Intertemporal Discounting with Veblen Preferences: Theory and Evidence[1]

by

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1 Introduction

In his classic work *The Theory of the Leisure Class* written a century ago, Veblen (1899) argued that a considerable part of consumption is motivated by the desire to demonstrate one's social position. Conspicuous consumption, as he called it, was undertaken by consumers so as to set themselves apart from others, that is, the goal was not enjoyment of the goods per se but rather the status that their consumption conferred. Veblen's ideas have attracted renewed interest in recent decades. They have formed the basis of a theory of savings of Duesenberry (1949) and the distinction between ordinary goods and status goods underlying much of the work of Frank (1985, 1999). Status concerns and their implications for resource allocation have been modeled quite formally recently [e.g. Hopkins and Kornienko (2004), Brekke, Howarth, and Nyborg (2003), Eaton and Eswaran (2008), Oxoby (2003, 2004)].

This chapter deals with the intertemporal effects of conspicuous consumption. The topic is very appropriate for this volume in honour of Curtis Eaton because Veblen effects have been a major preoccupation of his in recent years. We examine this issue with a simple two-period model and a laboratory experiment. We theoretically demonstrate that Veblen effects bias consumption towards the first period, thereby seriously magnifying the effect of discounting. We show that

increases in the marginal worth of conspicuous consumption and in productivity improvements increase the disparity between first and second period consumptions. These findings suggest that, if we infer the discount rate from observed patterns of intertemporal consumption without accounting for Veblen effects, we impute too high a discount rate: status concerns exaggerate the emphasis on the present and lead to an intertemporal misallocation of resources. Even a mild pure time preference can seriously distort choices in the presence of Veblen's consumption externality.

To test these ideas, we conduct a laboratory experiment in which we elicit discount rates from participants using a menu procedure akin to those utilized by Coller and Williams (1999), Harrison et al (2002), and McLeish and Oxoby (2007, forthcoming). The results of our experiments reveal that, in the absence of information on relative earnings, discount rates are the same for participants with high and low earnings. When they do have information on their relative earnings, however, we observe that participants with relatively high earnings display higher discount rates than those with low earnings. This is our predicted Veblen effect. However, these Veblen effects in our experiments are seen to be manifest only through hyperbolic and quasi hyperbolic discounting [Laibson (1997), O'Donohue and Rabin (1999, 2001)].

Very recently, Veblen effects have started receiving considerable prominence in the work on 'happiness research'. This research, which originally started with the seminal work of Easterlin (1974), has been reviewed recently by Layard (2005) and Frey and Stutzer (2002), and even more recently by Clark, Frijters, and Shields (2008). The essential findings for our purposes are easy to summarize: in the developed countries, aggregate measures of happiness have not shown any upward trend, though at a given point in time cross-sectional studies show that those with higher income register higher levels of happiness. This almost invites an explanation along the lines of Veblen's conspicuous consumption—if wellbeing is gauged in relative terms, equal absolute

improvements in the standard of living of all people will not register as higher levels of happiness.[2] Using the 1987-88 and 1992-93 waves of the National Survey of Families and Households in the United States, Luttmer (2005) found that, after controlling for own income and a host of other variables, an increase in the average earnings in their neighborhood makes individuals register lower levels of happiness. In fact, the effects of equal increases in own and average neighborhood incomes were found to roughly cancel out. This is strong evidence in favor of Veblen's hypothesis.

The findings we report here add one possible dimension to the manner in which Veblen effects undermine well-being: by an intertemporal misallocation of resources. In fact, Veblen effects may well magnify the effects of pure time preference, thereby leading to higher measured discount rates. Our simple two-period model suggests that Veblen effects bias (conspicuous) consumption towards the present. Furthermore, this intertemporal bias increases with the marginal utility of conspicuous consumption and with the productivity of labor. The latter result underscores the point that affluent societies are more prone to heavily discounting the future, all else constant. This is ominous if true, for it suggests that the very thing that is capable of improving our standard of living (productivity increases) may also be equally capable of dissipating those gains through Veblen effects. The intertemporal inconsistency we observe in our experiments seems to confirm that there may be important efficiency losses resulting from Veblen effects.

If indeed Veblen effects *de facto* increase discount rates, then they have serious consequences for the depletion of natural resources. To the extent that Veblen goods are intensive in the use of natural resources, we would expect too rapid a rate of depletion. If, further, conspicuous consumption increases the demand for commonly owned resources, the effects will clearly be even worse. Gowdy (1996) cites examples of how the demand for conspicuous consumption of coral reef fish from wealthy Hong Kong consumers has devastated the coral reefs in the Indian and Pacific

Oceans. Similarly, the demand for the fat of the Atlantic Bluefin Tuna from Japanese consumers has had dire effects on the fish stock. Our finding that greater productivity (affluence) skews the pattern of consumption towards the present does not bode well for future generations. Nor does it bode well for the present generations of poor countries—for they will see commonly owned resources exploited beyond the point of no return by people living in rich countries.

In the next section, we present a simple model with intertemporal choice in the presence of Veblen effects. In Section 3, we present our experiment and the accompanying results. In Section 4, some concluding thoughts are presented.

2 Veblen Effects in Intertemporal Choice

To see how Veblen effects may impinge on intertemporal choice, consider the simplest model of how a person would allocate a given amount of resources over two periods. Consider a society with identical agents choosing quantities of a consumption good C that is consumed in both periods. We assume preferences are additively separable. We denote by $u(c)$ the direct utility derived in any period from consuming an amount c of the good. This measures the utility due to the intrinsic worth of the good. We assume that marginal utility increases at a diminishing rate, $u' > 0$ and $u'' < 0$. We assume that the component of utility derived from conspicuous consumption of the Veblen kind depends on the *difference* between an individual's own consumption and the average consumption of others. We denote this utility by $v(c - \overline{c})$, where $\overline{c}$ denotes the per capital level of consumption prevailing in the society in that period. We assume that $v(0) = 0$, and $v' > 0$. We assume that the one-period utility function is $u(c) + v(c - \overline{c})$. If we further assume that $v'' < 0$, the effect of an increase in the average consumption on the marginal

utility of consumption of an individual, given by $-v''(c-\overline{c})$, will be positive implying that the marginal utility from own consumption is higher when others consume more, an effect dubbed "Keeping up with the Joneses" [Dupor and Liu (2003)].

Suppose every person in the society is endowed with an amount z that can be allocated over two periods. For simplicity, we assume that what is saved in period 1 earns zero returns. We write the two-period utility from consumption, $U(c_1, c_2)$, in the additively separable form:

$$U(c_1, c_2) = u(c_1) + v(c_1 - \overline{c}_1) + \delta\,[u(c_2) + v(c_2 - \overline{c}_2)], \tag{1}$$

where the parameter δ (with $0 \leq \delta \leq 1$) denotes the discount rate, common to all individuals, and $\overline{c}_1$, and $\overline{c}_2$ are the respective per capita consumptions in periods 1 and 2.

