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Combining insights from economics and social psychology to explain environmentally significant consumption

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Sammendrag:.
I dette arbeidet foreslår vi en modell som belyser faktorer av viktighet for å forklare konsum med miljømessige implikasjoner. Modellen skal bidra til forståelsen av denne type konsum, og gjennom dette å forbedre utformingen av virkemidler på området. Modellen baserer seg på innsikt fra økonomi og sosialpsykologi, og forsøker å syntetisere disse teoriene for konsum med miljømessige implikasjoner. Vi mener modellen bidrar med tre nye elementer ut fra eksisterende modeller på området:

- Modellen fokuserer eksplisitt på konsum. Dette gjør det enklere å belyse miljømessige effekter av handlinger enn for andre typer av miljøatferdsmodeller.
- Kunnskap fra økonomifager er brakt tydeligere inn i modellen
- Modellen åpner for en mer mangfoldig bruk av virkemidler enn det som framkommer av anbefalinger fra enkeltdisiplinene alene.

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Abstract:
In this paper we propose a comprehensive model for environmentally significant consumption. The immediate purpose is to improve our ability to understand such consumption. The underlying purpose is to improve our ability to predict consumption and to improve our policy recommendations, in particular with respect to designing effective policy instruments. The model draws on insights from economics and social psychology, and attempts to synthesize these theories with respect to explaining environmentally significant consumption. We believe that the model adds three important elements to existing models of environmentally significant behavior:

- It focuses more specifically on consumption. This links more directly to the environmental impact of the behavior than other types of models of environmentally significant behavior.
- It draws more heavily on insights from economics, both by relating the expectancy-value construct to the characteristics of goods, and by including cost as a separate factor.
- It opens up a wider hypothesis on policy instruments through showing the potential for the use of a diversified policy (information measures and incentives).

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Contents

1 Introduction

In this paper we propose a comprehensive model for environmentally significant consumption. The immediate purpose is to improve our ability to understand such consumption. The underlying purpose is to improve our ability to predict consumption and to improve our policy recommendations, in particular with respect to designing effective policy instruments.

A comprehensive model for environmentally significant consumption is from our point of view one that includes the influence of both internal factors and external factors on consumption. In other words a model that draws on insights from both internalist and externalist approaches to understanding consumption The *internalist* approach sees behaviour "mainly as a function of processes and characteristics which are conceived as being internal to the individual: attitudes, values, habits and personal norms." The *externalist* approach sees behaviour "as a function of processes and characteristics external to the individual: fiscal and regulatory incentives, institutional constraints and social practices." (Jackson, 2005).

Including both internalist and externalist approaches makes it fruitful to focus on two particular disciplines – economics and social psychology – and synthesizing theories relevant for explaining environmentally significant consumption within these disciplines. Social psychology mainly focuses on the influence of internal factors and is well suited to explaining motivation. Economics on the other hand focuses primarily on external factors to explain consumption. Preferences or the motivational factor is considered in most analyses a "black box". Stern (2000) argues that in order to understand environmentally significant behaviours better, we need "*synthetic theories or models that incorporate variables from more than one of the [classes of models], postulate relationships among them, and use them to explain one or more types of environmentally significant behavior*." While single-variable studies can demonstrate the explanatory power of particular variables, they do not necessarily give us the "*comprehensive understanding of particular environmentally significant behaviors that is needed to change them*" (Stern, 2000)[1].

In the following, we will first review the contributions from economics (section 2) and social psychology (section 3). In section 4 we will review previous proposals for synthesis theories, before developing our own model. Section 6 concludes with a discussion of policy implications and the need for further research.

2 Economics as an externalist approach

In economic theory individuals are assumed to adapt rationally and optimally to the relevant external factors. Behaviour is therefore assumed to be influenced by a.o. prices, taxes and regulation. More specifically, consumers are assumed to choose the most preferred bundle of goods given the prices of goods and his/her income.

The consumer is assumed to be able to rank different alternatives based on the happiness, satisfaction or utility that they provide. This ordering of alternatives gives rise to a preference ordering which is restricted by rather strong assumptions (e.g. transitivity, non-satiation and continuity). These assumptions make it possible to represent the consumer's preferences by a utility function which reflects the consumer's ordering of the bundles.[2] The utility function

[1] There have been several attempts to synthesize insights from the different approaches. We will return to these later.

[2] See almost any standard textbooks in microeconomics, such as Gravelle and Rees (1992).

represents the consumer's preferences in such a way that the bundles that the consumer is indifferent between would yield the same utility, while bundles which are preferred to others would yield higher utility.

