Well-Being, Leisure, Consumption, and Community in the Presence of a Relative Consumption Externality[1]

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1 Introduction

In this paper we develop a series of simple, competitive general equilibrium models in which there is a *pure* Veblen good, and therefore a *relative consumption externality*. The Veblen good is pure in the sense that it contributes to the welfare of any one individual only in so far as it affects that individual's relative consumption of the good; it provides no utility of its own accord. We use the models to explore the extent to which the Veblen good crowds out the consumption of other goods—leisure, a standard composite consumption good, and a good that we call community. In each of our models, crowding out gets progressively worse as productivity increases and, in the limit, it comes to dominate them.

This paper derives its motivation from the new literature on happiness.[2] It has been observed that, in the developed countries, while economic growth has led to substantial increases in per capita incomes there has hardly been a meaningful change in the extent of the average subjective well-being.[3] For example, in the United States, between the mid-seventies and the mid-nineties the per capita real income increased by around 20%. Yet the increase in happiness ratings is hardly perceptible [Blanchflower and Oswald (2004)]. In fact, despite the fact that real income increased in all but one of the deciles, the average happiness ratings fell in eight of the ten deciles [Frey and Stutzer (2002)]. In Japan, despite the spectacular growth in income in the post-war era, there has been no perceptible change in average happiness [Easterlin (1995)]. Similar patterns have been observed in many European countries [Alesina, Di Tella, and MacCulloch (2001)]. Although the evidence is not as extensive, it lends support

[2] See Frey and Stutzer (2003) for a review. The evidence is also summarized in Layard (2005) and somewhat earlier in Frank (2000).

[3] The pioneering paper in this literature is that of Easterlin (1974)]. Subjective wellbeing is measured by responses to questions that inquire about how satisfied people are with their lives. Layard (2005, Ch. 2) summarizes the evidence from neurobiology that demonstrates subjective wellbeing represents objective feelings as measured by brain activity and can form the basis of objective interpersonal comparisons.

to the proposition that in less-developed countries, per-capita income is positively correlated with average well-being (see ...). Helliwell argues that differences in social capital, the quality of governance, and trust account for much of the variation in average well-being across countries [Helliwell (2003)]. At a given point in time, however, within a country it is observed that people who are richer register higher levels of happiness than those who are poor. The increase in subjective happiness with income, however, is subject to diminishing returns. In summary: cross-sectional studies indicate that income correlates positively with happiness, but time series studies suggest that increases in average income in developed countries makes people no better off subjectively. Together, these "stylized facts" call for an explanation.[4]

In this paper, we pursue an explanation that dates back to Veblen (1899). He argued persuasively that people seek status through conspicuous consumption. This inherently derives its value for people not from the intrinsic worth of what is consumed but from the fact that they set people apart from others by their consumption. This idea is also the basis of Duesenberry's (1967, Ch. III) relative income hypothesis and, more recently, Frank's (1985) theory of the role played by status or 'positional' goods in consumption.

Recently, Eaton and Eswaran (2003) demonstrated in an evolutionary setting that there are good reasons to believe that natural selection may have led humans to guage their well-being in relative terms.[5] Humans are known to have evolved in relatively small groups ('bands'). In strategic settings, preferences that guage a person's well-being in relative terms were shown to confer a selective advantage over standard egoistic preferences that consider only one's own consumption. It follows that nature may have hardwired humans to assess their personal well-being in relative terms. This would explain why those who are richer would register greater satisfaction with life in happiness indices. However, since natural selection

[4] This is the point of departure of Layard's (2005) book.

[5] There are many antecedents to this in the recent literature in evolutionary games. See, for example, Bester and Guth (1998), Bolle (2000), Possajennikov (2000), Kockesen and Ok (2000), Kockesen, Ok, and Sethi (2000), Hansen and Samuelson (1988), and Schaeffer (1989).

works only at the individual level, assessment in relative terms leads to the collectively detrimental outcome that increases in average levels in income over time generate no benefit in terms of happiness.

This paper is not the first attempt at relating the paradox thrown up what has come to be known as happiness research. Indeed, Layard (2005, Ch. 4) suggests relative evaluation as one of the explanations for the paradox. Hopkins and Kornienko (2004) have provided a sophisticated model of status-seeking in a world where status depends on consumption. They show, among other things, that as society becomes richer people spend a greater proportion of their income on conspicuous consumption and utility at a given level of income declines.[6]

