

**Discussion Papers No. 227, September 1998  
Statistics Norway, Research Department**

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## **The Social Contingency of Wants Implications for Growth and the Environment**

**Abstract:**

Economic models typically assume that individual wants are determined by forces exogenous to the economic system. Social psychology and consumer research, in contrast, support the view that the perceived benefits of consumption are strongly affected by endogenously determined social norms. This paper presents a selective overview of the literature on the relationship between consumption and well-being, exploring the ways in which informal arguments from the descriptive social sciences might be linked to formal models of economic behavior. We incorporate Sen's (1985) distinction between commodities and functionings into Nordhaus' (1994) model of climate change and the world economy, showing that optimal paths for greenhouse gas emissions and capital accumulation are highly sensitive to the role of consumption norms in the welfare determination.

**Keywords:** Functionings, socially contingent wants, positional goods, greenhouse problem

**JEL classification:** D11, D60, Q00

**Acknowledgement:** This work was supported by a grant from the Norwegian Research Council. We thank Karine Nyborg for valuable comments and suggestions through the course of this project.

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# 1. Introduction

Standard models of economic behavior are premised on the assumption that individual wants are determined by forces exogenous to the economic system. Nevertheless, the dependence of preferences on cultural norms and social institutions has long been recognized by economists. In *The Wealth of Nations*, Adam Smith (1776) pointed out that the English of his day “would be ashamed to appear in public” without wearing shoes and linen shirts, a standard of dress that Smith viewed as specific to the place and time. Since Smith’s era, questions concerning the social contingency of wants have appeared now and then in the literature. A common theme is that the satisfaction an individual derives from goods and services depends upon aggregate consumption patterns in society as a whole. Veblen (1899), for example, maintained that households are motivated in part by attempts to establish enhanced social rank through conspicuous consumption. Duesenberry (1949) claimed that relative income effects are a basic foundation of savings decisions. And Frank (1985) explored the biological and psychological basis of preferences, arguing that social status plays an irreducible role in economic behavior.

The assumption that perceived wants are independent of social context is a useful simplifying device in the analysis of many economic problems. The representation of actual persons through appeals to the stylized model of *homo economicus*, however, presents important challenges in the analysis of social choice and welfare. In the context of environmental policy, standard theory suggests that emissions taxes and related market-based incentives are sufficient to achieve optimal levels of pollution abatement. Conservationists, in contrast, claim that resource depletion and environmental degradation are tied to pervasive patterns of overconsumption requiring directed policy solutions (Durning, 1992). In a synthesis of these views, Howarth (1996) examines a static externality model in which utility depends in part on economic status, defined by the relative magnitudes of individuals’ own consumption and average consumption in society. In this setting, the achievement of a Pareto efficient resource allocation requires taxes on both consumption and pollution to address the externalities generated by status-seeking and environmental degradation. In contrast with standard theory, the optimal pollution tax generally exceeds the marginal benefit of pollution abatement, calculated as the sum of individuals’ marginal willingness to pay for a cleaner environment.

In a related study, Ng and Wang (1993) explore the links between economic growth and environmental quality in a model where the welfare of a representative individual depends on absolute consumption, relative consumption, the fulfillment of aspirations, and the state of the environment. The fulfillment of aspirations is measured by the ratio of personal consumption to a dynamic reference

level that depends on the individual's past consumption history. The authors note that individuals' efforts to enhance their social standing through increased relative consumption are socially deleterious since scarce resources are dissipated in a positional arms race (Frank and Cook, 1995) that is ultimately unwinnable. Based on the assumption that individuals are myopic in the sense that they ignore the impacts of their present consumption and their own future aspirations, the authors conclude that the pursuit of aspirations also diminishes long-run personal well-being. Together, these factors suggest that standard models of economic growth overstate the welfare gains achieved through rising incomes. Since increased production and consumption are also tied to increased environmental degradation, Ng and Wang argue that unconstrained growth may actually erode social welfare.

The present paper extends the analysis of these issues in three important respects. We begin by setting the problem of preference determination and behavioral motivation into a context that is explicitly linked to Sen's (1985) distinction between commodities and functionings, in which the mapping from goods and services to human welfare is contingent on social norms that are beyond the control of individual decisions. In Sen's framework, goods and services are valued only indirectly for the contributions they make to functionings such as the satisfaction of basic needs and a positive self-image. As we shall see, this reconceptualization of preferences suggests that ordinary consumption may generate externalities that are connected to the evolution of perceived wants through time.

Next, we examine the relevance of research findings from social psychology and related fields for the problem under investigation. Although economists have emphasized the role of conspicuous consumption in signaling one's relative status to other members of society, the psychological literature suggests a richer interpretation in which the quest for identity and self-esteem are more central considerations. In this perspective, the meanings goods and services (and hence their instrumental value) is tied to shared conventions that are endogenously defined and reinforced through consumption behavior and social engagement (Dittmar, 1992). Empirical research suggests that prevailing consumption patterns and class identifications establish the vantage point through which individuals evaluate their personal well-being. As such, the consumption bundle necessary to achieve the "good life" is a moving target that depends on one's social environment.

Finally, we explore the welfare implications of contingent wants in an extended version of Nordhaus' (1994) Dynamic Integrated model of Climate and the Economy (DICE), which examines the tradeoffs between economic growth and the global environment in a numerical simulation framework. While the base version of this model supports high rates of consumption growth and greenhouse gas emissions, our analysis shows that these results depend critically on the assumption that perceived wants are invariant over time and independent of prevailing economic conditions. Since

the substantive findings of behavioral research provide strong reasons to doubt this assumption, our analysis points to the need for further research on the empirical dimensions of preferences and welfare.

