty</strong></td>
<td><strong>Type of question/issue/criteria</strong></td>
<td><strong>Preliminary insights</strong></td>
</tr>
<tr>
<td>Utility maximization</td>
<td>Efficiency, optimal policy</td>
<td>Efficiency is feasible</td>
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<td></td>
<td>Changing prices and opportunities: market based instruments</td>
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<td></td>
<td>Transaction costs and rent-seeking; usually preferences invariant: simple predictions of changes in prices and quantities</td>
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<tr>
<td>Lancaster’s theory</td>
<td>Efficiency, functions versus physical characteristics</td>
<td>Not goods themselves but their decomposable characteristics are essential to consumer; value decomposition via characteristics; separation of physical and functional characteristics</td>
</tr>
<tr>
<td>Satisficing / bounded rationality</td>
<td>Effectiveness, efficiency, realistic policy</td>
<td>Efficiency is uncertain</td>
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<tr>
<td>Procedural rationality</td>
<td>Effectiveness</td>
<td>Command-and-control</td>
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<tr>
<td>Lexicographic preferences</td>
<td>Effectiveness, equity</td>
<td>Transaction costs</td>
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<tr>
<td>Habitual behaviour</td>
<td>Effectiveness</td>
<td></td>
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<tr>
<td>Changing preferences</td>
<td>Effectiveness, sustainability</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Policy may be aimed at changing preferences in addition to opportunities; analysis of investments and durable goods; notion of optimal policy does not make sense anymore.</td>
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<tr>
<td>Endogenous preferences</td>
<td>Influence of various factors on preferences, sustainability</td>
<td>Environmental policy measures may be ineffective through preferences being influenced indirectly; cooperative behaviour; social norms and voluntary measures.</td>
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<tr>
<td>Multicriteria decision making</td>
<td>How do people use different types of information</td>
<td>Marginal values non-existent</td>
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<td>Sociobiology</td>
<td></td>
<td>Game theory models</td>
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<tr>
<td>Household and sector decisions</td>
<td>Do households and sectors act as if rational (consistent)</td>
<td>Decisions not necessarily efficient</td>
</tr>
<tr>
<td>Citizen behaviour</td>
<td>Social/ethical goals, sustainability</td>
<td></td>
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<tr>
<td>Value based on distribution</td>
<td>Efficiency and equity non-separable</td>
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<tr>
<td>Irrational, erratic, inconsistent behaviour</td>
<td>What is the range of outcomes of environmental regulation?</td>
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<tr>
<td>Firm behaviour</td>
<td>Efficiency, effectiveness, efficiency</td>
<td>Profit maximization</td>
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<tr>
<td>Price based instruments</td>
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<td>Command-and-control</td>
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<tr>
<td>Behaviour under risk &amp; uncertainty</td>
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<tr>
<td>Expected utility</td>
<td>Efficiency, Intertemporal decisions</td>
<td>Choices are not easily predictable; ex ante versus ex post (Pareto) evaluation criteria and compensation tests; option value theory; WTP Locus theory.</td>
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<tr>
<td>Bayesian learning</td>
<td>Dynamic efficiency</td>
<td>Impact of providing information on preferences and decisions</td>
</tr>
<tr>
<td>Prospect theory</td>
<td>Effectiveness, equity, investment decisions, sustainability</td>
<td>Negotiation of actors with each other (Coase) or with regulator (initial distribution permits) or internationally (agreements between countries)</td>
</tr>
<tr>
<td>Regret theory</td>
<td>Effectiveness, equity, sustainability</td>
<td>Timing of investments, buying of durable goods</td>
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<tr>
<td>Discrete choice theory</td>
<td>Pervasive uncertainty</td>
<td>Transport decisions, durable goods Imitate others, wealth creation, growth is regarded as the solution to environmental problems; reduce uncertainty by buffering of nature;</td>
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<td>Mimetic behaviour and Girardian economics</td>
<td>Information imperfect</td>
<td>Benefits versus costs of searching for information</td>
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<td>Search theory</td>
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