In this paper, we construct simple general equilibrium models in which consumer preferences are defined over three goods: leisure, a Veblen good, and a standard good which is a composite of all other goods. In the penultimate section, we add a fourth good by drawing a distinction between private and social leisure. Using these models, we offer a modest contribution to the literature along several dimensions. First, we examine the behavior of the consumptions of leisure, the standard good, and the Veblen good in transparent general equilibrium models as the income (productivity) of a society exogenously increases. We attempt to identify conditions under which leisure may or may not increase in the face of rising affluence. This is particularly relevant for countries like the United States where affluence does not seem to have been accompanied by commensurate increases in leisure. Second, we attempt to identify conditions under which conspicuous consumption may crowd out the consumption of other goods by appropriating virtually the whole of an individual's budget. Third, we examine the extent to which the presence of a Veblen good may facilitate the crowding out of social leisure when productivity increases. This has consequences for soci-

[6] Robson (1992) has investigated the role played by status in risk behavior. He has demonstrated that, even if the von Neumann utility function is strictly concave in wealth, a concern for status (as determined by one's ranking in the wealth distribution) may induce convex segments in the utility function. As a result, concern for status offers a compelling explanation for the pervasive observation that individuals simultaneously exhibit risk-taking and risk-loving behavior (like buying insurance and participating in lotteries).

ety since, as Putnam (2000) has emphasized, social leisure is conducive to the building of a nation's social capital.

2 Pure Veblen Models

For clarity, we begin with a couple of ridiculously simple two-good general equilibrium models. In each the preferences and productivity of all individuals are identical, and there are just two goods, leisure and a Veblen good. The Veblen good is valued by individuals only in so far as it effects their own *relative* consumption of the good; it has no independent value and in this sense it is a *pure* Veblen good.

We denote by x_i the representative individual i's consumption of leisure, by v_i her consumption of the Veblen good, and by v the average consumption of the Veblen good in the economy. In the first pure Veblen model, utility from consumption of the Veblen good is dependent on $v_i - v$, and in the second it is dependent on on both $v_i - v$ and v_i/v.

Production of the Veblen good uses just one input, labor, and there are constant returns in production, and one unit of labor produces w units of the Veblen good. Both the labor market and the market for the Veblen good are competitive, and productivity is exogenous. Then, choosing the Veblen good as the numeraire, the prices of labor and the Veblen good in the competitive equilibrium are, respectively, w and 1.

Think of an island economy where the essentials of life—food, clothing, shelter, and so on—are not scarce, and where the only productive activity involves the use of time and other non-scarce resources like flowers or sea shells to produce ornaments used to adorn one's body. These ornaments are, of course, the Veblen good.

2.1 Pure Veblen 1

In Pure Veblen 1, the representative individual's utility function is

$$U(x_i, v_i) = F(x_i) + D(v_i - v). \tag{1}$$

The function F is differentiable, increasing, and strictly concave in leisure, x_i. Further we assume that leisure is essential, so in the limit as x_i approaches 0, F' is infinite. The function D is increasing and strictly concave in the amount by which the individual's consumption of the Veblen good exceeds the average consumption, $v_i - v$. We assume that $D'(0)$ is finite (and, of course, positive), so the Veblen good is not essential.

The representative individual has just 1 unit of time to allocate to leisure, x_i, and work, h_i, so the time budget constraint is $x_i + h_i = 1$. Given our assumptions, in the solution to the individual's maximization problem, the money budget constraint will hold with equality: $v_i = wh_i$. Then combining the constraints to eliminate h_i, the constraint on the representative individual's choice problem is

$$v_i + wx_i = w. \tag{2}$$

We have then a simple, competitive general equilibrium model with a representative individual, one exogenous productivity parameter, w, and two endogenous variables, equilibrium quantities of leisure and the Veblen good, which we denote by $x^*$and v^*.

The representative individual's choice problem is

$$\max_{x_i, v_i} \quad F(x_i) + D(v_i - v) \ \text{ subject to } v_i + wx_i = w. \tag{3}$$

Assuming for the moment that the solution is interior, the first order conditions for this problem are

$$\frac{F'(x_i)}{w} = D'(v_i - v), \tag{4}$$

and

$$v_i + wx_i = w. \tag{5}$$

Since individuals are identically motivated and equally productive, in the general equilibrium $v_i = v = v^*$ and $x_i = x^*$. Using these facts, when the equilibrium is interior, it is completely characterized by two conditions:

$$\frac{F'(x^*)}{w} = D'(0), \tag{6}$$

and

$$v^* + wx^* = w. \tag{7}$$

Clearly, the equilibrium is not necessarily interior. In fact, whether v^* is 0 or positive depends upon the magnitude of w relative to $\underline{w}$, where $\underline{w}$ is implicitly defined by the following condition: $F'(1)/\underline{w} = D'(0)$. If $w \leq \underline{w}$, then $x^* = 1$ and $v^* = 0$, and if $w > \underline{w}$, then $0 < x^* < 1$ and $v^* > 0$. That is, conspicuous consumption manifests itself only when the productivity is sufficiently high.