## 2. Commodities and functionings

In a seminal paper, Stigler and Becker (1977) argue that phenomena like addiction, customs, advertising, and fashion can be analyzed using models characterized by stable tastes. The authors' argument is based on the notion of a household production function, in which market commodities are transformed into nonmarket goods that enter directly into individuals' utility functions. In this setting addictions, customs, advertising, and fashion modify the production function while leaving the utility function itself unchanged.

In an extension of this framework, Amartya Sen (1985) introduces the concept of functionings, which represent the effective services generated by material goods as mediated by social and psychological factors. According to Sen (p. 15),

“It may be illuminating up to a point to see functionings as ‘commodities,’ produced by the household, but this analogy can also be misleading since functionings are features of the state of existence of a person, and not detached objects that the person or the household happens to ‘produce’ and ‘own.’ Living long, or being free from malaria, or not being ‘ashamed to appear in public,’ can be seen as commodities in only a very limited sense, and a formal structure based on that sense need not be particularly helpful.”

In Sen's model, a single commodity might be used to provide entirely different functionings. A loaf of bread, for example, may be used either to satisfy one's appetite or to gather a group of friends to a party. Similarly, different commodities might be used to provide similar functionings, just as different types of food can assuage one's hunger. But if a person ate fish at her last dinner, she might prefer pasta the next night to provide the functioning of variety. Preferences are defined over functionings, but as commodities are required to provide functionings, it is possible to derive preferences over commodities from preferences over functionings.

Sen describes the formal aspects of his approach using the following nomenclature. Let  $x_i$  be a vector of commodities possessed by individual  $i$ , and let  $c(x_i)$  be a function that converts this commodity vector into a vector of characteristics. This distinction is emphasized by Lancaster (1971, p. 6), who argues that the characteristics associated with goods and services are objectively determinate:

“A steak is seen ... as something to eat, with many properties that could be agreed on by everyone, and not as something with which to make clothing... Those who do not like beef dislike some of its properties.”

Since any commodity possesses a great number of physical properties, only some of which are relevant to economic decisions, Lancaster defines characteristics in terms of properties that affect the perceived value of goods.

According to Sen, the mapping from characteristics to functionings is given by:

$$b_i = f_i[c(x_i)]$$

where  $b_i$  is a vector of qualities that defines the state of being of person  $i$  and where  $f(\cdot)$  is a so-called “utilization function.” Sen is not explicit regarding the use of this framework in behavioral modeling, nor even on the links between functionings and aggregate measures of individual welfare. He describes both a happiness function  $h(b_i)$  and a value of well-being function  $v(b_i)$ , noting that “whether or not happiness is a plausible criterion of the goodness of life, *valuing* a life and measuring the *happiness* generated in that life are two different exercises” (p. 12, emphasis in original). He does not propose the maximization of either happiness or well-being as a behavioral hypothesis; indeed, his writings repeatedly stress that such an approach would constitute a decidedly narrow description of human activity.

For our purposes, the key aspect of the model is that the functionings that a person derives from a particular bundle of goods may depend on social institutions and prevailing economic conditions. In Adam Smith’s example of clothing conventions in 18th century England, the relevant functioning is to appear in public without shame. The type of clothing required to achieve this end depends on cultural norms that in turn reflect the complex interplay of technological, economic, and social conditions.

Human beings are social animals, and many of the functionings we aim to achieve are characteristically social in nature. We need to belong to families and communities, have friends, earn the respect of associates, and otherwise participate in social life. The analysis presented here builds on the premise that economic factors such as consumption, possessions, occupational status, and so forth are essential to the attainment of these functionings. In particular, one’s social prospects depends importantly upon one’s economic standing relative to one’s peers.

To capture these effects we will focus on a simplification of Sen’s approach in which the functionings obtained from the commodity vector  $x_i$  are given by:

$$b_i = f_i(x_i, s_i).$$

In this formulation,  $s_i$  is defined as a vector of socially determined variables that are relevant to person  $i$ ’s well-being but beyond her individual control, and hence taken as exogenous in private decision-making. To illustrate this approach, consider the functioning “to appear in public without shame.” Let

$s_i$  denote the quality of clothes deemed customary and appropriate given the cultural norms of person  $i$ 's society. If  $x_i$  is the quality of  $i$ 's wardrobe, we may define a functioning:

$$b_i = \begin{cases} 0 & x_i < s_i \\ 1 & x_i \geq s_i. \end{cases}$$

In this setting, person  $i$  is able to appear in public without shame if (and only if) her clothing meets prevailing expectations ( $b_i = 1$ ). Under this model, Adam Smith's claim would be that  $s_i$  was higher in 18th century England than in earlier, and less wealthy, societies.

### 3. Varieties of social functionings

Adam Smith's example of fashion conventions is useful in illustrating the links between commodities and functionings in a context of contingent wants. To construct realistic models that incorporate these concepts, however, requires explicit attention to the insights generated by social psychology and related disciplines. The following sections provide a brief overview of the most relevant aspects of the literature on the social determination of wants. Scitovsky (1976) and Frank (1985) present more detailed treatments that emphasize the psychology of individual decision-making.