The consumer will choose the bundle of goods which yields the highest utility given the budget constraint, i.e. the consumer will maximize his/her utility function given that the total cost of the chosen bundle must be less than or equal to his/her income:

$$\underset{x_1,x_2,\ldots,x_n}{Max}\ u(x)$$

subject to

$$p_1x_1 + p_2x_2 + \ldots\ldots + p_nx_n \leq I \quad x_i \geq 0 \quad (i = 1,2,\ldots,n)$$

where u(x) represents the utility function, x is the vector $x = (x_1, x_2, \ldots\ldots, x_n)$, where x_i, $i=1,2,\ldots\ldots n$, is the amount of the ith good in the bundle, p_i is the price of the ith good, and I is income

This optimization problem leads us to the demand function for goods (or what he/she demands of different goods).

$$x_i^* = D_i(p_1, p_2, \ldots\ldots, p_n, M) \quad (i = 1,2,\ldots\ldots, n)$$

Given the preferences and income of a consumer, and the prices of different goods, the result of the utility maximization can be described by x_i^*. Preferences are not observed directly. Economists instead observe the outcome of choices based on these preferences. Traditionally economists assume that the observed demand behaviour reveals the preferences of a consumer, and make assumptions about how an observed choice must relate to preferences to correspond to the underlying utility theory. This is known as the *revealed preference theorem* (introduced by Samuleson, 1938).

While preferences are typically assumed to be stable, they do not have to be biological givens. The more common view among economists is that economic theory can cast light on the consequences of given preferences (or tastes), while sociologists, psychologists and others can explain the formation and changing of preferences (MacPherson 1987). There are, however, some economic theories that focus on what lies behind the preferences, how they can be changed and which implications this has for the standard utility function:

Weizäcker (1971) considers a limited form of changed preferences (endogenity of preferences) where preferences depend on economic variables like advertising, the consumption patterns of other consumers or the consumer's past experiences with consumer goods. This view is also reflected in the literature on habit formation which was intensively discussed in the 1970s (see for example Pollak, 1976 and 1978; Hammond, 1976). Habit formation is modelled as an endogenous change of tastes. Individuals' current preferences are assumed to depend on past consumption. The view originates from psychological learning theory which views habitualization as a result of continuous reinforcement over time. This literature also points to the problems that changing tastes create for conventional utility theory. When preferences change over time, problems of temporal inconsistency in preferences arise. "A consumer who expects to have different preferences in the future faces a planning problem between his present and future self…" (MacPherson op.cit., 402).

In 1966 Kenneth Lancaster proposed what has later been termed the attribute model of consumer preferences, or simply the Lancaster model (Lancaster, 1966). Lancaster assumes that "good possess, or give rise to, multiple characteristics in fixed proportions and that it is these characteristics, not goods themselves, on which the consumer's preferences are exercised." The value of a good is given by the sum of the value of its characteristics or

attributes. A good can possess many characteristics and these can be shared with other goods. Hence, it is the characteristics of a good that produce utility and the consumer valuation of these characteristic that constitutes the consumer's preferences.

Several studies concerned with environmental consumption draw on the Lancaster model. Zepeda and Jinghan (2007) used the Lancaster model together with Weinstein's precaution adoption process to investigate the characteristics of organic and nonorganic food shoppers. In an econometric study McFadden and Train (2000) a mixed multinominal logit model to estimate demand for alternative fuel vehicles, and use a.o. the environmental attributes of the cars (for instance whether they are electric or methanol fuelled) in the estimation.

There are some economic studies that include both external and internal variables, and which find that the predictive power of a model increases if it includes both. Johansson et al. (2005) include individual specific latent variables, including proenvironmental preferences, in a mode choice model. They find that the "enriched discrete choice model" with attitudinal and behavioural indicator variables "outperforms the traditional discrete choice model…" (Johansson et al., 2005). Clark et al (2003) analyze the importance of internal and external factors for participation in a green-electricity program. They find that both external and internal factors are significant for explaining participation. In their study the internal factors are altruistic and environmental attitudes, while the external factors are household income and sociodemographic characteristics.

In his Nobel lecture McFadden (2001) argues that internal and external approaches can be combined to improve the ability to predict economic choices. In his view of the choice process, internal factors like memory, motivation, affect and attitudes influence preferences and perceptions, which in turn are inputs to the process that leads to choices. In this process the external factors, defined as the budget constraint, also play a major role. However, Mcfadden (2001) concludes his lecture by saying that econometric research has not yet explored the structure of consumer preferences by for instance including "the potentially important role of perceptions, ranging from classical psychological perception of attributes through psychological shaping of perceptions to reduce dissonance, to mental accounting for times and costs."

Still, it is fair to claim that the effort to include internalist approaches in economics has not been very extensive. The externalist view of preferences still dominates economics. Traditional economic theory explains demand as result of utility maximization and focus on how demand is dependent on prices and income. This makes traditional economic theory an externalist approach. By using this approach economist may fail to "...understand the levels and the changes in behaviour if they neglect motives…." (Fehr and Falk, 2002, p.687). Fehr and Falk (2002) argue further that this might limit progress in understanding incentives. They provide evidence that motives also shape human behaviour. For instance, they discuss the desire to reciprocate or the desire to avoid social disapproval as powerful motives that explain behaviour.