The comparative statics of the interior equilibrium are of some interest. Differentiating condition (6), we see that

$$\frac{dx^*}{dw} = \frac{D'(0)}{F''(x^*)} < 0. \tag{8}$$

In words, leisure consumed in equilibrium is a decreasing function of productivity, w. Further, it is apparent from equation (6) that, as w approaches infinity, x^* approaches 0. In this limit, none of the available resources in this economy are devoted to leisure, or putting it differently, all of the available resources are devoted to production of the Veblen good.

Given that $dx^*/dw < 0$, it is clear that

$$\frac{dv^*}{dw} = (1 - x^*) - w\frac{dx^*}{dw} > 1 - x^*. \tag{9}$$

As the productive potential of the economy increases, all of the added productivity is taken in added consumption of the Veblen good, and then some.

Since the representative individual's utility is decreasing in v, average consumption of the Veblen good, there clearly is a negative externality at work in this model; we call it the *relative consumption externality.* To control the externality, a social planner would set $v = v_i$, and accordingly the planner's problem is

$$\max_{x_i, v_i} \quad F(x_i) + D(0) \quad \text{subject to} \quad v_i + wx_i = w. \tag{10}$$

Since the planner's objective function is independent of v_i, the solution is $x^\diamond = 1$ and $v^\diamond = 0$.

Now let us quickly compare the equilibrium with the optimum. When $w \leq \underline{w}$, the equilibrium is coincident with the optimum, but when $w > \underline{w}$, the equilibrium is distorted relative to the optimum in the direction of too little of leisure and too much of the Veblen good: $1 = x^\diamond > x^*$, and $v^* > v^\diamond = 0$.

Since $x^\diamond = 1$, and since the representative individual's endowment of time is the only resource in this economy, the obvious index of *equilibrium efficiency* is

$$E \equiv x^* = 1 - v^*/w. \tag{11}$$

The efficiency index is bounded below by 0 and above by 1: $0 \leq E \leq 1$.

Holding w constant at a value greater than $\underline{w}$, from equation (6) it is apparent that E is inversely related to $D'(0)$, and that it can be arbitrarily close to 0. It is clear then that the distortion caused by the relative consumption externality can be far from insignificant. Further, when $w > \underline{w}$, $dE/dw < 0$ (since $dx^*/dw < 0$), so efficiency is inversely related to productivity in this model, and since x^* goes to zero as w increases without bound, so too does E go to 0 in this limit.

The comparative statics of equilibrium utility mirror the comparative statics of equilibrium efficiency. Equilibrium utility is just $u^* = F(x^*)+D(0)$, and when $w > \underline{w}$, $u^*$is inversely related to w, and approaches a global minimum as w increases without bound.

2.2 Pure Veblen 2

In Pure Veblen 2, utility from consumption of the Veblen good is dependent on both $v_i - v$ and v_i/v, as indicated in the following utility function for the representative individual:

$$U(x_i, v_i) = F(x_i) + D(v_i - v) + H(\frac{v_i}{v}). \tag{12}$$

The function H is increasing and strictly concave in its argument, v_i/v. When both v_i and v are scaled up by the same multiplicative factor, even though her relative standing remains the same, the individual perceives herself to be better off (if $v_i > v$) or worse off (if $v_i < v$) because the absolute distance from the average increases. When both v_i and v are scaled up by the same additive factor, the individual perceives herself to be worse off (if $v_i > v$) or better off (if $v_i < v$) because the relative distance from the average decreases even though the absolute distance remains the same.

The representative individual's choice problem is

$$\max_{x_i, v_i} \quad F(x_i) + D(v_i - v) + H(\frac{v_i}{v}) \quad \text{subject to} \quad v_i + wx_i = w, \tag{13}$$

and the first order conditions for this problem are

$$\frac{1}{w}F'(x_i) = D'(0) + \frac{1}{v}H'(\frac{v_i}{v}), \tag{14}$$

and

$$v_i + wx_i = w. \tag{15}$$

As in Pure Veblen 1, since all individual's have identical preferences and constraints, in equilibrium $v_i = v = v^*$ and $x_i = x^*$. Using these facts, the general equilibrium of Pure Veblen 2 is completely characterized by two conditions:

$$\frac{F'(x^*)}{w} = D'(0) + \frac{H'(1)}{v^*}, \tag{16}$$

and

$$v^* + wx^* = w. \tag{17}$$

Since the right hand side of condition 16 approaches infinity as v^* approaches 0, it is always the case that $v^* > 0$. In this sense, the Veblen good is essential in Pure Veblen 2.