#### 3.1. Material possessions as constitutive of the self

According to Mead (1913, 1934), human beings' conception of the self depends on their ability to view themselves from the perspective of others. This conceptual framework, which is commonly known as *symbolic interactionism*, is aptly summarized by the Mead's aphorism that "we must be others if we are to be ourselves" (1934, p. 276). As Farr (1997) notes, Mead's framework draws on the concept of the "impartial spectator" that Adam Smith (1759) introduced to moral philosophy and political economy. With this in mind, it is interesting to explore its implications for contemporary economics.

Dittmar (1992, p. 75) embraces symbolic interactionism in her approach to the social psychology of material possessions:

"The core of symbolic interactionism is the notion that developing a sense of identity stems from the human ability for self-reflexivity... Self-awareness means that the self becomes the object of reflection."

Noting that "we do not experience our environment as a chaotic and overwhelming mass of impressions, but as an ordered and comprehensible world" (pp. 67-68), she points out that the concepts and meanings used to impose order on experience are strongly shaped by cultural traditions and social conventions:

“Material goods play a particular role here, in the sense that gender, class, and status are clearly marked by certain kinds of possessions and dress. During socialization, we learn to understand the map of our social environment in terms of which material possessions signify which social categories” (p. 70).

Thus the meanings of commodities are not objective facts but rather social constructions, and the functionings provided by goods and services are contingent on prevailing institutions.

Mead’s work stresses the supreme role of symbols and their socially shared meanings for the development of a sense of identity. Although the concept of symbols covers language and myths in addition to inanimate objects, the application of this framework to material commodities is especially relevant for our purposes. According to Dittmar (p. 79),

“Material objects can symbolically communicate the personal qualities of individuals; that they are, for instance, artistic, extroverted, conventional, adventurous or open-minded.”

The meanings of goods and services must be socially shared if they are to function as symbols. The set of shared meanings, however, is not static, but is rather continuously evolving through the process of social engagement. In this paper we focus particularly on how economic growth influences the dynamics of meaning and hence the functionings provided by production and consumption.

### **3.2. Consumer goods as bridges to hopes and ideals**

McCracken’s (1990) views on the displaced meaning of consumer goods provide an interesting connection to symbolic interactionism. According to McCracken (p. 104),

“Consumer goods are bridges to ... hopes and ideals. We use them to recover this displaced cultural meaning, to cultivate what is otherwise beyond our grasp. In this capacity, consumer goods are also a way of perpetually renewing our consumer expectations. The dark side of this aspect of consumption is that it helps to enlarge our consumer appetites so that we can never reach a ‘sufficiency’ of goods and declare ‘I have enough.’”

This claim is grounded on the assumption that hopes and ideals would lose their functions if they were readily attainable in our daily lives, as their perceived qualities would be reduced to the mundane through overfamiliarity. On the other hand, hopes and ideals would serve no purpose if they were so far beyond our reach that they lost their connections to experience. Hence we need bridges, and consumer goods are perfect bridges. They are concrete objects here and now, but at the same time their attainment is limited by prices and incomes. In this setting, luxury goods such as summer houses, high-performance automobiles, and original works of art may emerge as socially defined symbols of “the good life.”

A range of evidence suggests that the sudden acquisition of wealth may cause individuals to reevaluate, and subsequently reject, their prior beliefs concerning the idealized value of status

goods. McCracken (p. 113), for example, recounts the following anecdote from the *Toronto Sunday Star* (Rickwood, 1984):

“A Canadian woman recently won \$900,000 in a provincial lottery and then succeeded in spending nearly half this amount in a three-week period. A reporter talked to her toward the end of this riot of consumer activity and she confided in him: ‘A lot of fun is taken out of life when you just go out and buy whatever you want. It is not as wonderful as you think it will be before you win. I don’t think you can ever get back to the way it was before.’”

This example corresponds to Kahneman’s (1994) finding of important disparities between “decision utility” and “experienced utility” in economic choices. According to Kahneman, laboratory experiments establish that the gratification anticipated from a future activity often bears little relation to the gratification achieved when the activity actually takes place. Thus the drive to achieve economic gain may be driven false beliefs about the true benefits of material goods that are conditioned by social conventions.

### **3.3. Positional goods**

A particular type of social functioning concerns the benefits that individuals derive from the use and control of so-called *positional goods*. This concept, which was introduced by Hirsch (1976), is connected to goods and services that are defined in relation to individuals’ comparative social standing. The functionings pertaining to membership in the top decile of the income distribution, for example, do not increase in availability as average incomes rise. In a similar fashion, only five hundred persons can serve as chief executive officers in Fortune 500 firms, only the top-ranked professors will be hired by the very best universities, and only the most talented players will find employment in professional athletics.

Properly understood, positional goods are not functionings per se but rather means to achieve functionings. Being hired by a top university may reinforce one’s conception of being intellectually gifted, as well as contributing to the respect one receives from one’s colleagues and friends. It is not axiomatic, of course, that functionings of this type exist in fixed relative abundance. A person might, for example, define a new area in which she particularly excelled, while tactful individuals might strive to ensure that all of their friends and colleagues felt honored and respected, irrespective of their possession of positional goods. Nonetheless, the importance of relative standing in anchoring self-worth and social esteem seems difficult to contest. Since the supply of these functionings is in no sense affected by economic growth, it is interesting to suppose that the mapping from positional goods to functionings is fixed.