3 Social psychology as an internalist approach

Social psychology does not have a similarly unified theoretical core as economics does. Therefore we cannot speak of *the* approach, but must consider different approaches. The social psychology models that can explain environmentally significant consumption stem primarily from what may be denoted a dispositional view of human behaviour (Ajzen, 2005). One particular aspect of the dispositional view is the idea of logical consistency, i.e. people are assumed to be inherently consistent in their responses due to the way we process information and make decisions (Ajzen, 2005). We will present two theories deriving from

the dispositional view, which are used to explain environmental behaviours: the theory of planned behaviour (TPB) and the value-belief-norm theory (VBN).

3.1 The theory of planned behaviour (TPB)

The TPB sets out to predict and explain specific behavioural tendencies in terms of a small number of concepts (dispositions) adhering to the principle of compatibility, which implies that all concepts involved need to be measured at the same level of specificity (e.g. belief about CO_2 emissions from a car, and social norm to minimize CO_2 emissions – rather than a more general norm to behave environmentally responsible) and generality to ensure strong relation between them (Ajzen,1991; Ajzen, 2005; Ajzen and Fishbein, 1980). The TPB proposes that the disposition most closely linked to a specific behavioural tendency is the intention to perform the particular behavioural tendency assuming that people by and large do what they intend to do. Furthermore, the theory has identified three determinants of behavioural intentions. First, *attitude towards the behaviour* refers to the positive or negative evaluation of the behaviour in question; second, *subjective norm* deals with perceived normative prescriptions or the perceived social pressure to perform the behaviour, and third *perceived behavioural control* deals with the perception of ease and difficulty of performing the behaviour. The basic idea is that people makes three kinds of considerations before they form an intention to perform or not perform the behaviour: (i) "what do I personally get out of performing it?" (ii) "what are the opinion of my valued others?" (iii) "do I have the ability and resources perform it?" Thus people intend to perform a behaviour, if they evaluate it positively, perceive a social pressure to perform it, and if they believe they have the resources and opportunities to perform it. Perceived behavioural control is also assumed to be a predictor of subsequent behaviour to the extent that it reflects actual control.

The TPB has been successfully applied to a wide range of behaviours. In particular this is so when it comes to prediction of behavioural intentions as shown in a recent meta-analysis (Armitage & Conner, 2001) which indicated that the three TPB components were able to account for 39% of the variance in intentions.

The formation of attitudes, social norms, and perceived behavioural control can be traced back to the three types of accessible beliefs about the behaviour: behavioural, normative and control beliefs. Thus the TPB posits that people think and act in a more or less in a logical and consistent fashion by systematically processing and considering available information, in a subjective sense, about a behaviour before they decide whether or not to involve in that particular behaviour. The three constructs are assumed to emerge spontaneously and automatically as people form the respective beliefs about the behaviour, and intentions and actions follow reasonably from the three concepts.

This informational foundation of the TPB derives from the expectancy-value model (see Ajzen and Fishbein, 1980) - which is related to the Lancaster model. The expectancy-value model describes how beliefs about a behaviour are combined with evaluation of the behaviour. For example, an individual's attitudes towards personally involving in a behaviour (say, "turning off light at night") would be a function of the perceived probability that behavioural involvement is associated with certain consequences ("turning of the light at night reduces my expenses"), and the evaluation of these consequences ("reducing my expenses is important to me"). By multiplying the probability and the value component and summing the resulting products, an indirect measure of an attitude toward the behaviour is obtained.

It should be noted that these processes pertain to behaviours which are assumed to be primarily under *volitional control*, i.e. they are the direct result of conscious deliberations on the part of the individual. However, the reality is a bit more complex so that volitional control may best be viewed as continuum with simple, specific behaviours at one pole (reading a

book), and difficult behavioural projects at the other pole (get rid of a addiction). The latter can be likened to the attainment of goals. Thus lack of actual control over the performance of a behaviour may disrupt the relation between intention and behaviour. Ajzen (2005) suggested that the degree of control depends upon a number of internal and external factors. The former comprises factors which are more easily overcome (information, skills and abilities), while some types of behaviour are subject to forces outside one's control, like emotional and compulsive behaviours. External factors comprise situational opportunities and dependence on others. For example, in order to reduce household energy consumption one has to obtain correct information about the most effective ways of reduction, one has to practice how to do it, and one has to cooperate with the other household members.

A second factor which may disrupt the intention-behaviour relation is *literal inconsistency*, i.e. that people fail to translate their intentions into action (Ajzen et al., 2004). The most frequent reasons provided when asked about why they fail, are that they simply forgot it (Orbell et al., 1997) or that they were "too busy" or had "other business to attend to" (see Milne et al., 2002). In these cases one effective strategy to close the intention-behaviour gap is to ask people to decide when, where and how to perform the behaviour, i.e. so-called implementation intentions (Gollwitzer, 1993, 1999). The effectiveness of implementation intentions has also been confirmed in the area of environmental behaviours (Bamberg, 2003, 2003). Their effectiveness may stem from improvement of prospective memory of the intention, or they may provide a sense of commitment to perform the behaviour in terms of explicit and public statements (Ajzen, 2005).