Using equation (17) to eliminate v^* in equation (16), we can characterize x^* by just one condition:

$$F'(x^*) = wD'(0) + \frac{H'(1)}{1 - x^*}. \tag{18}$$

Differentiating this condition, we obtain

$$\frac{dx^*}{dw} = \frac{D'(0)}{\left[F''(x^*) - \frac{H'(1)}{(1-x^*)^2}\right]} < 0. \tag{19}$$

As in Pure Veblen 1, leisure is a decreasing function of productivity. Further, it is clear from condition (16) that as w increases without bound, x^* goes to 0. Notice that this outcome depends on preferences over the Veblen good being such that $D'(0) > 0$. In particular, if $D'(0) = 0$, the marginal utility per dollar from leisure and the Veblen good are both inversely proportional to productivity and so the amount of leisure consumed is independent of productivity. When $D'(0) > 0$, the marginal utility of the Veblen good falls less rapidly than that of leisure and an individual finds it in her self-interest to curtail leisure.

As in Pure Veblen 1, since $dx^*/dw < 0$,

$$\frac{dv^*}{dw} = (1 - x^*) - w\frac{dx^*}{dw} > 1 - x^*. \tag{20}$$

As w increases, it is once again the case that all of the added productivity is taken in added consumption of the Veblen good, and then some.

To control the relative consumption externality, a social planner would set $v = v_i$, and accordingly the planner's problem is

$$\max_{x_i, v_i} \quad F(x_i) + D(0) + H(1) \quad \text{subject to} \quad v_i + wx_i = w. \tag{21}$$

Clearly, the solution to the planner's problem is again $x^\diamond = 1$ and $v^\diamond = 0$. Hence the equilibrium is again distorted relative to the optimum: $1 = x^\diamond > x^*$, and $v^* > v^\diamond = 0$.

As productivity increases, both Pure Veblen models eventually get stuck in what might be called a *relative consumption trap.* As productivity increases, equilibrium efficiency, utility, and leisure all decrease, as expenditure on the Veblen good crowds out all other activity, eventually completely dominating the economy.

It is perhaps no surprise that the relative consumption externality looms large is these pure Veblen models, where the only produced good is a Veblen good. The results for these models may tell us very little about any real economy. They do, however, raise some interesting questions and disturbing possibilities that we explore below.

3 A Standard Veblen Model

Now let us define a model that we call Standard Veblen, by adding a standard consumption good to Pure Veblen 2. This good is a composite of all produced goods other than the Veblen good — a composite of food, shelter, and clothing if you like.

Let y_i denote the amount of the standard good consumed by the representative individual and $G(y_i)$ the utility derived from consumption of y_i, where the function G is increasing and concave in y_i. We assume that in the limit as y_i goes to 0, G' is infinite. In Standard Veblen, the representative individual's utility function is

$$U(x_i, y_i, v_i) = F(x_i) + G(y_i) + D(v_i - v) + H(\frac{v_i}{v}). \tag{22}$$

Notice that all three goods are essential in Standard Veblen.

The standard good is produced using just labor under constant returns in production, and units are chosen so that one unit of labour produces w units of the standard good. The markets for labour, the Veblen good and the standard good are perfectly competitive. Hence, the competitive equilibrium price of labour is again w, and the competitive equilibrium prices of the Veblen and standard goods are both 1.

3.1 The Optimum

As in the Pure Veblen models, a social planner would recognize that inevitably $v = v_i$, and therefore that the Veblen good ultimately contributes nothing to utility—that is, a planner would recognize that the optimal quantity of the Veblen good is 0, or that $v^\diamondsuit = 0$. Given this, optimal quantities of leisure and the standard good are the solution to the following problem:

$$\max_{x_i, y_i} \quad F(x_i) + G(y_i) \quad \text{subject to} \quad y_i + wx_i = w. \tag{23}$$

The solution to this planning problem is characterized by

$$G'(y^\diamondsuit) = \frac{F'(x^\diamondsuit)}{w}, \tag{24}$$

and

$$y^\diamondsuit + wx^\diamondsuit = w. \tag{25}$$

As will be apparent when we look at some simulation results, the comparative statics of the planner's solution with respect to productivity are of some interest. The comparative static for optimal consumption of the standard good is unambiguously positive:

$$\frac{dy^\diamondsuit}{dw} = \frac{-wG'(y^\diamondsuit) + \frac{y^\diamondsuit}{w}F''(x^\diamondsuit)}{F''(x^\diamondsuit) + w^2G''(y^\diamondsuit)} > 0. \tag{26}$$

The inequality holds because both the denominator and the numerator in this expression are negative. Productivity improvements will invariably lead the planner to increase consumption of the standard good.

On the other hand, the comparative static for optimal consumption of leisure is ambiguous:

$$\frac{dx^\diamondsuit}{dw} = \frac{G'(y^\diamondsuit) + y^\diamondsuit G''(y^\diamondsuit)}{F''(x^\diamondsuit) + w^2G''(y^\diamondsuit)}.$$

Since the denominator is unambiguously negative, the sign of $dx^\diamondsuit/dw$ hinges on the sign of the numerator.