Hirsch stressed the importance of positional goods in his seminal book *The Social Limits to Growth*. The main argument of this work is that the marginal utility of conventional commodities falls as the economy grows in scale and people's material needs become satisfied. As the direct benefits of increased prosperity diminish in importance, people's attention becomes focused on the competition for positional goods, the supply of which is not augmented by economic growth. Thus growth exacerbates rather than relieves distributional conflicts. As the economic pie grows larger, people become more and more concerned with the distribution of relative shares.

As Brekke *et al.* (1998) show, the share of total expenditures allocated to the acquisition of positional goods will increase with incomes only if the elasticity of substitution between positional and normal goods is less than unity. With this in mind, Hirsch's argument constitutes a conditional hypothesis rather than a general theoretical result. This issue aside, the importance of positional goods and related concepts of economic status is supported by both intuition and empirical generalizations. Easterlin (1974, 1996), for example, examines the statistical links between income and subjective well-being as measured through social surveys. His analysis finds that:

- (1) In a given society at a given point in time, cross-sectional data reveal a positive correlation between personal income and self-reported happiness.
- (2) Time-series data from the 1950s to the present reveal no tendency for average life satisfaction to rise with average incomes in the United States, Europe, and Japan.

Based on these observations, Easterlin conjectures that in affluent societies the perceived benefits of consumption are defined mainly in comparative terms, so that one's share of the pie becomes more important than the size of one's serving. An elaboration and evaluation of this argument is presented by Oswald (1997).

### **3.4. Income and infrastructure**

The frameworks discussed above focus on subjective mechanisms through which individual preferences are influenced by aggregate patterns of economic activity. It is important to note, however, that both subjective and objective factors play roles in defining the mapping from commodities to social functionings. Sen (1983), for example, cites a case in which low-income students were disadvantaged because their families did not own the television sets necessary to view curricularly prescribed programs. Based on the assumption that most households own televisions, the school system imposed requirements that, in effect, diminished the functionings attainable by students from poor families.

In a similar fashion, reliance on private automobiles is central to the transportation systems of modern cities such as Los Angeles. While the supporting infrastructure of subdivisions and

expressways promotes mobility and hence personal freedom, it implies that central functionings such as commuting to work, grocery shopping, and visiting friends are unattainable by people who lack ready access to cars. Average incomes and infrastructure development are of course closely interconnected. Since most people in western societies can afford automobiles, businesses cater to car owners' demand for highway access and convenient parking. These features, however, reduce access for those lacking the income necessary to support car ownership. In this sense, low relative income can substantively impair people's ability to attain functionings that are not in themselves positional in nature.

#### **4. Modeling contingent preferences**

We have developed the argument that cultural norms and shared systems of meaning play crucial roles in defining the links between goods and services and human functionings. In this view, the benefits derived from material commodities are strongly shaped by social conventions that are determined endogenously within the economic system. On the one hand, individuals' need for belonging and identity is closely connected to the symbolic interpretations attached to material artifacts. On the other hand, a person's sense of self-worth and ability to attain valued functionings is in part a matter of relative economic status. With this in mind, we turn our attention to the task of embedding these concepts in a formal of economic growth and environmental quality.

As we noted above, we find Sen's (1985) approach to commodities and functionings to be particularly well-suited to the task at hand. Suppose, for example, that a standard consumption good ( $c$ ) provided two types of functionings, direct enjoyment and a positive self-image, the latter of which was defined in terms of access to positional goods. For the purposes of modeling, it is useful to specify the latter functioning as proportional to consumption:

$$b = c / s$$

where  $1/s$  is the factor of proportionality between consumption and positional goods, or the effective price of positional goods. Since positional goods exist in fixed in supply, we may normalize the social standing of an average person to  $b = 1$ . Defining  $\bar{c}$  as the average consumption level in society, it follows that  $s = \bar{c}$  so that:

$$b = c / \bar{c} .$$

In this setting, a direct demand for positional goods entails an implicit concern for relative consumption. While this model by no means captures the variety of social functionings described in the literature, it provides a relevant example that illustrates the essential structure of the problem.

Under these assumptions, it is natural to represent individual preferences using the utility function:

$$u(c, s) = u(c, c / \bar{c}) .$$

Although Sen argues that utility maximization is an overly restrictive approach to behavioral modeling, our aim is to introduce the concept of functionings into an otherwise standard description of preferences and choice. In particular, we amend Nordhaus' (1994) well-known Dynamic Integrated model of Climate and the Economy (DICE) to incorporate the functionings associated with relative consumption. The details are described in the following paragraphs.

#### 4.1. The DICE model and relative consumption

The DICE model offers a parsimonious representation of the links between economic growth, greenhouse gas emissions, and global climate change. In the standard version of this model, resource allocation decisions are chosen to maximize the objective function:

$$\sum_{t=0}^{\infty} N_t \ln(c_t) / (1 + \rho)^t$$

where  $N_t$  is total population at time  $t$ ,  $c_t$  is the consumption of a typical individual, and  $\rho$  is the pure rate of time preference. Nordhaus uses this approach to simulate the aggregation of individual and collective choices in the world economy.