Finally, the relation between intention and behaviour is weaker also in the case of *habitual behaviours*, i.e. behaviours which are performed frequently under similar conditions. In these cases the behaviour is automatically activated without much conscious deliberations. To the extent that behaviour has become habitual, i.e. performed frequently under similar and familiar circumstances, intentions become largely irrelevant as a predictor of behaviour. On the other hand, intention should be a highly relevant predictor when it comes to new and unfamiliar behaviours (Ouelette & Wood, 1998). Bamberg & Schmidt (2003) have also observed that car use habits significantly increased the predictive power of the TPB in the case of self-reported car use. In this context Verplanken & Aarts (1999) have raised the interesting idea of the functionality of installing new habits (like turning off the light at night, lower the thermostat at night etc.), a process which resembles very much the processes underlying the formation of an implementation intention.

The TPB is primarily an account of motivation (Fishbein & Ajzen, 2005). When it comes to prediction of actual behavioural performance, the theory needs to be extended to take care of self-regulatory processes to increase understanding of this process. Thus the concept of implementation intention will provide an important advance in this context. Likewise the concept of habit may function as a moderator of the intention-behaviour relation as well as having a direct effect on behaviour unmediated by intention (see Bamberg & Schmidt, 2003).

The TPB is a theory outlining the proximal influences close to the action context. The theory posits that factors more distant to the individual may exert influence on behaviour through the various types of beliefs outlined by the theory. Such background factors may be of three types (Ajzen, 2005):

- personal (for example, general attitudes, personality traits, values etc.)
- social (age, gender, ethnicity, education and income)
- information (experience, knowledge, media exposure, informational campaigns)

Thus informational campaigns are assumed to operate by influencing individuals' behavioural, normative or control beliefs. In this context the theory serves as a heuristic tool for identifying the factors which may be of importance for policy makers who want to

influence those specific behaviours, i.e. it provides a general scheme for identifying plausible targets for social influence efforts. Firstly, the theory might provide an indication of which of the three components a policy maker might usefully focus on in attempting to influence the behaviour. Secondly, the theory may provide more specific foci of persuasive messages by identifying which beliefs distinguish between "intenders", i.e. those who intend to perform the particular behaviour under study and "non-intenders", i.e. those who do not. These differentiating beliefs can subsequently be used as arguments in persuasive communications to influence the particular behaviour.

Indeed, O'Keefe (2002) has noted that the underlying expectancy-value model points to a number of alternative ways in which the three constructs may be changed: (i) one may try to increase the favourability or desirability of an existing positive belief, (ii) attempt to increase the probability of an existing positive belief, (iii) one may attempt to decrease the unfavourability or undesirability of an existing negative belief, (iv) one may attempt to decrease the likelihood of an existing negative belief , (v) add a new salient belief about the behaviour, (vi) shuffling existing beliefs around so as to change the relative saliency of them.

3.2 The Value-Belief-Norm theory (VBN)

Another theory which is based on the assumption that people that people think and act in more or less logical ways is the Value-Belief-Norm theory (VBN). While the TPB is a general theory aiming at describing the processes underlying any social behaviour, the VBN is a specific theory about environmentalism. It links value theory, environmental worldview perspective and norm activation theory through a causal chain of five predictors leading to four types of environmental behaviours: (i) environmental activism, (ii) nonactivist behaviours in the public sphere, (iii) private-sphere environmentalism, and (iv) organisational actions. The idea is that altruistic values reflecting concern for the welfare of other people affect people's environmental worldviews, i.e. beliefs about the relation between human beings and the environment. Such worldviews are domain specific and consistent with the principle of correspondence are thus more strongly associated with environmental behaviours than values which constitute more global and stable constructs.

The VBN further posits that an individual's concerns about environmental issues raise his or her awareness that environmental conditions threatens outcomes that the individual values, awareness of consequence beliefs, which in turn elicits beliefs that the individual can act to reduce this threat, ascription of responsbility to self beliefs. This ascribed responsibility to act in turn activates a sense of obligation to act in an environmental responsible way, i.e. a personal norm. Thus contrary to the TPB, activation of a sense of moral obligation to act is sufficient to elicit the relevant environmental behaviour directly without forming an explicit intention to do so. In one study VBN was able to account for 19% of the variance for private–sphere behaviours, 30% in environmental citizenship, and 35% in policy support (see Stern, 2000). In another study Steg et al. (2005) applied VBN in order to account for the acceptability of energy policies. The full model accounted for 32% of the variance in acceptability ratings.