The behavior of leisure in the face of productivity improvements depends crucially on the manner in which the marginal productivity of the standard good changes with its consumption, that is, on the curvature of $G(y)$. A handy way of quantifying this is to invoke the concept of relative risk aversion, defined by the index $R(y) = -yG''(y)/G'(y)$. The sign of the comparative static expression above can be written:

$$Sgn\left(\frac{dx^{\diamondsuit}}{dw}\right) = Sgn[R(y^{\diamondsuit}) - 1]. \tag{27}$$

If $G(y)$ is $\log(y)$, the index of relative risk aversion is unity, and $dx^{\diamondsuit}/dw = 0$. In this case, $y^{\diamondsuit}$ is an increasing, linear function of w. The planner would have individuals consume the same amount of leisure as productivity increases. If, however, the index of relative risk aversion is *everywhere* less than unity, then $dx^{\diamondsuit}/dw < 0$ for all w. Conversely, if the index of relative risk aversion is *everywhere* greater than unity, then $dx^{\diamondsuit}/dw > 0$ for all w. In essence, if the marginal utility of the standard good does not decline "too rapidly", the planner would have leisure decline in order to augment the consumption of the standard good more than proportionally to the productivity increase. If, on the other hand, the marginal utility of the standard good declines "sufficiently rapidly", the planner would have leisure increase in the wake of a productivity increase even though this would entail a less-than-proportional increase in the consumption of the standard good. The dividing "knife-edge" case occurs when the index of relative risk aversion is precisely unity (that is $G(y)$ is the logarithm function), where the planner would not alter the time allocated to leisure when productivity increases.

3.2 Equilibrium

In Standard Veblen, the representative individual's choice problem is

$$\max_{x_i, y_i, v_i} F(x_i) + G(y_i) + D(v_i - v) + H(\frac{v_i}{v}) \quad \text{subject to} \quad v_i + y_i + wx_i = w. \tag{28}$$

Since all three goods are essential, the equilibrium is always interior. The first order conditions for the choice problem are

$$D'(v_i - v) + \frac{1}{v}H'(\frac{v_i}{v}) = \frac{F'(x_i)}{w}, \tag{29}$$

$$D'(v_i - v) + \frac{1}{v}H'(\frac{v_i}{v}) = G'(y_i), \tag{30}$$

and

$$v_i + y_i + wx_i = w. \tag{31}$$

Of course, in equilibrium $v_i = v = v^*$, $x_i = x^*$, and $y_i = y^*$. Using these facts, the general equilibrium of Standard Veblen is characterized by three conditions:

$$D'(0) + \frac{1}{v^*}H'(1) = \frac{F'(x^*)}{w}, \tag{32}$$

$$D'(0) + \frac{1}{v^*}H'(1) = G'(y^*), \tag{33}$$

and

$$v^* + y^* + wx^* = w. \tag{34}$$

The comparative static results for consumption of the Veblen and standard goods are unambiguously signed, but the comparative static for leisure is ambiguous. In particular, $dv^*/dw > 0$, $dy^*/dw > 0$, and dx^*/dw has no determinate sign. To establish these results, assume first that $dv^*/dw = 0$. From conditions (31) and (30), we see that $dy^*/dw = 0$ and $dx^*/dw = 0$. But $dx^*/dw = 0$ implies that $d(v^* + y^*)/dw > 0$, since from the budget constraint $v^* + y^* = w(1 - x^*)$, a contradiction. Hence, $dv^*/dw \neq 0$. Now assume that $dv^*/dw < 0$. Then, from condition (31), $dy^*/dw < 0$. So, $d(v^* + y^*)/dw < 0$, which implies that $dx^*/dw > 0$. But, then condition (30) could not hold, since the left side would increase and the right side would decrease as w increased, another contradiction. The two contradictions leave only one possibility: $dv^*/dw > 0$. Condition (30) then implies that $dy^*/dw > 0$. Below we will examine some simulations that confirm that the sign of dx^*/dw is ambiguous.

The limiting results are perhaps more interesting. Define $\overline{y}$ to be the value of y such that $D'(0) = G'(\overline{y})$. As w increases without bound, x^* approaches 0, y^* approaches $\overline{y}$, and v^* approaches infinity. To establish these results, we again proceed by contradiction. Assume that in the limit as w increases without bound, x^* approaches $\underline{x} > 0$. Then, $v^*+y^* = w(1-x^*)$ approaches infinity as w increases without bound. But, but from condition (31), y^* cannot exceed $\overline{y}$, so v^* must approach infinity as w increases without bound. But then condition (30) will not be satisfied for w sufficiently large, since $D'(0)+H'(1)/(w(1-\underline{x})-\overline{y}) > F'(\underline{x})/w$ for sufficiently large w, a contradiction. So, as w increases without bound, x^*approaches 0. Given this result, it is then apparent that in the limit v^* approaches infinity and y^*approaches $\overline{y}$.