Production possibilities may be summarized using the reduced-form equation:

$$C_t + K_{t+1} = f(K_t, L_t, E_t, T_t, t) + (1 - \delta)K_t$$

where  $C_t = N_t c_t$  is aggregate consumption,  $K_t$  is the capital stock,  $L_t$  is the supply of labor,  $E_t$  is the emission of greenhouse gases,  $T_t$  is the increase in mean global temperature relative to the pre-industrial norm, and  $\delta$  is the rate of capital depreciation. Time enters the production function to allow for exogenous technological change. The supply of labor is given by:

$$L_t = \lambda_t N_t$$

where  $\lambda_t$  represents the proportion of people's time devoted to labor activities. In Nordhaus' specification,  $\lambda_t$  is taken as fixed so that labor services are strictly proportional to population. Finally, temperature change is determined by past greenhouse gas emissions so that:

$$T_t = T(E_0, \dots, E_{t-1}) .$$

The parameterization of this model is fully described by Nordhaus (1994) and need only be sketched here. In DICE, population grows from 5.6 billion persons in 1995 to 10.5 billion in the long-run future. The bulk of this increase is concentrated in the next one hundred years. The pure rate of time preference ( $\rho$ ) is set equal to 3 percent per year, while the rate of capital depreciation ( $\delta$ ) is 10 percent per annum. The production function exhibits the familiar Cobb-Douglas form defined over inputs of capital and labor, adjusted to reflect the costs and benefits of greenhouse gas emissions. Technological change augments total factor productivity at an initial rate of 1.0 percent per year, but slows gradually over time to reflect observed long-term trends. These assumptions ensure that the model replicates observed rates of interest, investment, and economic growth in baseline simulations.

The labor supply parameter  $\lambda_t$  is defined only implicitly in DICE, though the value of this parameter is important in the elaboration of the model that is described below. According to the United Nations Development Programme (1993), a typical worker labors some 38 hours per week in nations with detailed labor statistics. On the assumption that individuals are active for 16 hours each day, or 112 hours each week, it follows that the proportion of time spent working is  $\lambda_t = 0.34$ .

DICE assumes that a doubling of atmospheric greenhouse gas concentrations relative to the pre-industrial norm would lead to a 2.9°C temperature increase and a 1.2 percent loss of gross world product. Climate change damages increase with the square of the temperature change caused by human activities. The model is premised on the assumption that greenhouse gas emissions would rise from 9.3 to 24 billion tonnes of carbon equivalent (tce) over the next century in the absence of emissions control measures. A 50 percent emissions reduction leads to a 0.9 percent loss of gross world output, while control costs rise to 6.9 percent with the complete control of emissions. Once in the atmosphere, greenhouse gas molecules have a residence time of 120 years, with a doubling of concentrations occurring by the mid-twenty-first century in the absence of abatement policies.

The main findings of the DICE model are well-known in the literature. As illustrated by the base runs presented in Table 1, the optimal path for this economy supports substantial growth in aggregate consumption, the capital stock, and greenhouse gas emissions. Under the stipulated assumptions, it is better to bear the costs of climate change than to impose aggressive greenhouse gas emissions abatement policies. Hence emissions are reduced by only 9-14 percent in comparison with unconstrained levels, while mean global temperature increases by 4.6°C through the year 2195.

**Table 1. DICE model runs, generalized version with  $\alpha = 0$  versus base run. Base run in parenthesis**

		1995	2035	2075	2115	2155	2195
N	$10^9$ persons	5.6 (5.5)	7.9 (7.9)	9.2 (9.2)	9.9 (9.9)	10.3 (10.3)	10.4 (10.4)
C	$10^{12}$ 1989 USD/yr	19 (19)	45 (45)	72 (73)	94 (96)	110 (112)	120 (123)
K	$10^{12}$ 1989 USD/yr	48 (48)	120 (120)	199 (202)	267 (273)	318 (325)	352 (361)
$\lambda$	%	34 (34)	34 (34)	33 (34)	33 (34)	33 (34)	33 (34)
E	$10^9$ tce/yr	8.5 (8.5)	14 (14)	19 (19)	22 (22)	24 (24)	25 (25)
T	$^{\circ}\text{C}$	0.8 (0.8)	1.6 (1.6)	2.5 (2.5)	3.4 (3.4)	4.1 (4.1)	4.6 (4.6)

The discussion thus far is limited to a presentation of the core structure and results of DICE under Nordhaus' initial specification. We turn now to the description of a more general version of this model that incorporates the functionalities associated with relative consumption and a labor-leisure tradeoff. In the specification of preferences, suppose that policies and institutions are chosen to maximize the revised objective function:

$$\sum_{t=0}^{\infty} N_t u_t / (1 + \rho)^t$$

where:

$$u_t = (1 - \alpha) \ln(c_t) + \alpha \ln(b_t) + \beta \ln(1 - \lambda_t).$$

In this setting,  $u_t$  is the utility of a typical individual, while  $b_t = c_t / \bar{c}_t$  is an index of her relative consumption in comparison with the social average. Under these assumptions, the parameter  $\alpha$  defines the weight individuals attach to their perceived economic standing. The third term of the utility function reflects the disutility of labor or, equivalently, the utility gained from leisure. Here  $1 - \lambda_t$  represents the proportion of time that a typical person devotes to non-work activities, which is explicitly chosen to balance the perceived costs and benefits of labor.

In the absence of relative consumption effects (i.e., with  $\alpha = 0$ ), the standard and extended versions of DICE yield closely similar results when the leisure preference parameter is set equal to  $\beta = 1.8$ , the value that is employed in the simulations reported here (Table 1). This

correspondence suggests that the assumption of a fixed relationship between labor supply and population is a useful descriptive device under the stipulated conditions.