Kaiser et al. (2005) contrasted the VBN and the TPB in accounting for an index comprising 50 conservation behaviour items. They provided evidence of the mediating power of both intentions and personal norms. However, intention was a stronger predictor of conservation behaviour than personal norms, which may be attributed to the fact that intention is considered to be conceptually closer to behaviour than personal norms (cf. Kaiser et al., 2005). Furthermore, the definition of *awareness of consequence* and *ascription of responsbility to self* beliefs as well as measures of personal norms differ in the applications of the VBN in that some studies have made use of specific belief measures while other studies have focused on general environmental conditions (cf. Steg et al., 2005). Behaviour specific

beliefs were more strongly related to behaviour, which also provides a better reflection of the proposed causal chain moving from general to specific beliefs (cf. Steg et al, 2005). Thirdly, the VBN neglects the issue of volitional control in the prediction of environmental behaviours, indicating that the theory can primarily account for behaviours that are more volitional rather than outside individual control, i.e. costly behaviours in terms of effort, time and money may not be predictable from the VBN. In particular this is the case for behavioural tendencies, while less so for behavioural aggregates because the role of such situational factors then tend to cancel out (see Kaiser & Gutscher, 2003). Finally, as compared to the TPB, the VBN does not provide a complete account of the informational foundation of behaviours since it does not address the details of the cognitive underpinnings of the theoretical components. Thus the VBN is of less interest than the TPB when it comes to providing information for behavioural interventions.

4 Combining insights to create a new theoretical framework

Economic theory focuses on explaining consumption while social pshychology focuses on explaining intentions to act (or on a particular act). This may be so because the phenomena they attempt to explain are relatively different. Most consumption decisions are likely to be dominated by contextual factors (prices, income, regulations), while intentions are inherently related to personal attitudes, norms and other subjective variables.

Stern (2000) presents a hypothesis about why economics and social psychology can work quite well on their own in some circumstances, but not in others: "The attitude-behavior association is strongest when contextual factors are neutral and approaches zero when contextual forces are strongly positive or negative". In other words the factors used in the social psychology models are poor predictors of behaviours that are difficult, time-consuming or expensive. For these behavirous contextual forces, such as prices and policy instruments, are likely to be better predictors. He further argues that "Supporting evidence for this implication exist in studies that have used the same attitudinal variables to account for different proenvironmental behaviors. For example, in a study of household energy conservation, the relative explanatory power of social-psychological variables declined as effort or cost increased..."

Based on this, as well as the preditive power of the different approachs in various contexts, our claim is that explaining environmentally significant consumption has to rely on both approaches: Environmentally friendly consumption decisions are typically costly, so we should not expect the internal factors used in social psyhology models to be able to explain consumption behaviour very well. However, precisely because pro-environmental consumption decisions are more costly, neither is traditional economic theory well suited as an explanatory model. A synthesis approach may therefore prove very productive when it comes to explaining environmentally significant consumption.

We will discuss existing comprehensive models of environmentally significant *behaviour* before we introduce our model of environmentally significant *consumption*. The purpose is to show which factors have been considered important in the different models, and to draw on these insights when we propose a model that is more narrowly directed towards explaining environmentally significant consumption.

4.1 Models of environmentally significant behaviour

Several proposals for comprehensive models of environmentally significant behaviour have been put forth. Most of these have been grounded in one discipline and have attempted to improve the predictive power by including other types of variables, such as some social

psychology models that are extended to include external (or contextual) factors. None of these models have a particular focus on explaining consumption, but rather on environmental behaviours or intentions more generally.

Ölander and Thøgersen (1995) argue that "Consistency between attitudes and behaviour can be expected only if the behaviour depends solely on the actor's free choice, that is, if the actor commands the necessary and sufficient will-power, abilities, resources, and technical means to perform the behaviour…" They further argue that many, perhaps most, environmentally significant behaviours are not completely under volitional control. The predictive power of behavioural models can therefore be considerably improved by including "as moderators of the relationship between attitude and behaviour an ability concept…, and a concept of facilitating conditions or the opportunity to perform the behaviour…" The Ölander and Thøgersen model thus has three main influences on behaviour: *motivation* - as predicted by social norms and attitude towards the behaviour, *ability* and *opportunity* (overall situational conditions). Fransson and Gärling (1999) propose a model that is very similar at the aggreagate level (the only additional influence on intention is normative outcome).

Stern (2000) discusses a relatively similar framework to that of Ölander and Thøgersen, namely the ABC-model (Guagnano et al. 1995). In this model there are four factors that influence environmentally significant behaviour: attitudes, personal capabilities, contextual factors and habits. The personal capabilities include the knowledge and skills required for particular actions, the availability of time to act, and general capabilities and resources such as literacy, money, and social status and power (Stern, 2000). Contextual factors include interpersonal influences, community expectations, advertising, government regulations, other legal and institutional factors, monetary incentives and costs, the physical difficulties of specific actions, capabilities and constraints provided by technology and the built environment, and various features of the broad social, economic and political context (Stern, 2000).

Much of what has been proposed in the more recent comprehensive behavioural models was already proposed by Harry Triandis thirty years ago. In Triandis' Theory of Interpersonal Behaviour intention is influenced by attitudes, social factors and affect, and intention influences behaviour together with habits and "facilitating conditions" (similar to the conept of contextual factors). Though Triandis' model has greater explanatory power than many other models (Bamberg and Schmidt, 2003), it has not been much used.