The problem confronting an individual is to maximize equation 1 subject to the constraint $c_1 + c_2 \leq z$. We assume that each consumer takes the period averages for consumption as given and beyond her control. Eliminating the budget constraint by substituting $c_2 = z - c_1$ in the objective function and taking the derivative with respect to c_1, we obtain the first order condition:

$$u'(c_1) + v'(c_1 - \overline{c}_1) = \delta\,[u'(z - c_1) + v'(z - c_1 - \overline{c}_2)]. \tag{2}$$

In writing this condition down, we are assuming that an individual takes the economy's average consumption as exogenous to her. Since all individuals are identical, however, in equilibrium they will be making identical choices. Invoking symmetry, that is, setting $\overline{c}_1 = c_1$ and $\overline{c}_2 = z - c_1$, the above first order condition evaluated at the equilibrium reduces to

$$u'(c_1) = \delta\, u'(z - c_1) - (1 - \delta)\, s, \tag{3}$$

where $s \equiv v'(0) > 0$ is the marginal utility of conspicuous consumption at the average consumption level. The magnitude of s measures the perceived status conferred by a marginal deviation from the mean consumption and will be referred to as the 'status parameter'. Denote the solution to (3) by $\{c_1^*(z,s), c_2^*(z,s)\}$.

We note from equation (3) that when $\delta = 1$ or when $s = 0$, the allocation of the resource across the two periods is dictated by

$$u'(c_1) = \delta\, u'(z - c_1), \tag{4}$$

That is, the discounted marginal utility of consumption is the same across two periods, as in standard models without Veblen effects. When $\delta < 1$ and $s > 0$, we see from (3) that, at the equilibrium, the allocation yields a marginal utility in period 1 that is less than the discounted marginal utility in period 2, that is, consumption is tilted towards the present. Even though the aggregate consumption is the same as before (equal to the endowment, z), this leads to a *decline* in each consumer's discounted utility compared to what would have obtained had the choice been dictated by (4) because the transfer induces a deviation from the optimal allocation without adding anything to the Veblen component in equilibrium. The self-defeating nature of the externality embodied in Veblen effects are, by now, well-known in static contexts [see, for example, Hopkins and Kornienko (2004), Brekke, Howarth, and Nyborg (2003), Eaton and Eswaran (2008), and Oxoby (2003, 2004)]. But the misallocation here is an intertemporal one leading to a present period bias, and this despite the fact that Veblen effects operate in all periods.

We can easily identify the effect of an increase in the importance of conspicuous consumption,

s. Totally differentiating (3) with respect to s yields

$$[u''(c_1) + \delta\, u''(z - c_1)]\, \frac{dc_1^*}{ds} = -(1 - \delta). \tag{5}$$

Proposition 1: When the endowment is fixed and $\delta < 1$, an increase in the marginal utility of conspicuous consumption at average consumption increases the first period consumption.

Thus, if we were to infer discount rates from people's intertemporal consumption patterns without accounting for Veblen effects, we would be attributing *too high* a discount rate. In other words, the allocation attributable to Veblen effects will be erroneously attributed to intertemporal time preference. This may partly explain why the discount rates that have been experimentally found tend to be considerably higher than market interest rates [Frederick, Lowenstein, and O'Donoghue (2002)]. To press the point, suppose that we examine intertemporal allocation of a resource and seek to infer the discount rate from it by fitting the data to the utility function $u(c_1) + \beta\, u(c_2)$, where β is the *imputed* discounted factor. Using the first order condition, we can write the imputed discount factor as

$$\beta = \frac{u'(c_1^*(z, s))}{u'(z - c_1^*(z, s))}. \tag{6}$$

This will tell us the imputed discount factor when the data contains Veblen effects but our theory does not. Naturally, this value of β will depend also on the true discount factor δ, in addition to z and the status parameter s. The following result obtains an immediate consequence of the above proposition:

Corollary 1: The imputed discount factor declines when the marginal utility of conspicuous consumption at average consumption increases.

The greater the value of s, the more will consumption be tilted towards the present for a given value of the true discount factor δ because of Veblen effects and the lower would be the imputed discount factor β. It is as if the desire for status magnifies the extent of intertemporal discounting.

[Figures 1.a and 1.b here]

Figure 1 displays the comparative statics with respect to s when $u(c)$ is logarithmic, that is $u(c) = \ln(c)$. In Figure 1.a, we plot the consumption levels in period 1 (top curve) and in period 2 (bottom curve) as the status parameter increases. The endowment in this exercise is assumed to be $z = 1$ and the true discount factor is $\delta = 0.8$. As the importance of status s increases, consumption is reallocated towards c_1^*. As status consciousness increases (in both periods), Veblen effects put increasing weight on the first period consumption because of discounting. From Figure 1.b, we see that the imputed discount factor β declines sharply with s.

In order to isolate the intertemporal misallocation we have considered a model with only one good (the Veblen good). Suppose, for a moment, we had introduced another good that is a standard consumption good, say X, with no Veblen characteristics. Denote the period 1 and period 2 consumptions of this good by x_1 and x_2. An increase in the marginal utility of conspicuous consumption in such a model would induce an intertemporal reallocation to towards $c1$, as above, as well as an allocation away from X towards the Veblen good in period 1 and possibly in period 2 also.

It should be mentioned that the theoretical prediction of Veblen effects depends on how the comparison with others is modeled. We have modeled the utility from conspicuous consumption

as depending on the *difference* between own and average consumption. One might also consider modeling this utility as depending on the *ratio* of own to average consumption, according to some function $w(c/\overline{c})$, with $w' > 0$.[3] If we model it in this manner and redefine the marginal utility of conspicuous consumption at average consumption as $w'(1)$, Proposition 1 holds true if $c_2^*(z,s) > \delta\, c_1^*(z,s)$, an unhelpful condition because it is couched in terms of endogenous entities.[4] This unfortunate dependence on functional form, however, is not a peculiarity of only our analysis. The slew of recent papers that have sought to examine Veblen effects in a growth context invariably assume specialized functional forms for the utility function.[5] The recent review by Clark, Frijters, and Sheilds (2008) briefly outlines the nature of the intricacies on which the results obtained from such models depend. We caution that the simple models we present here with an eye to motivating our experimental finding to follow cannot claim generality. Nevertheless, perhaps they do offer a transparent view of one theoretical issue related to conspicuous consumption, namely, it can skew intertemporal consumption and thereby bias measured discount rates.

2.1 The Effect of Unequal Endowments

In the above sub-section, we assumed that all people were identical. We now briefly inquire how the aggregate behavior changes when there is inequality of endowments. A person with endowment z solves the problem stated in (1). The relevant first order condition for this individual is

$$u'(c_1) + v'(c_1 - \overline{c}_1) - \delta\,[u'(z - c_1) + v'(z - c_1 - \overline{c}_2)] = 0.$$

The argument of the function $v'(.)$ does not necessarily vanish when evaluated at the equilibrium now because not all people consume the same amounts. If we assume that the marginal utility of conspicuous consumption is constant at the value s, that is, derivative $v'(.) = s$ is constant, this individual's period 1 consumption is obtained as the solution to

$$u'(c_1) = \delta\, u'(z - c_1) - (1 - \delta)\, s, \tag{7}$$

which is the same as (4). We denote the solution to the above equation by $\{\widehat{c}_1(s,z), \widehat{c}_2(s,z)\}$.