The implications for efficiency when w is large are very strong. Given v^*, the time not used to produce the Veblen good, $1-v^*/w$, is optimally allocated to leisure and the standard good since conditions (30) and (31) imply that $F'(x^*)/w = G'(y^*)$. The time allocated to production of the Veblen good is, of course, simply squandered. Hence,

$$E \equiv 1 - v^*/w \tag{35}$$

is an appropriate index of the efficiency of the equilibrium. In the limit as w increases without bound, v^* approaches $w - \overline{y}$, so v^*/w approaches 1, and E approaches 0. In other words, in Standard Veblen, when w is very large, virtually all of the productive potential of the model is dissipated by the relative consumption externality. Just as the Pure Veblen models did, when productivity is sufficiently large, Standard Veblen gets stuck in a relative consumption trap in which added productivity is simple squandered on increased production of the Veblen good with no benefit to anyone.

Simulations of the evolution of Mixed Veblen 2 as productivity increases illustrate a number of interesting and suggestive possibilities, depending on the functional form of G.

3.3 Simulations of Standard Veblen

In this section, we present some simulation results. We assume that:

$$F(x_i) = -\frac{10}{x_i}\ ;\ \ D^{`}(0) = 1; \quad H^{`}(1) = 1. \tag{36}$$

Notice that we do not need to specify the full functional forms for $D(.)$ and $H(.)$; specifying their derivatives when $v_i = v$ suffices.

Since a crucial role is played by the utility, $G(y)$, derived from the standard good we consider two possible variations of this function.

Relative Risk Aversion Greater Than Unity

We first consider a functional form for $G(y)$ that exhibits an index of relative risk aversion that exceeds unity ($R(y) > 1$ for all $y > 0$):

$$G(y_i) = -\frac{10}{y_i}. \tag{37}$$

The simulation results are presented in Figure 1.

Figures 1.A through 1.G present a picture of the typical behavior of Standard Veblen in this case. In Figure 1.A, we plot the behavior of equilibrium utility (the lower curve) and optimal utility (the upper curve). Naturally, optimal utility is an increasing function of w, while equilibrium utility at first increases and subsequently decreases. Figure 1.B plots the behavior of equilibrium consumption of the Veblen good (optimal consumption is, of course, 0). Notice that this schedule increases at an increasing rate throughout. Figure 1.C plots the behavior of equilibrium (the lower curve) and optimal (the upper curve) consumption of the standard good. Both optimal and equilibrium consumption increase at a decreasing rates, equilibrium consumption asymptotically approaches a fixed value (referred to earlier as $\overline{y}$) from below, and the divergence of the equilibrium from optimal consumption gets larger and larger.

Figure 1.D plots equilibrium (the lower curve) and optimal (the upper curve) consumption of leisure. Optimal consumption of leisure is an increasing function of w, while equilibrium consumption of leisure initially increases as w increases and subsequently decreases. Since $R(y) > 1$, the marginal utility of consumption from the standard good is levelling off rapidly and so the planner allocates more time to leisure when productivity increases. In the competitive equilibrium, however, when the benefit to consuming more of the standard good becomes negligible the productivity increase is channelled to fuel the self-defeating race for consumption of the Veblen good. This proceeds to the extent that, at some point, leisure actually decreases with productivity increases.

Figures 1.E, 1.F and 1.G give a detailed picture of the distortions driven by the relative consumption externality. Figure 1.E plots the evolution of dead weight loss, measured in units of labour: deadweight loss is equal to the amount of labour used to produce the Veblen good, v^*/w. Deadweight loss is an increasing function of w (recall that we established above that it approaches 1 as w increases without bound). Figures 1.F and 1.G separate the deadweight loss into two components: one associated with the divergence of equilibrium consumption of the standard good from optimal consumption (Figure 1.F), and the other associated with the divergence of equilibrium consumption of leisure from optimal consumption (Figure 1.G). As the figures reveal, when $R(y) > 1$, the divergence of equilibrium from optimal consumption of leisure accounts for the lion's share of the deadweight loss. This, as alluded to earlier, is due to the fact that the marginal gains to consuming the standard good are pretty much exhausted at high productivity levels and so its optimum consumption does not differ appreciably from the equilibrium value. Veblen competition in equilibrium forces leisure to deviate substantially from the optimum.

We have experimented with a variety of other functional forms and parameter values. While the details of the behavior are different, the general picture in all of them is consistent with the features that we highlighted in our discussion of Figures 1.A through 1.G.