4.2 A model of environmentally significant consumption

The proposed models of environmentally significant behaviour capture most of the relevant influences on behaviour. Our contribution is to consolidate these insights, and to add a stronger focus on economic factors as most of these models have a relatively strong "bias" towards social pshychology. This bias is particularly important when it comes to our purpose – to explain environmentally significant *consumption*.

We believe it is necessary and useful that the basic structure of the model should build on the distinction between internal and external factors, as they have different functions in influencing behaviour. The basic structure of our model is that the probability of consuming a good is a function of the internal motivation to consume the good and the external influences. The internal motiviation is represented by an expectancy value construct, while the (mostly) external variables are 'ability', 'social norms', 'cost' and 'contextual constraints'. Throughout we will use residential energy efficiency measures to illustrate the (potential) importance of each of the factors in the model. Energy efficiency measures are a good illustration as both economics and social psychology on their own fall short of explaining why people do not undertake measures that are both financially and environmentally beneficial. There is a large economic literature attempting to explain the so-called energy efficiency gap. This literature,

however, deals with the gap between consumer behaviour and what is judged to be economically optimal decisions. It does not address whether any personal environmental motivations or social norms might lead inviduals to undertake energy efficiency investments beyond what is financially efficient. There is also evidence that traditional economic policy instruments alone might not be very effective: Stern (1999) reports a case where a utility company offered energy conserving home improvements at no cost with a guarantee of lower energy bills. Only six percent of eligible households signed a contract with the company. When the invitation to the programme was instead sent by the Chairman of the county Board of Commissioners, five times as many people signed a contract!

The social pshychology litereature does address such motivations, but fails to investigate important economic factors (discount rates, transaction costs, information assymmetries, principal-agent problems, etc.).

Motivation is represented by an expectancy value construct, as in the TPB. However, we do not use evaluation of and beliefs about behavioural *outcomes*. Instead we use evaluation of and beliefs about the *characteristics* of the consumed good. This brings us close to the Lancaster model (Lancaster, 1966). This construct allows us to predict the strength of preferences for consuming a specific good based on its characteristics. However, we define the 'characteristics' of goods in a perhaps somewhat wider sense than commonly done: Characteristics are not only the objective properties of the good as such (e.g. price, performance and size of a car), but also properties relating to the production, purchase and use of the good (e.g. the status a premium car confers, or the CO_2 emissions resulting from the use of the car). We will assume, like Lancaster, that beliefs about attributes are objective, but unlike him that individuals subjectively assign different weights to the importance of the various attributes (the evaluation of the attribute). Thus one individual might for example put great emphasis on the CO_2 emissions of a car, while another individual does not - but both agree on how large these emissions are. It is important that the model can include the environmental characteristics of the good since intention, acts, behaviour or consumption can only indirectly (and with varying degrees of precision) be linked to their environmental impact. The environmental characteristics of goods, such as the CO_2 emissions of a car or the amount of cyanide used to extract the gold for a gold ring, however, link directly to the environmental impact. The environmental significance of the choice is therefore much easier to predict and to link to any pro-environmental preferences.

While the motivation to undertake energy efficiency improvements may be largely economic, it can also be normative: Black et al. (1985) find that "The strongest single direct influence [on low-cost investments in energy savings] is the personal norm for energy efficiency. It may also be other attributes that appeal to households. Mills and Rosenfeld (1996) argue that "While energy savings from microwave ovens can be substantial, the non-energy amenity and convenience factors appear to have driven consumer adoption."

Cost is represented as a separate factor, something which none of the other comprehensive models do. Cost should account not only for the purchase price of the good, but the full cost of purchasing, maintaining and using the good. This includes any relevant taxes, fees or subsidies. Income is perhaps best accounted for by dividing total costs by income (to arrive at an individual measure of "relative cost") as this income tells us something about the relative importance of costs to the individual consumer. Black et al. (1985) highlight the importance of economic factors, and also has findings relevant to the contexts in which costs may or may not be a critical factor: "capital investments [in energy savings] are much more constrained by a variety of factors, including home ownership, availability of funds, the possibility of making a costly error of judgment, and the physical structure of the building. Low-cost investments are more readily undertaken in response to norms because they are less constrained by factors out of the consumer's control."

The *ability* category covers both habit and task, as suggested by Ölander and Thøgersen (1995), and also some of the factors included in Stern's (2000) concept of 'personal capabilities'.[3] In applications of the model typically only a few factors from this category will be salient, and habit is perhaps the factor that most often will be salient. A lot of the empirical data on electricity consumption points to *ability* as an important factor. A survey conducted by Energy Australia (Energy Australia, 2006) measured almost 2,500 showers taken over five days by more than 400 people and included surveys on what people did in the shower. This showed that brushing teeth, singing, playing with toys and just day dreaming are some of the reasons why young children are showering longer, while for parents relaxing, exfoliating or shaving were the reasons given for keeping the hot water running.