The assumption that $v'(.)$ is constant makes the above first order condition independent of the distribution of endowments in the economy. One scenario in which this assumption is obviously reasonable is when the income distribution is approximately egalitarian. An alternative scenario in which this might be reasonable is one where people compare themselves not with everybody in the population but only with people who fall in a similar income bracket. This presumption of *localization* in Veblen comparisons fits in well with casual observations on the circumscribed nature of self-interest. Academics, for example, are likely to compare themselves not so much with the general population or with other academics in different universities or even in the same university but with others in their own department. Although the above first order condition is independent of the endowment distribution, it does depend on an individual's own endowment and so the aggregate behavior in this economy will depend on the distribution.

[Figures 2.a, 2.b, and 2.c here]

Figure 2 displays the behavior of this model as a function of the worth of conspicuous consumption when the endowment can take on two possible values, z_1 and z_2, equally weighted in the population. As before, we assume $u(.)$ is the logarithm function. Fig. 2a shows the aggregate

consumption in period 1 when $z_1 = z_2 = 1$ (bottom curve) and for the mean-preserving spread $z_1 = 1.5$ and $z_2 = 0.5$ (top curve). We see that aggregate consumption gets tilted towards period 1 when the endowment is asymmetrically distributed. Fig. 2b shows the mirror image of this for period 2. In Fig. 2c we show the imputed discount factor in the egalitarian society (middle curve), and for the rich (bottom curve) and the poor (top curve) in the inegalitarian society. All else constant, the rich have a lower imputed discount factor than do the poor: the intrinsic marginal utility from consumption declines while the marginal utility from conspicuous consumption (being measured from the average consumption) does not. So the rich dissipate a greater proportion of their endowment in the futile search for status. This result suggests that a Benthamite welfare function that employs the true discount factor would deem the inegalitarian economy inferior to an egalitarian one because greater inefficiency is induced in the former.[6]

2.2 A Model with Leisure

In this sub-section, we consider a two-period model in which the endowment is not fixed but is determined by a labor-leisure trade-off in period 1. Period 2 is deemed to be one of retirement, and so there is no effort applied. We denote by the increasing and strictly concave function $R(l)$ the utility derived in period 1 from an amount of rest or leisure l. To keep the model tractable, however, we revert to the scenario where all people are identical. Each individual is assumed to be be endowed with 1 unit of time in both periods, and in period 1 they choose how much of this they devote to working. The productivity of labor is assumed to be constant at A for all individuals. A typical individual solves the problem

$$\max_{c_1,c_2,l} \quad u(c_1) + v(c_1 - \overline{c}_1) + R(l) + \delta\,[u(c_2) + v(c_2 - \overline{c}_2)] \quad s.t. \quad c_1 + c_2 = A\,(1 - l). \tag{8}$$

Substituting $c_2 = A(1-l) - c_1$ from the budget constraint into the objective function, writing down the first order conditions for c_1 and l and then evaluating these at the point of symmetry in equilibrium, we obtain the respective equations:

$$c_1 : \quad u'(c_1) + s - \delta\,[u'(A(1-l) - c_1) + s] = 0, \tag{9}$$

$$l : \quad R'(l) - \delta\,A\,[u'(A(1-l) - c_1) + s] = 0, \tag{10}$$

where $s \equiv v'(0)$, as before, is a measure of the marginal utility of conspicuous consumption at the average income. We can solve the previous two equations for c_1 and l and then obtain c_2 from the budget constraint. Denote the solution to an individual's problem by the triplet $\{c_1^\dagger(s,A), c_2^\dagger(s,A), l^\dagger(s,A)\}$. This formulation yields the following comparative static results:[7]

Proposition 2: An increase in the marginal utility of conspicuous consumption at average consumption,

(a) increases the consumption in the first period if $\delta < 1$, and

(b) decreases leisure in period 1 for any δ.

Part (a) of the above proposition indicates that, as before, if there is any intrinsic discounting the presence of discounting shifts consumption to the first period when conspicuous consumption becomes more relevant. However, part (b) informs us that leisure declines whether or not there is any discounting. Conspicuous consumption induces people to work harder. Previous studies have shown that Veblen effects result in reductions in leisure [e.g. Neumark and Postlewaite (1998),

Brekke, Howarth, and Nyborg (2003), Bowles and Park (2005), Eaton and Eswaran (2008)].

It is instructive to assume the following special functional forms for the rest of this sub-section: $u(c) = \ln c$ and $R(l) = \ln l$. The above first order conditions then reduce, respectively, to

$$\frac{1}{c_1} = \frac{\delta}{A(1-l) - c_1} - (1-\delta)\ s, \tag{11}$$

$$\frac{1}{l} = \frac{\delta\, A}{A(1-l) - c_1} + \delta\ s\, A, \tag{12}$$

Before proceeding to examine this solution we note that, when Veblen effects are absent (that is, $s = 0$), we readily obtain a closed form solution:

$$c_1^\dagger(0, A) = A/(2+\delta); \quad c_2^\dagger(0, A) = A\,\delta/(2+\delta); \quad l^\dagger(0, A) = 1/(2+\delta). \tag{13}$$

In this special case, leisure is independent of the productivity of labor and the two consumption levels increase linearly in A. In fact, the ratio $c_2^\dagger(0, A)/c_1^\dagger(0, A)$ is equal to δ, the discount factor. So these functional forms for the utility of consumption of the good and leisure are convenient ones to adopt because, for them, in the absence of Veblen effects we can *correctly infer* the discount rate by simply taking the ratio of the observed consumption in period 2 to that in period 1.

In the presence of Veblen effects (when $s > 0$), the solution to an individual's optimization problem in the symmetric equilibrium is given by $\{c_1^\dagger(s, A), c_2^\dagger(s, A), l^\dagger(s, A)\}$. A researcher who ignores Veblen effects (that is, assumes $s = 0$) and seeks to estimate an individual's discount factor from her actual consumption pattern that does embody conspicuous consumption will impute the discount factor given by $\beta = c_2^\dagger(s, A)/c_1^\dagger(s, A)$. In general, this imputed discounted

factor will differ from the true discount factor δ and will depend on the labor productivity and the magnitude of the status parameter.

[Figures 3.a, 3.b, and 3.c here]

In Figure 3 it is assumed that the true discount factor is $\delta = 0.8$. In Fig. 3.a, labor productivity is fixed at $A = 2$. We see that as the status parameter increases, consumption in period 1 increases. That in period 2 initially increases but then declines. Aggregate consumption increases because individuals consume less leisure. Fig. 3.b shows that leisure monotonically declines with greater status concern. Fig. 3.a brings out the effects of intertemporal allocation of the consumption that foregone leisure brings about. Fig. 3.c displays the behavior of the imputed discount factor (bottom curve) relative to its true value (flat line). The error entailed in ignoring Veblen effects in inferring intertemporal preferences is apparent from this Figure.

[Figures 4.a, 4.b, and 4.c here]

In Figure 4, we display the interesting effects of increases in labor productivity, A, when the status parameter is fixed at $s = 2$. In Fig. 4.a, both the period 1 consumption (highest curve) and the period 2 consumption (lowest curve) increase with productivity, but the former increases relatively faster. The two other curves that are in-between show the period 1 and period 2 consumptions when there are no Veblen effects (that is, $s = 0$). As we have seen, when $s = 0$, these increase linearly in A. In the presence of Veblen effects, an increase in labor productivity results in a "fanning out" of the consumption levels in the two periods. In Fig. 4.b we see that leisure declines with productivity (bottom curve) compared to what obtains when status effects are absent (top curve), as in earlier static models [Eaton and Eswaran (2008)]. Veblen effects

induce people to work harder when productivity is higher and then dissipate the salutary effects of the productivity improvement.