It is readily observed, however, that the decisions made by decentralized individuals in competitive markets would be independent of the particular value assumed by  $\alpha$ . To see this, note that the utility function may be written in the form:

$$u_t = \ln(c_t) - \alpha \ln(\bar{c}_t) + \beta \ln(1 - \lambda_t).$$

Since a rational individual would take the average consumption level  $\bar{c}_t$  as an exogenous (socially determined) parameter, she would behave *as if* her preferences were defined by the simplified function  $\ln(c_t) + \beta \ln(1 - \lambda_t)$  in which relative consumption plays no explicit role. If public policies sought to equate the marginal costs and benefits of greenhouse gas emissions but did not address the externalities associated with relative consumption, the resulting resource allocation would maximize this naive specification of social preferences, replicating the results summarized in Table 1.<sup>1</sup>

Figures 1-5 in the appendix show that *optimal* paths for this economy depart from the base results for the DICE model when individual preferences depend significantly on relative consumption. (For purposes of comparison, the figures also depict a *laissez faire* scenario in which resources are allocated by competitive markets in the absence of taxation.) From a social perspective  $c_t = \bar{c}_t$  so that the utility of a typical person is  $(1 - \alpha) \ln(c_t) + \beta \ln(1 - \lambda_t)$ . As  $\alpha$  increases from zero to 0.75, the proportion of time devoted to labor falls from 34 to 11 percent, while consumption levels are reduced by up to 55 percent in the short run and 66 percent in the year 2195. The intuition behind these results is that, under these conditions, relative consumption contributes to *individual* but not *social* welfare. The perceived social benefits of consumption are therefore diminished in correspondence to the weight individuals attach to relative consumption.

The links between relative consumption and environmental quality are also illustrated by these simulations. Since greenhouse gas emissions are driven by aggregate economic activity, and since optimal social choices reign in labor and consumption to account for the external costs associated with relative consumption effects, optimal levels of greenhouse gas emissions fall as the value of  $\alpha$  increases. For  $\alpha = 0$ , emissions rise from 8.5 to 25 billion tonnes of carbon equivalent per year between 1995 and 2195, while mean global temperature increases by 4.6°C relative to the pre-

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<sup>1</sup> Note that this interpretation ignores existing taxes on income and consumption as well as the social benefits generated by public expenditures. It might be argued that current policies internalize the costs of consumption externalities so that the baseline path of the economy corresponds to a social optimum for some  $\alpha > 0$ . As our main objective is to illustrate the qualitative importance of social norms in economic choices, we simplify by setting  $\alpha = 0$  in the base case, thereby conforming to the assumptions of Nordhaus' initial specification.

industrial norm. In the extreme case where  $\alpha = 0.75$ , in contrast, emissions are reduced to 3.7 billion tonnes in 1995 and 8.9 billion tonnes in 2195, limiting the increase in mean global temperature to 2.8°C over the period of analysis.

## 5. Conclusion

The standard models of economic theory are premised on the assumption that individual wants are determined by forces exogenous to the economic system. This paper has explored the legitimacy of this assumption and its importance in applied welfare economics. In particular, we have argued that the theoretical and empirical findings of social psychology and related fields provide compelling evidence that the subjective welfare that individuals derive from goods and services depends fundamentally on preference parameters that are in turn shaped by prevailing cultural values and economic conditions. In this context, the meanings of commodities are established and reinforced by social conventions, and consumption patterns are used by individuals to establish their identities and to signal social status to other members of society.

As we have seen, the endogenous nature of wants fits well with Sen's (1985) distinction between commodities and functionings in behavioral motivation. In this setting, commodities are valued because they are instrumentally useful in supporting both basic human needs and social functionings such as a sense of self-worth or, to draw once more on Adam Smith's (1776) analogy, the ability to appear in public without shame. We have argued that social norms play a crucial role in the mapping between commodities and functionings, making the case that the desire for positional goods and economic status, as well as the need to conform to the demands imposed by prevailing infrastructure and technologies, imply that consumption behavior generates externalities that are mediated by their impacts on the evolution of preferences.

Finally, we have shown that introducing the functionings associated with relative consumption into Nordhaus' (1994) model of climate change and the world economy leads to fundamental changes in the model's policy implications. In the absence of relative consumption effects, Nordhaus concludes that relatively modest steps are warranted to abate greenhouse gas emissions since emissions control would lead to costly reductions in short-run consumption. Our analysis extends these results to show that substantial reductions in both consumption and emissions would be socially desirable if relative consumption played an important role in individual preferences. This finding, of course, depends on the particular specification of the model and is presented for mainly illustrative purposes. It is sufficient to show, however, that invoking the preferences of *homo economicus* can lead to important biases in the recommendations of applied welfare economics.

We conclude, then, that there is a fundamental need for further research on the links between psychology, economics, and related disciplines on the endogenous determination of perceived wants and their importance in individual behavior and well-being. Psychological realism is as important as methodological convenience in the analysis of social choice and welfare, and it is not sufficient to embrace models that generate correct positive predictions regarding economic phenomena. Although research of this type blurs the distinctions implicit in traditionally defined academic disciplines, it is necessary both to restore to the broad perspective of classical political economy and to provide credible guidance regarding contemporary policy choices.