Social norms are here defined as "what the individual believes other people who are important to him/her would approve or disapprove of." Perceptions of what significant others are doing in a particular domain motivates by showing what is the typical or normal thing to do, and what is likely to be an effective and adaptive decision ("If everyone is doing it, it must be a sensible thing to do"). There are some social norms that are relevant for electricity consumption. "Social norms also show to have influence on energy conservation behaviour. In an experimental study conducted by Schultz et al (2007) it is shown that actual energy usage is best motivated by referring to common behaviour (social norms).

Finally, *contextual constraints* include the availability and quality of the necessary "supporting infrastructure" for consumption of the good (such as fuelling stations or trained mechanics), legal constraints (the need to have a driver's license to drive a car) and advertising (exposure to advertising might create habits in much the same way as previous consumption of the good does). Relevant contextual constraints in terms of electricty consumption are the choices available to the household. For example, the heating sources and electrical appliances used in the household are important determinants of the level of electricity consumption. A specific example is the "physical structure of the building", as mentioned in the above quote from Black et al. (1985). The proposed model is illustrated below in figure 1.

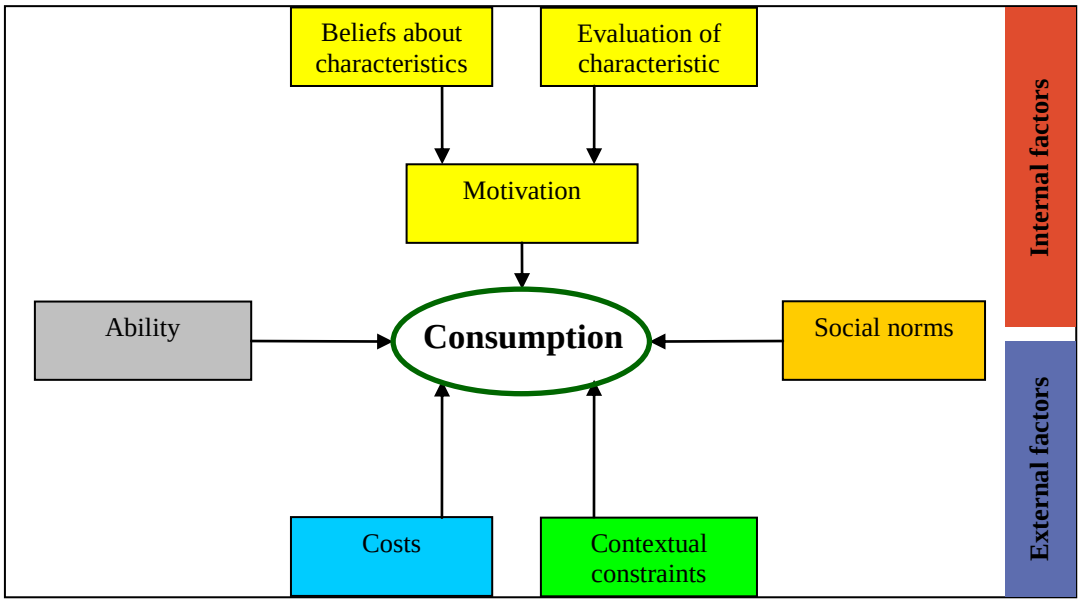

Figure 1: A comprehensive model of environmentally significant consumption

[3] We differ from Stern (2000) in that we do not include money, social status or power as socio-economic factors.

5 Applications of the model

The model is not intended as an estimation tool, such as the TPB or an econometric model. It is a tool to identify critical constraints/limiting factors. This will help point us in the direction of which models might be used successfully to make estimations. The model might imply that an economic model will be sufficient, or that contextual constraints and costs are largely irrelevant, such that the TPB model might be appropriate. The purpose is to help ensure that critical factors are not overlooked when choosing which factors to include in an estimation (and which model to use).

The traditional environmental policy recommendations in economics are based on the assumption that the intrinsic properties of goods are equal across goods, i.e. that the same kind of policy can be used to regulate gasoline consumption as electricity consumption. This implies that external effects arising from consumption of these goods could be regulated by the use of (the same) Pigouvian taxes. We would argue that the traditional theory of policy recommendations is too narrow in its conception of relevant factors to efficiently regulate environmental effects of consumption. There are three main policy implications arising from our comprehensive model of environmentally significant consumption.