Fig. 4.c shows how the imputed discount factor (bottom curve) changes relative to its true value (flat line) when labor productivity increases. All else constant, more affluent societies, then, will appear to have lower discount factors if these are imputed from intertemporal consumption patterns. In their review of time discounting, Frederick, Lowenstein, and O'Donoghue (2002) catalog the numerous studies that have sought to infer the discount factor. As they point out, most of the attempts simply take the intertemporal choices and figure out the discount factor that will rationalize them. One of the regularities they note is that, in most studies, high discounting seems to prevail. They argue that, to correctly understand intertemporal choices, we need to incorporate many factors that impinge on them in addition to pure time preference. We suggest that the presence of Veblen effects may be one such factor, and an important one at that.

3 An Intertemporal Experiment

To assess our model, we conducted a simple economic experiment in intertemporal decision making along the lines of those conducted by Coller and Williams (1999), Harrison et al (2002), and McLeish and Oxoby (2007, forthcoming). In these experiments, an incentive compatible elicitation mechanism is used to determine individuals' rate of impatience. These studies have found that, while discount rates are stable, men have higher discount rates than women (McLeish and Oxoby, 2007; Wilson and Daly, 2004) and that discount rates are significantly reduced when individuals are given information regarding the rate of return on risk-less bonds (Coller and Williams, 1999).

In our experiment, we elicited two dependent measures of individuals' discount rates using the

elicitation protocol in the aforementioned experiments. Under this protocol individuals were asked two series of intertemporal questions in which they indicated their preference between a sum of money in the near future and a larger sum of money in the more distant future. Specifically, one set of questions asked participants their preferences between \$40 in one week and \$40+y, $y \in \{1, ldots, 10\}$ in four weeks. The second set of questions asked participants their preferences between \$40 in three weeks and \$40+y, $y \in \{1, ldots, 10\}$ in six weeks. The tables used to ask these questions are presented in Tables 1 and 2. These tables present amounts more distant in the future with three week interest rates ranging form 2.5% to 25% in increments of 2.5%. In order to ensure incentive compatibility regarding these intertemporal choice questions, participants were informed that one of the twenty questions in these tables would be randomly selected and they would be paid in accord with their response to that question. Participants were given post-dated checks which were only payable upon the appropriate date (depending on their answer and the date of the experiment). After completing these questions, participants answered a series of demographic questions.

[Table 1 here]

Thus, in each table a respondent indicates her preference between an amount of money sooner and a larger amount of money later. To proxy an individual's discount rate, we use the point at which they cease choosing the sooner option and begin choosing the larger, more distant sum of money (Coller and Williams, 1999). We refer to this measure from Table 1 as the dependent variable *Arate*; we refer to the same measure from Table 2 as *Brate*.

[Table 2 here]

Our experimental manipulation aimed at exploring the role of Veblen effects was the following:

Prior to completing Tables 1 and 2, participants were randomly assigned into groups of four participants. Participants were then asked to each complete a 12 question quiz culled from the Graduate Record Exam (GRE). Individuals received a payoff based on the number of questions they correctly answered: if a participant answered less than 6 questions correctly, she received \$10 with a 75% probability and \$20 with a 25% probability; if she correctly answered 6 or more questions, she received \$20 with a 75% probability and \$10 with a 25% probability. In contrast to the payment for answering intertemporal choice questions, these payments were made in cash at the end of the experimental session. Our desire in having participants "earn" this money was based on previous literature and experiments on mental accounting and found money effects.[8] This literature has shown that individuals treat money they have earned as more salient than money allocated by the experimenter. As we based these endowments as the source of our Veblen effects, we had participants earn these funds to ensure that their endowments were salient in their intertemporal decision making (Tables 1 and 2).[9] Moreover, our use of a randomization procedure in mapping exam scores to earnings was done to provide a control against the possibility that there exist interteporal choice differences between participants correctly answering more and less than six questions. Some experimenters have argued that there may exist differences in rationality (manifest here through revealed intertemporal preferences) between individuals who are more or less intelligent or more or less rational. Our randomization procedure provides a control for this potential confounding by ensuring that some of the individuals earning \$20 (\$10) did more poorly (better) than their raw earnings would suggest. As such, we can infer from our results that any wealth-based differences in intertemporal preferences are not attributable to differences in displayed rationality (i.e., test scores).

Our treatment variable (independent measure) was whether or not individuals knew their

relative earnings from this quiz. In the baseline conditions, individuals were informed of their score on the quiz and their earnings prior to answering the intertemporal choice questions. In our relative wealth treatment, participant were informed of their score and earnings, but also of the earnings of the three other individuals in their group. Our intent was that this would make salient in participants' minds their relative earnings and hence produce a Veblen effect. Importantly, this manipulation was not directly referenced in the instructions. Rather, information on scores, earnings, and the earnings of others were displayed on-screen for thirty seconds prior to the experiment continuing with Tables 1 and 2.

Based on our experiment, we put forth two hypotheses regarding responses to Tables 1 and 2 and the role of relative wealth.

Hypothesis 1 *Individuals' discount rates should be consistent across time. That is, for each respondent i, Arate = Brate.*

This hypothesis follows research on exponential discounting in which individual's discounting is consistent across all time periods. A rejection of this hypothesis would indicate that participants display discounting behavior akin to that found in models of hyperbolic and quasi-hyperbolic discounting (Strotz, 1956; Laibson, 1997; O'Donohue and Rabin, 1999, 2001). Our second hypothesis is in regards to our manipulation and Veblen effects.

Hypothesis 2 *Individuals' discount rates should be independent of their relative wealth.*

This hypothesis is again based on the standard model of intertemporal choice. Specifically, this hypothesis implies that our manipulations should have no effect on individuals' intertemporal preferences. A rejection of this hypothesis would be evidence of a Veblen effect regarding

intertemporal choice in which knowing their relative wealth alters the manner in which they make intertemporal choices.

3.1 Results

A total of 82 participants were involved in our experiment, all of whom were recruited from the undergraduate population at the University of Calgary. The experiments were conducted in the University of Calgary's Behavioral and Experimental Economics Laboratory using the software z-Tree (Fischbacher, 2007).

Table 3 presents the summary statistics from our experiments. Our measure of consistency is calculated as the difference $Arate - Brate$. Recall that these numbers represent the point at which an individual ceased choosing the sooner, smaller option in favor of the later, larger option. As such, these numbers are indices of an individual's impatience with higher numbers reflecting the fact that the individual needed a larger more distant payment to entice her to choose to defer receiving money. That is, the elicited numbers move in the opposite direction as the discount factor δ (i.e. more in the same direction as the subjective rate of impatience).

[Table 3 here]

To analyze the data, we focus on the results of non-parametric Kolmogorov-Smirnov tests on the distributions of responses. This gives us the most general approach to the analysis, avoiding the violations of normality and issues with sample size inherent in the analysis of experimental data.[10] To begin, we find support for our Hypothesis 1 in that none of our measures of consistency are significantly different from zero (KS $p > 0.20$). However, it is interesting to note that participants earning \$10 in the relative wealth treatment appear to display less consistency than others. Within a given level of earnings (i.e. all those earning \$10 and all those earning \$20)

we find no differences in intertemporal choices: the distributions of responses measured by *Arate*, *Brate* and consistency do not differ in any significant manner. While these results support our Hypothesis 1, we do find evidence of an interesting Veblen effect when we consider the decisions made by those earning different wealth levels in the relative wealth treatment.