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Figure 1: Consumption (trillion 1989 \$)

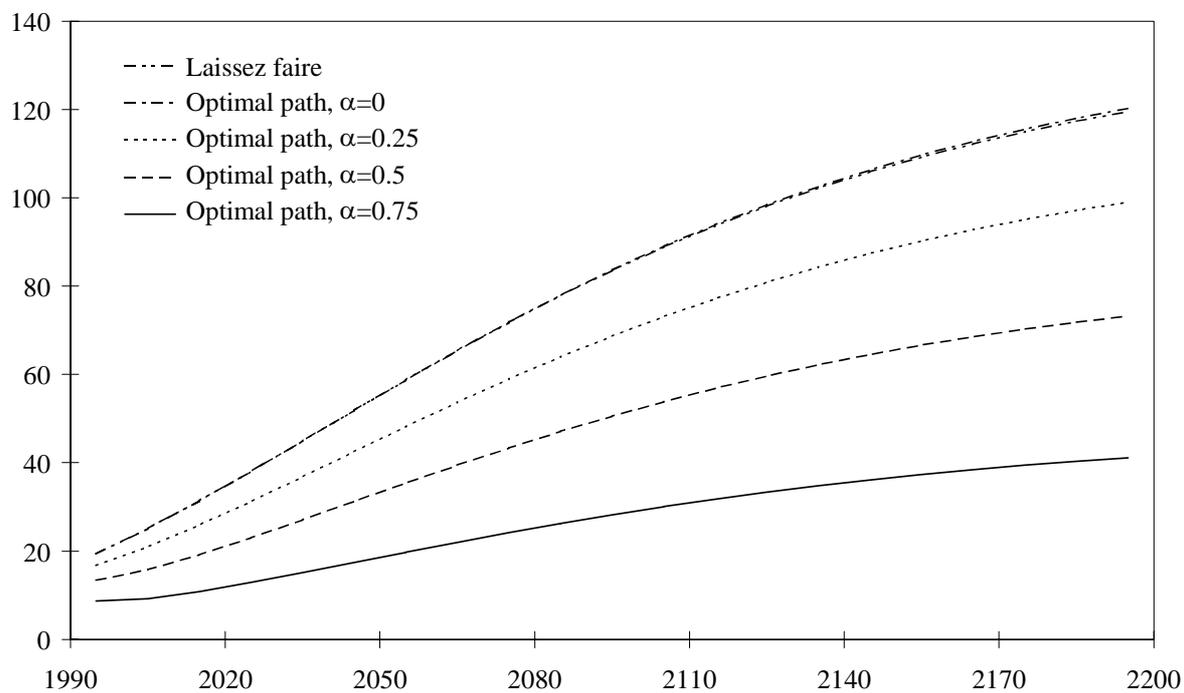
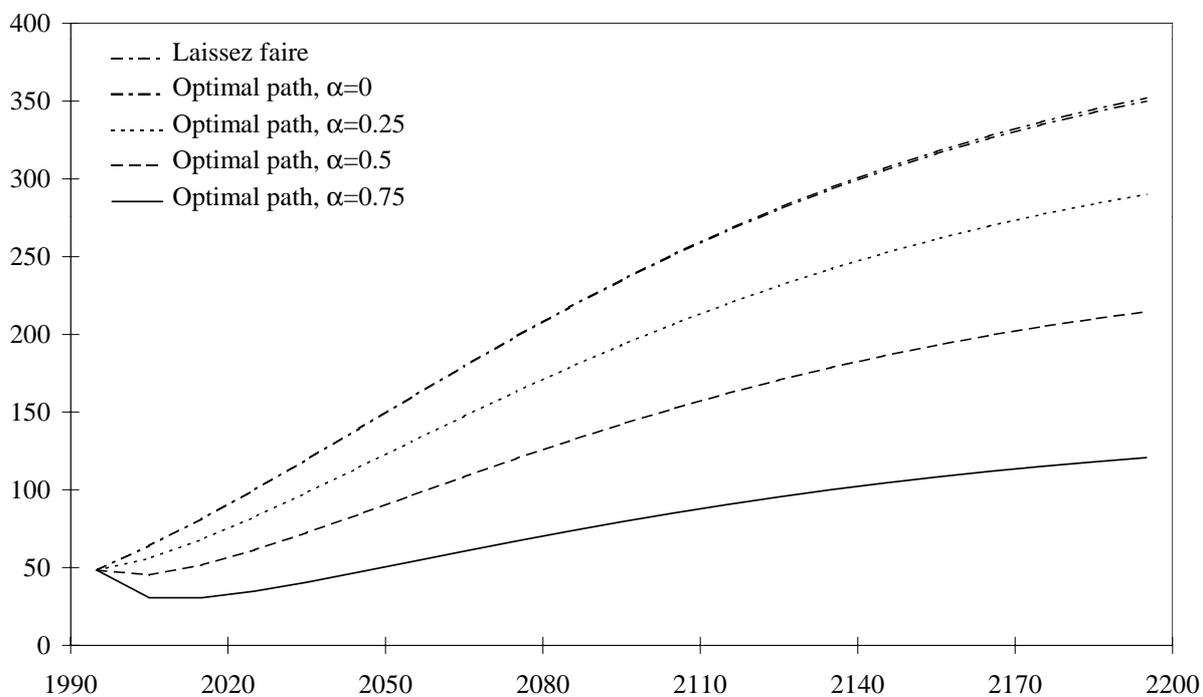
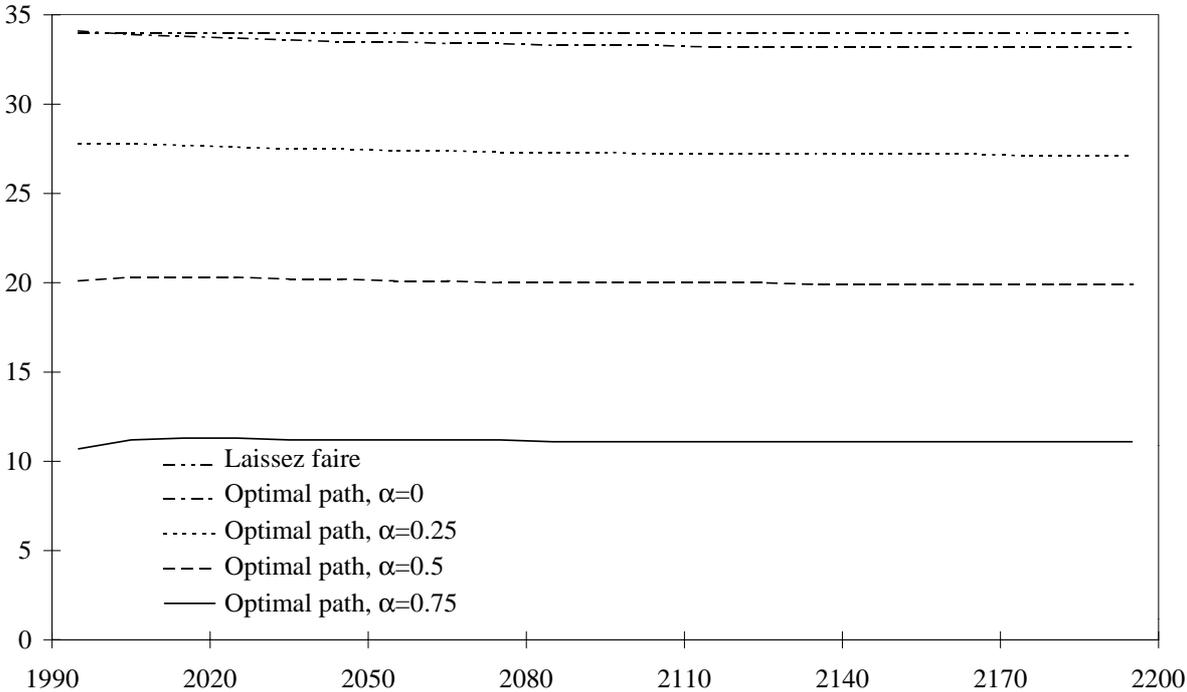