Relative Risk Aversion Less Than Unity

We next consider a functional form for $G(y)$ that exhibits an index of relative risk aversion that is less than unity ($R(y) < 1$ for all $y > 0$):

$$G(y_i) = 10y_i^{1/2} \ . \tag{38}$$

The simulation results are shown in Figure 2.

Figures 2.A and 2.B are similar to 1.A and 1.B. As w increases, equilibrium utility at first increases and later decreases, and equilibrium consumption of the Veblen good increases at an increasing rate. There is one significant difference between Figure 2.C and 1.C: in Figure 2.C, optimal consumption of the standard good increases at and increasing rate, while it increases at a decreasing rate in Figure 1.C. This is because, when $R(y) < 1$ for all $y > 0$, the marginal utility of consumption of the standard good does not fall too rapidly and the planner utilizes productivity increases to augment the consumption of this good by curtailing leisure.

Similarities and Differences

Figure 1.D is different from Figure 2.D in one important respect. In Figure 1.D, the

optimal consumption of leisure is an increasing function of w and equilibrium consumption initially increases and subsequently decreases, while in Figure 2.D the optimal (the upper curve) and equilibrium (the lower curve) consumptions of leisure are both decreasing functions of w throughout. We have seen why the optimal leisure declines with w when $R(y) < 1$ for all $y > 0$; equilibrium leisure declines for the additional reason that Veblen competition further absorbs labor.

Figures 2.E and 1.E tell the same story: deadweight loss is an increasing function of w, and it approaches 1, its maximum possible value, as w increases without bound. The differences that we saw in Figure 2.C versus Figure 1.C and in Figure 2.D versus 1.D show up again when we look at the distribution of deadweight loss in Figures 2.F and 2.G. From the latter two Figures, we see that the lion's share of the loss results from the divergence of optimal consumption of the standard good form equilibrium consumption, whereas in Figures 1.F and 1.G it results from the divergence of optimal consumption of leisure form equilibrium consumption. This difference arises because, in Figure 2 the marginal benefits from the standard good consumption are not getting exhausted rapidly. So diversion of leisure to Veblen competition in equilibrium induces substantial welfare loss from underconsumption of the standard good.

Here too we have experimented with a variety of other functional forms and parameter values. Once again, the details are different, but the general picture is the same.

Naturally, we have conducted simulations in which $R(y) = 1$ for all $y > 0$ (that is, when G is the logarithm function). In these simulations, the one notable difference is that the deadweight loss is attributable to significant divergences of optimal values from equilibrium values of both leisure and the standard good. This is understandable, since this is the 'knife-edge' case.

4 Community Veblen

The recent literatures on social capital and well-being suggest to us that we can develop additional insights concerning the ways in which the relative consumption externality distorts decision making in rich economies by distinguishing two sorts of leisure, *private leisure* and *social leisure*.

The distinguishing feature of social leisure is that it involves positive externalities among individuals. We have in mind a good that might best be called *community* that is valuable to all, and is produced by the voluntary choices of social leisure by different individuals.

The fact that community is produced by voluntary choices and that it involves positive externalities implies that there will be too little of it, obviously. This is not, however our primary concern here. Instead what we are interested in is the extent to which the relative consumption externality distorts individual incentives to choose social leisure, and the behavior of this distortion as productivity increases. This would seem to be an important issue for the simple reason that the price of social leisure is the wage rate. In Standard Veblen we saw that in rich economies the relative consumption externality can produce a situation in which the Veblen good crowds out private leisure and the standard good. To what extent, and in what circumstances, does the Veblen good crowd out social leisure are the questions that we address in this section by introducing a model that we dub Community Veblen.

If we assume that the production function for community is symmetric in the quantities of social leisure chosen by different individuals, the production function can be written as $M(s_i, s)$, where s_i is the social leisure of individual i and s is the common value of social leisure for all other individuals. We assume that M is increasing in both its arguments and is strictly concave. It is useful to have some notation for the marginal value of s_i to individual

i when $s_i = s$. Accordingly, define $MV(s_i)$ as follows:

$$MV(s_i) \equiv M_1(s_i, s_i) \tag{39}$$

where M_1 is the partial derivative of M with respect to its first argument.