Specifically, we test for Veblen effects by asking if the distribution of the *Arate* (*Brate*) is different between people who know only their own earnings and those who also know the earnings of the others in their group. We find no difference in the distribution of *Arate*. However, we do find a significant difference between the distribution of *Brate*. The Kolmogorov-Smirnov test reveals that the *Brate* for those who only know their own earnings is *less than* the *Brate* of those who know also their relative earnings (KS $p = 0.081$), rejecting our Hypothesis 2 regarding the absence of Veblen effects. In other words, our experiments provide some evidence (at the 8% or higher level of significance) that Veblen effects increase the discount rate — as our theory predicts.

The absence of discernible effects in the *Arate* but its presence in the *Brate* in our results suggest that Veblen effects in intertemporal decision making are manifest in the form of quasi-hyperbolic discounting, where an individual's utility is given by

$$U(c_0, \ldots, c_T) = u(c_o) + \gamma \sum_{t=1}^{T} \delta^t u(c_t), \tag{14}$$

where c_t is period t consumption, δ is the traditional discount factor and $\gamma < 1$ is an individual's "present day bias" resulting in an increased desire for immediate rewards [O'Donohue and Rabin (1999, 2001)]. Note that an individual with these preferences discounts consistently between periods t and $t + s$, but an inconsistency arises in that the discounting between period 0 and any other period is increased by a factor of $1/\gamma$. The increasing impatience of these individuals (as

demonstrated by their intertemporal inconsistency relative to other participants) is consistent the quasi-hyperbolic discounting identified experimentally by McLeish and Oxoby (2007). In that study, participants completed tables similar to our Tables 1 and 2 and they displayed an inconsistency wherein the term γ in equation 14 fell between five and seven weeks in the future. Here, our results suggest that this same term falls between three and six weeks in the future.

It is interesting to note what our findings imply. Although individuals are consistent in their intertemporal decision making, we observe a Veblen effect in which richer individuals are more impatient with regard to sums of money to be received in the (relatively) distant future. That is, richer individuals require additional compensation to defer consumption when their high relative wealth is salient in their decision making. While this result is consistent with our model in section 2.1 (where it is predicted that Veblen effects make wealthier individuals more impatient), it is apparently inconsistent with the finding of Shapiro (2005) who identifies how increased impatience among food stamp recipients results in a 15% decline in caloric intake over the distribution month. Similarly, Eckel et al (2005) find greater impatience among the poor with respect to relatively short term decisions over monetary amounts. More broadly, Kelso (1994) and Squires (2006) who have argued that biases in intertemporal decision making have a detrimental effect on the decision making of the poor. As such, these individuals are more likely to engage in highly expensive short-term financing (e.g. pay-day loans) and eschew savings opportunities. How do we square these findings with ours? The theory we presented assumed that the pure rate of time preference was identical for all individuals. In reality, this is very unlikely to be the case. We believe that there are evolutionary reasons why the pure time preference hardwired in humans will trigger different discount rates when they are in abundance than when they are near susbsistence. The results cited in this paragraph are probably picking up this difference in time preference

between the rich and the poor.[11] Our experiment attempts to isolate the Veblen effect with relatively small differences in earnings, keeping all else constant.

4 Conclusions

This paper has considered the effect of conspicuous consumption a là Veblen on the intertemporal allocation of consumption and effort with the aid of fairly simple models. We have demonstrated that Veblen comparisons can magnify the effects of intrinsic discounting. Consumption is tilted towards the present. The higher the productivity of labor, the greater is this present bias. An increase in the marginal utility of conspicuous consumption has the same effect. In an inegalitarian economy, the proportional front-loading of consumption of the rich skews the aggregate consumption of the economy towards the present. We show that if discount rates are inferred from consumption patterns without taking Veblen effects into account, the discount rate would be biased upwards, possibly seriously. Our experimental results provide some evidence, admittedly weak, for our claim.

One issue we have skirted here is whether people desire to be conspicuous in their consumption of goods or in their consumption of leisure. Veblen, after all, spoke of the leisure class, and it may well be argued that it is the consumption of leisure, not goods, that is meant to be ostentatious. This, of course, is an empirical issue. But, as Frijters and Leigh (2005) have pointed out, goods are more visible than leisure activities and so the latter would be preferred only in neighborhoods with low rates of turnover for in these areas one's leisure activities would be better known to others. They find empirical evidence from the U.S. in support of their contention. In the context of our model, the incorporation of a choice between conspicuous consumption and conspicuous

leisure would likely reinforce the bias towards consumption of goods in the present but leisure in the future. This is because by staggering the choices, a reduction in present leisure can finance not only conspicuous consumption now but also conspicuous leisure later; the reverse is not possible. So one would likely see an excessive application of effort when one is young and an excessive consumption of leisure when one is older. If we incorporated conspicuous consumption only in leisure, however, our two-period model in which people necessarily retire in the second period would generate no intertemporal inefficiency in consumption. It would merely predict that people consume too much leisure relative to the scenario where this externality is absent.

A Instructions

These are the instructions used in both treatments. Copies of the quiz used in the experiment are available from the authors.

This is an experiment in the economics of decision making. During this session you will make a number of decisions. These decisions will result in a payoff which will be paid in cash.

At the start of the experiment, the computer will randomly put you into groups of four participants. The experiment will then begin with a short quiz. You will have 10 minutes to answer 12 questions. You will receive a payment based on the number of questions you answer correctly. Specifically, if you answer less than 6 questions correctly you will receive \$10 with a 75% probability and \$20 with a 25% probability. If you correctly answer 6 or more questions, you will receive \$20 with a 75% probability and \$10 with a 25% probability. These payments will be made in cash at the end of today's session.

After the quiz, you will be informed of your score and your payment for today's portion of the experiment. The computer will choose a random number which will be used to determine your payoff based on your score and the probabilities mentioned above.

After this, a number of choices will be presented to you where you are to indicate your preference over a sum of money in one week or a different sum of money in four weeks. For each choice, indicate which payment option you prefer. After making these choices please click the continue button. You will then be asked a similar set of questions regarding your preference between a sum on money in three weeks and a different sum of money in six weeks. Your payment for participating in this experiment will be based on these choices: one of your choices will be randomly selected by the computer and you will receive the amount of money you chose at the time you chose (in what week or in what month). These payments will be made by postdated

check and you will receive these checks at the end of the experiment.

After completing the series of questions, you will be asked to provide us with some demographic information. This information is confidential and is used in our analysis of the data.

Once everyone has had an opportunity to ask any final questions we will begin the session.

Option	Amount in 1 week	Amount in 4 weeks
1	\$40	\$41
2	\$40	\$42
3	\$40	\$43
4	\$40	\$44
5	\$40	\$45
6	\$40	\$46
7	\$40	\$47
8	\$40	\$48
9	\$40	\$49
10	\$40	\$50

Table 1: Table used to elicit discount rate in first series of questions. The point at which the individual ceased choosing the sooner option and chose the last option proxies their discount rate. We refer to this measure of intertemporal preferences as *Arate*.