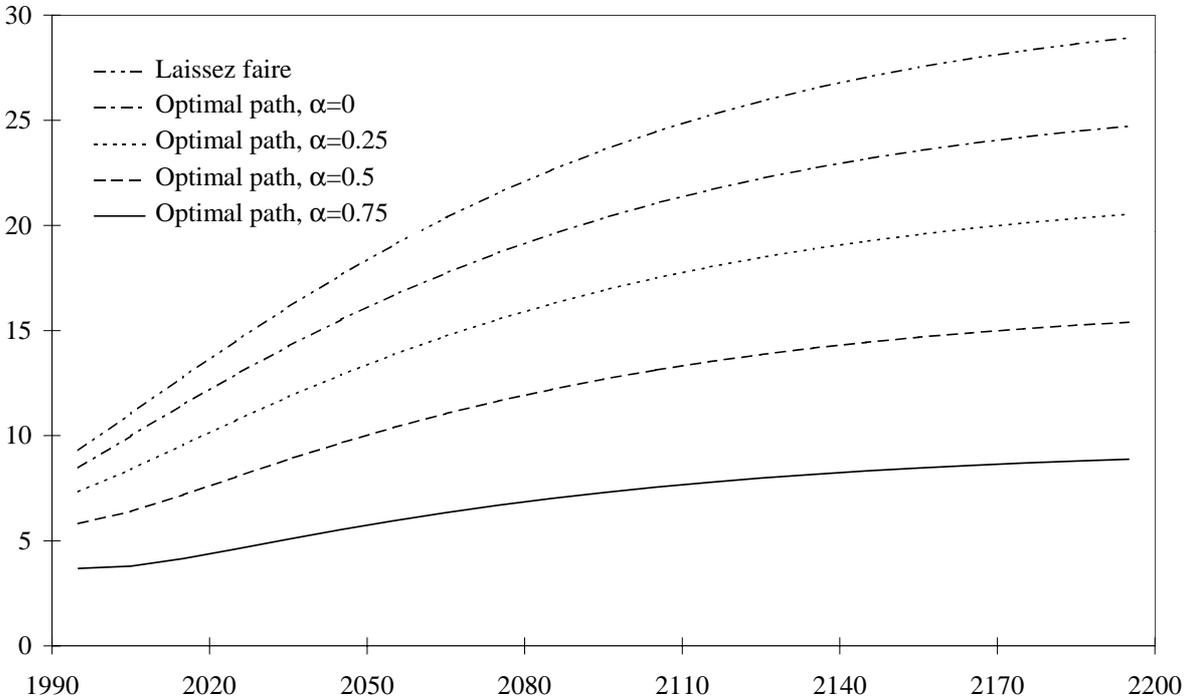
Figure 2: Capital Stock (trillion 1989 \$)



**Figure 3: Labor Effort (%)**



**Figure 4: Greenhouse Gas Emissions (billion tce)**



**Figure 5: Temperature Change (degrees C)**