First, one has to look into the different elements of the consumption of a good and the characteristics of the good to design effective policy interventions. By elements of consumption we mean all the single acts that add up to consumption of this good. For instance, electricity consumption is not one single act. A certain level of kWh used in a household is a result of numerous acts; the use of the dish washer, the use of lights, heating and electrical appliances. The focus on the elements of consumption gives an indication of where efforts should be focused to achieve the greatest effects. For instance, in the case of electricity consumption in Norway a focus on influencing the consumption of heating and the use of hot water would in most cases give the greatest effect if the instrument use is effective.[4]

It is also important to gain knowledge about the different characterisitcs of a good and how these are evaluated by different groups. This helps us understand what influences the motivation for consuming specific goods.[5] For instance, when buying a car, there are different characteristics of the car that might be valuable for the consumer; comfort, safety equipment and environmental performance. Another example is electricity consumption which provides comfort through heating and lighting, reduced time allocated to household activities, and which extends the possibilities for different activities.

Second, including internal factors and a more comprehensive account of external factors regarding environmentally significant consumption implies that the use of economic instruments like taxes and subsidies might not be the only way ahead. Combinations of instruments might be more effective. For example, if contextual factors, such as the availability of biofuel for cars, is important for the consumption of a good, there might be reasons to use legal instruments that affects this context (required petrol stations to sell biofuels), rather than to use economic instruments alone (tax breaks for cars than run on biofuels). Stern (1999) for instance argues that "incentives and information have different functions, so that efforts focused on only one are sometimes misplaced; however, properly deployed, they can have synergistic effects on behavior."

Finally, to design an effective policy it is also necessary to understand which factors are limiting conditions for consumption of the different goods. Stern (2000) introduces an

[4] Heating and use of hot water accounts for 65% of the Norwegian electricity consumption while and lighting accounts for 11%.
[5] By characteristics of the good we mean (as defined above) both the objective properties of the good and properties related to production, purchase and the use of the good.

intuitive concept of limiting conditions: "Interventions do little or nothing until one of them removes an important barrier to change... ". The concept of limiting conditions also implies that particular kinds of interventions have diminishing returns after they have fulfilled their major function. For example, once financial incentives are large enough to demonstrate a clear personal benefit, increasing the incentive may be far less effective in producing behavior change than providing information through marketing..." (Stern, 2000). The model might be useful in helping to identify limiting conditions by defining relevant categories in which to search for these:

Take the example of sales of electrical cars. Why are sales so low? Electrical cars are cheap ro run and environmentally friendly. If only cost and moral motivation (environmental concern) mattered, there would seem to be little reason they should not be selling better. By going through the different factors in the model we can identify potential limiting factors:

- *Motivation*: Electrical cars produce no exhaust and therefore do not emit greenhouse gases or any other pollutants. To the extent that the consumer is environmental concerned, this should contribute positively to the motivation to purchase an electrical car. However, motivation is probably the single factor that best explains the low sales of electrical cars: They score very low on beliefs about characteristics such as comfort, safety, passenger and luggage capacity, performance (speed) and range.
- *Cost*: The unit cost of electrical cars is low compared to "cars" as such, but high compared to cars with similar attributes. Running costs are very low, and many contries have incentives such as free marking or zero road use fee for electrical cars.
- *Ability*: Most people who can operate a conventional car should have little problem learning to operate and electrical car.
- *Social norms*: Pro-environmental norms strongly favour the purchase of electrical cars over conventional (combustion-engine) cars. More traditional status-related norms would favour larger cars and famous brands over electrical cars.
- *Contextual constraints*: There might be some contextual benefits of using an electrical car, such as the possiblity to use public transport lanes in some countries. However, there is a limited supply of mechanics who know how to fix these cars, and possibilities to recharge are in practice more scarce than the possibilites to refuel a conventional car.

Based on a brief qualitative assessement, the model can help us identify which factors might be critical for explaining the low sales of electrical cars: Motivation is likely to be a "limiting condtion" in terms of the poor performance of electrical cars on several attributes that are typically important to car buyers.

6 Concluding remarks

The immediate purpose of proposing a comprehensive model for environmentally significant consumption is to improve our ability to understand such consumption. The underlying purpose is to improve our ability to predict consumption and to improve our policy recommendations, in particular with respect to designing effective policy instruments.

We believe that the model adds three important elements to existing models of environmentally significant behaviour:

- It focuses more specifically on consumption. This links more directly to the environmental impact of the behaviour than other types of environmentally significant behaviour.

- It draws more heavily on insights from economics, both by relating the expectancy-value construct to the characteristics of goods, and by including cost as a separate factor.
- It opens up a wider hypothesis on policy instruments through showing the potential for the use of a diversified policy (information measures and incentives).

However, there is also a great need to develop the model further, both through testing central elements of it, and to develop it further theoretically:

- How do we identify ”limiting conditions” from all the variables that can potentially influence consumption?
- The model, as a whole, should be tested in empirical applications. For this purpose the Mixed Multinomial Logit model (McFadden and Train, 2000) might be suitable.
- The model does not account for any interaction between the variables, for example crowding-out of intrinsic motivation by external intervention (Frey and Jegen, 2001). The model could be extended to account for such effects.
- Both economics and social psychology are individualistic approaches. Though cultural and social factors are determinants of social norms and some of the institutional barriers, there is no scope for them to change in our model. The social and cultural forces therefore form a static backdrop to the model.

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