Option	Amount in 3 week	Amount in 6 weeks
1	\$40	\$41
2	\$40	\$42
3	\$40	\$43
4	\$40	\$44
5	\$40	\$45
6	\$40	\$46
7	\$40	\$47
8	\$40	\$48
9	\$40	\$49
10	\$40	\$50

Table 2: Table used to elicit discount rate in second series of questions. The point at which the individual ceased choosing the sooner option and chose the last option proxies their discount rate. We refer to this measure of intertemporal preferences as *Brate*.

Treatment	Participant Earnings	*Arate*	*Brate*	consistency
baseline	\$10 ($n = 20$)	7.00 (4.25)	7.00 (4.25)	0.00 (0.79)
baseline	\$20 ($n = 15$)	4.46 (4.09)	5.23 (4.69)	-0.77 (2.00)
relative wealth	\$10 ($n = 26$)	7.54 (2.95)	8.88 (2.98)	-1.35 (2.41)
relative wealth	\$20 ($n = 23$)	7.30 (3.89)	7.30 (2.87)	-0.04 (4.96)

Table 3: Summary statistics from the experiment. Standard deviations are in parentheses.

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Notes

[1]We thank Ralph Winter for comments on an earlier draft. SSHRC funding is gratefully acknowledged.

[2]See, for example, Eaton and Eswaran (2003) for an evolutionary explanation for preferences of the Veblen type.

[3]See Eaton and Eswaran (2008) for a one-period model that incorporates both these forms of Veblen preferences.

[4]Harbaugh (1996) uses an analogous model to show that savings can increase when income is *rising* in an economy.

[5]See e.g. Cooper, Garcia-Penalosa, and Funk (2001), Van Long and Shimomura (2004), Pham (2005), Dupor and Liu (2003), Ljungqvist and Uhlig (2000).

[6]These observations would need to be modified if the poor do not compare themselves with others who are poor but, rather, seek to emulate the rich. For then it is conceivable that the poor would display lower discount factors than the rich.

[7]Total differentiation with respect to s yields the two equations:

$$[u''(c_1^\dagger) + \delta u''(c_2^\dagger)]dc_1 + \delta A u''(c_2^\dagger)dl^\dagger = (1-\delta)ds,$$

$$\delta A u''(c_2^\dagger)dc_1 + [\delta A^2 u''(c_2^\dagger) + R''(l^\dagger)]dl^\dagger = \delta A ds.$$

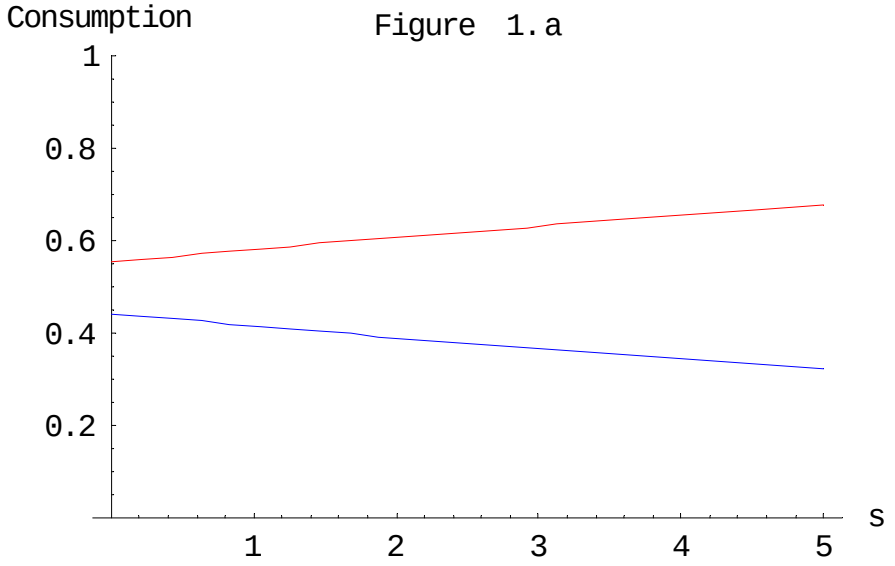
Applying Cramer's rule and invoking the assumption that the second order sufficient conditions hold, we obtain the two comparative static results stated in the proposition.

[8]Similar means for having participants earn their endowments have been used by Cherry et al (2002) and Oxoby and Spraggon (2008).

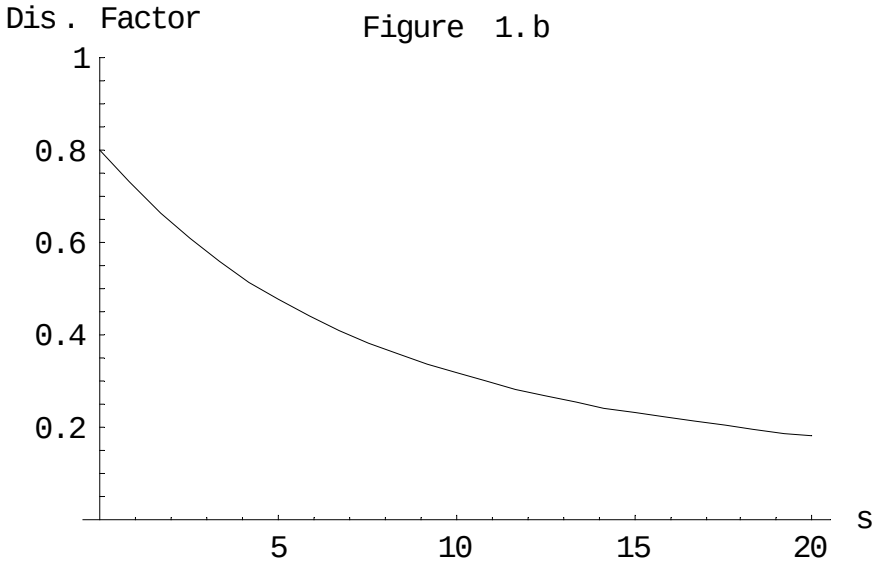
[9]The instructions are presented in Appendix A. Copies of the quiz and the z-Tree treatment files are available from the authors.

[10]Our results are robust to alternate pairwise non-paramteric tests (Wilcoxon, ANOVA).

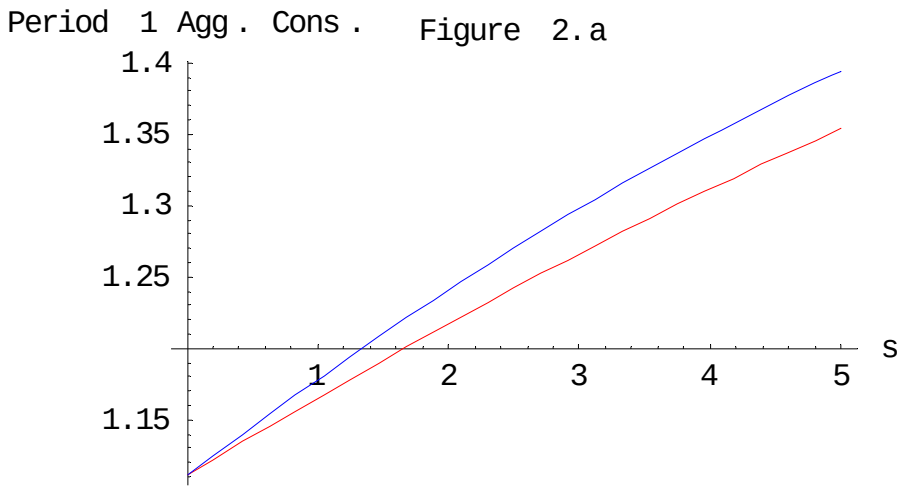
[11]In general, the poor are also likely to be more credit constrained.



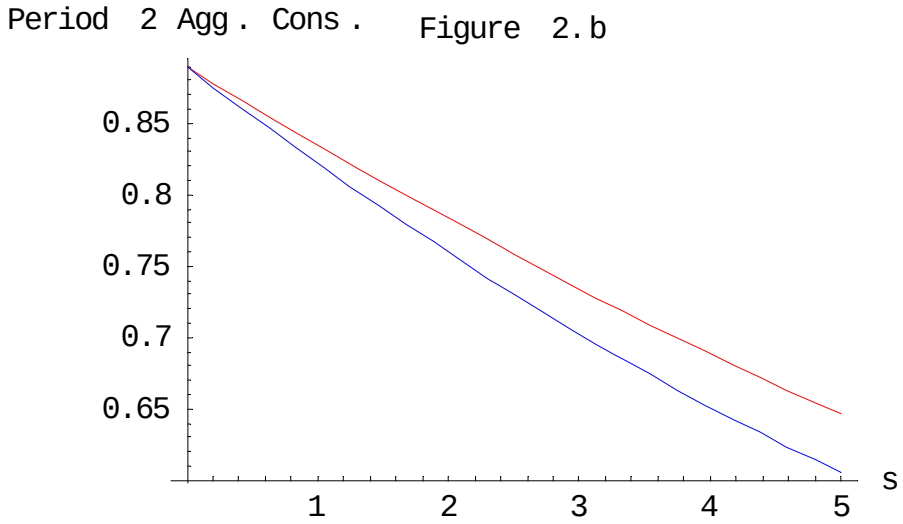
The top (bottom) curve is the consumption in period one (two) as a function of status concern.



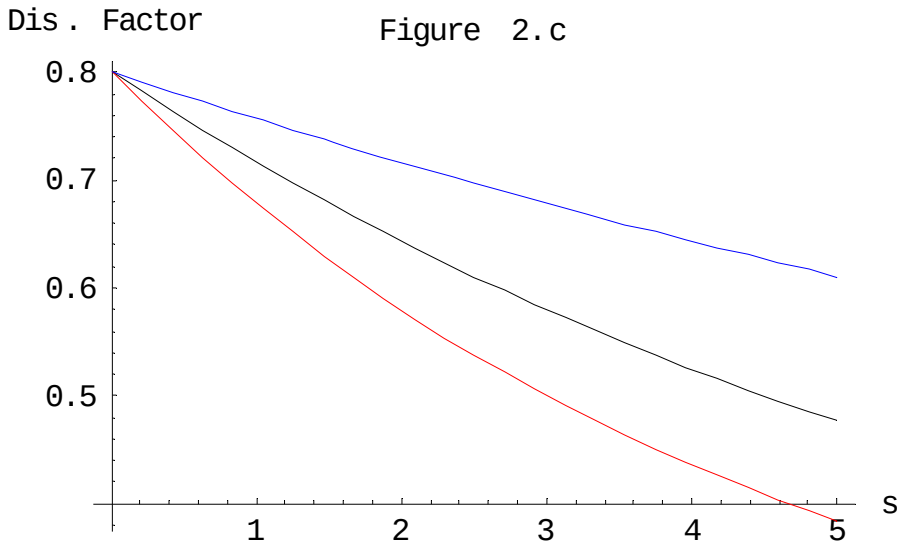
How the imputed discount factor varies with status concern.



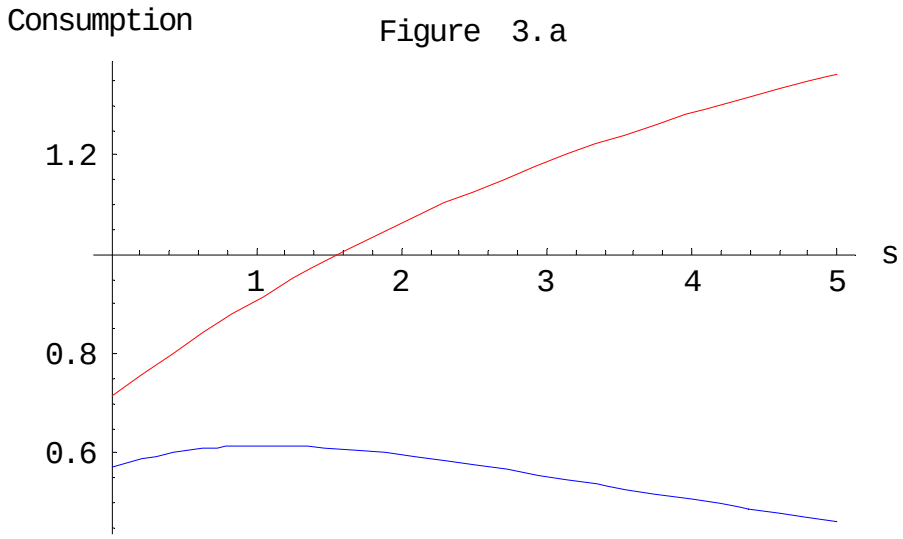
How aggregate consumption in period one varies with status concern when the wealth distribution is egalitarian (bottom) and when it is inegalitarian (top).



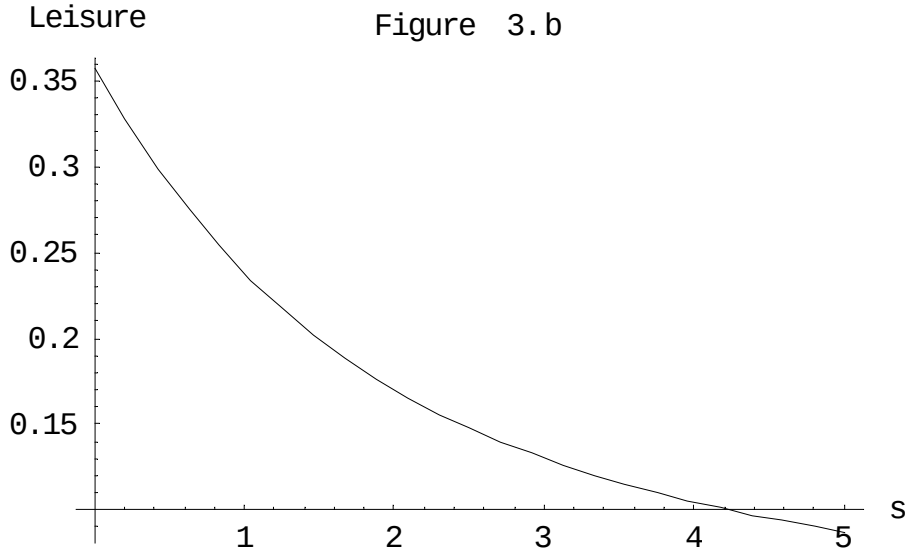
How aggregate consumption in period two varies with status concern when the wealth distribution is egalitarian (top) and when it is inegalitarian (bottom).



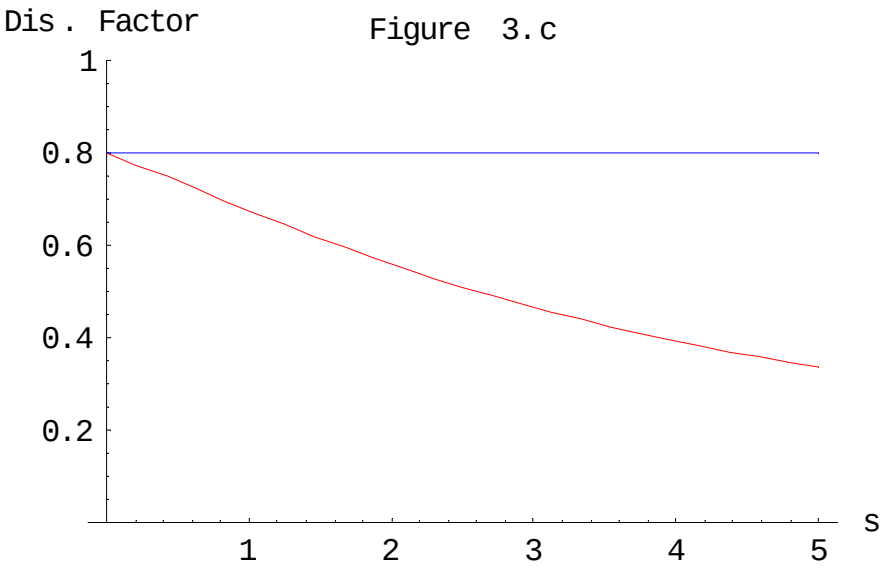
How the imputed discount factor varies with status concern when the wealth distribution is egalitarian (middle), and when it is inegalitarian (top for poor, bottom for rich).



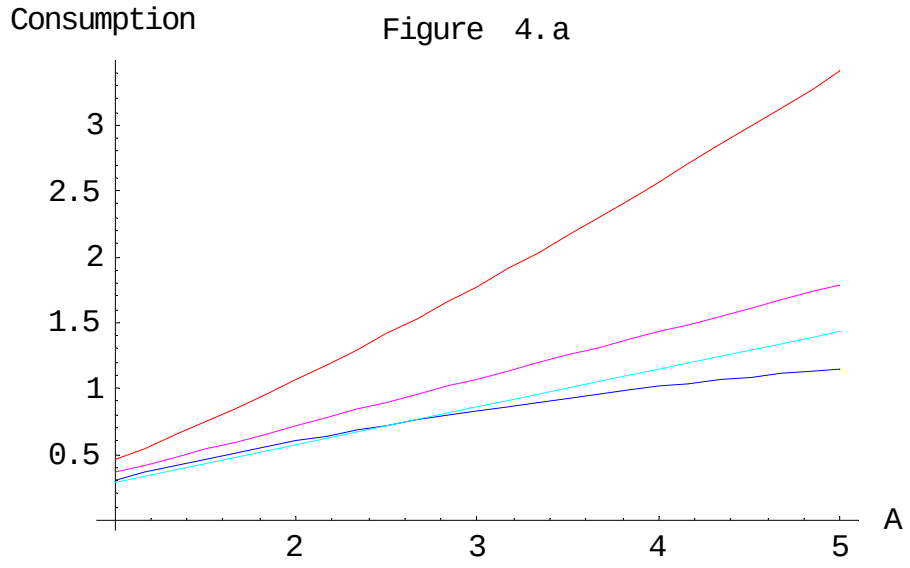
Consumption in periods one (top) and two (bottom) as status concern increases in a model with leisure.



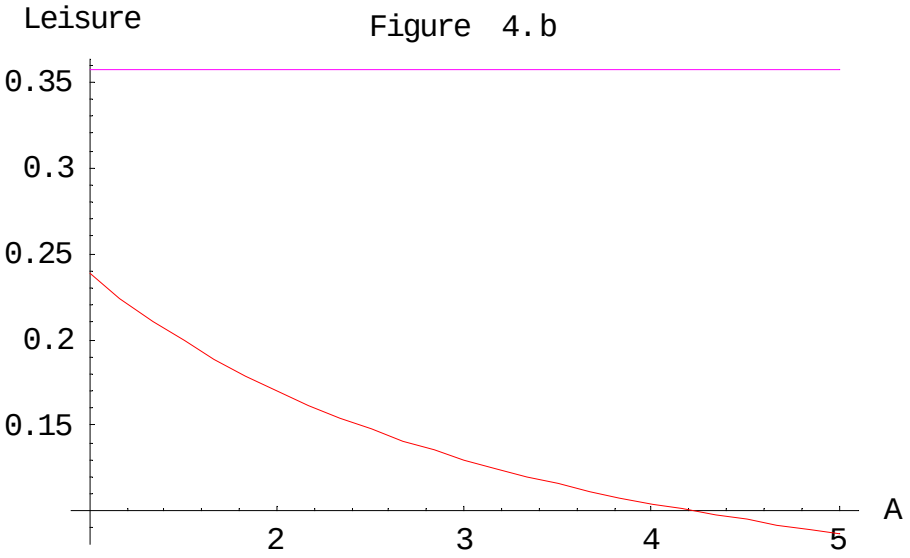
Consumption of leisure as status concern increases.



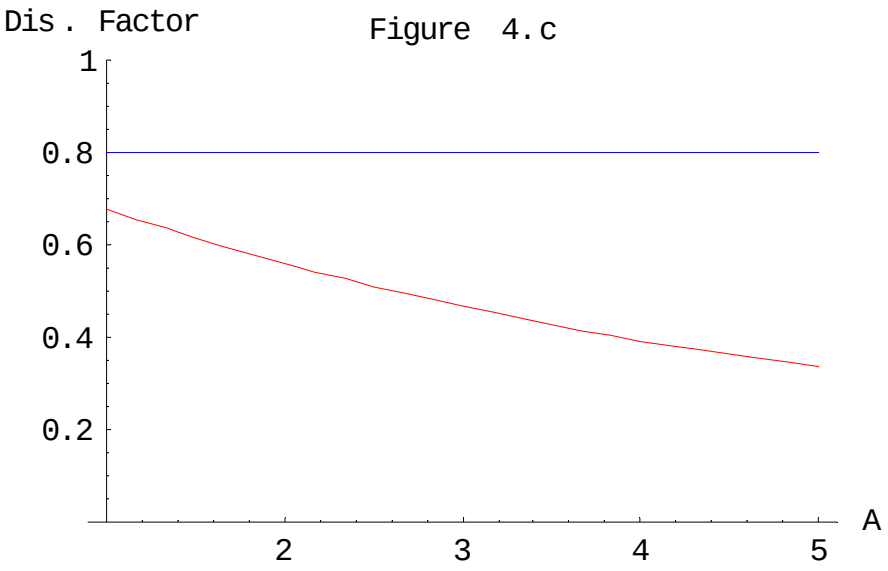
The imputed discount factor (bottom) as compared to the true one (top) as status concern increases.



The consumption in period one (topmost) and in period two (bottommost) as a function of labor productivity in the presence of Veblen effects. The two curves in-between are the corresponding consumption levels in the absence of Veblen effects.



Leisure as a function of labor productivity in the presence (bottom) and absence (top) of Veblen effects.



The imputed discount factor (bottom) as compared to its true value (top) as labor productivity increases.