In Community Veblen, the representative individual's choice problem is now

$$\max_{x_i, y_i, v_i, s_i} F(x_i) + G(y_i) + D(v_i - v) + H(\frac{v_i}{v}) + M(s_i, s) \quad \text{subject to} \quad v_i + y_i + wx_i + ws_i = w. \tag{40}$$

If the solution is interior, the first order conditions for the choice problem are

$$D'(v_i - v) + \frac{1}{v} H'(\frac{v_i}{v}) = \frac{MV(s_i)}{w}, \tag{41}$$

$$D'(v_i - v) + \frac{1}{v} H'(\frac{v_i}{v}) = \frac{F'(x_i)}{w}, \tag{42}$$

$$D'(v_i - v) + \frac{1}{v} H'(\frac{v_i}{v}) = G'(y_i), \tag{43}$$

and

$$v_i + y_i + w(x_i + s_i) = w. \tag{44}$$

Of course, in equilibrium $v_i = v = v^*$, $x_i = x^*$, $y_i = y^*$, and $s_i = s^*$. Using these facts, and assuming that the equilibrium of Community Veblen is interior, it is characterized by four conditions:

$$D'(0) + \frac{1}{v^*} H'(1) = \frac{MV(s^*)}{w}, \tag{45}$$

$$D'(0) + \frac{1}{v^*} H'(1) = \frac{F'(x^*)}{w}, \tag{46}$$

$$D'(0) + \frac{1}{v^*} H'(1) = G'(y^*), \tag{47}$$

and

$$v^* + y^* + w(x^* + s^*) = w. \tag{48}$$

4.1 In the Absence of Veblen Good

In order to isolate the effect of the presence of the Veblen good on social leisure, it is expedient to first consider the case in the absence of the Veblen good. To this end, we set $D'(0) = H'(1) = 0$ in this subsection, so that $v^* = 0$. The first order conditions in this case are readily seen to be:

$$G'(y^*) = \frac{F'(x^*)}{w}, \tag{49}$$

$$G'(y^*) = \frac{MV(s^*)}{w}, \tag{50}$$

and the budget constraint is

$$y^* + w(x^* + s^*) = w. \tag{51}$$

Equating the right hand sides of (49) and (50) and differentiating totally with respect to w, we obtain

$$MV'(s^*)(ds^*/dw) = F''(x^*)(dx^*/dw).$$

Diminishing returns to both private and leisure imply that $MV' < 0$ and $F'' < 0$, so that

$$Sgn\left(\frac{ds^*}{dw}\right) = Sgn\left(\frac{dx^*}{dw}\right). \tag{52}$$

Thus, as productivity increases, private and social leisure either increase together or decrease together. This raises the question: Under what conditions do they increase or decrease? The answer, demonstrated in the Appendix, turns out to be the same as when there was only private leisure:

$$Sgn\left(\frac{ds^*}{dw}\right) = Sgn\left(\frac{dx^*}{dw}\right) = Sgn[R(y^*) - 1]. \tag{53}$$

If the marginal utility of the standard good declines relatively slowly ($R(y^*) < 1$), private and social leisure decline with higher productivity; and, on the other hand, if it declines relatively rapidly ($R(y^*) > 1$), private and social leisure rise with higher productivity.

4.2 In the Presence of Veblen Good

Now we are ready to consider how the presence of the Veblen good impinges on leisure when productivity changes. In this subsection, we restore the assumptions that $D'(0) > 0$ and $H'(1) > 0$.

If social leisure is not essential, that is, if $MV(0)$ is finite, a corner solution in which $s^* = 0$ is clearly possible. Given that the standard good, leisure, and the Veblen good are essential, such an equilibrium is characterized by the following conditions:

$$D'(0) + \frac{1}{v^*}H'(1) > \frac{MV(0)}{w}, \tag{54}$$

$$D'(0) + \frac{1}{v^*}H'(1) = \frac{F'(x^*)}{w}, \tag{55}$$

$$D'(0) + \frac{1}{v^*}H'(1) = G'(y^*), \tag{56}$$

and

$$v^* + y^* + wx^* = w. \tag{57}$$

It is then immediately clear that if $MV(0)$ is finite, there is a value of w, call it $\underline{w}$, such that $s^* = 0$ if $w > \underline{w}$, since $MV(0)/w$ goes to 0 as w goes to infinity. In other words, if it is not essential, in very rich economies social leisure is completely crowded out by the Veblen good.

We can demonstrate a more powerful result: the above outcome obtains asymptotically even when social leisure is deemed essential. So now we drop the assumption that $MV(0)$ is finite. The relevant first order conditions are given by (45) - (47), and the budget constraint by (48).

We first show that

$$\frac{dv^*}{dw} > 0, \quad \frac{dy^*}{dw} > 0. \tag{58}$$

We prove this by contradiction. Suppose $\frac{dv^*}{dw} \leq 0$. Then (47) implies that $\frac{dy^*}{dw} < 0$, (46) that $\frac{dx^*}{dw} > 0$, and (45) that $\frac{ds^*}{dw} > 0$, since $MV' < 0$, $F'' < 0$, and $G'' < 0$. But this violates the budget constraint (48), which when rewritten as $y^* + v^* = w(1 - x^* - s^*)$ would see the left hand side decrease while the right hand side increases. This contradiction establishes that $\frac{dv^*}{dw} > 0$. Then (47) implies that $\frac{dy^*}{dw} > 0$.

In the limit when w becomes infinitely large, both x^* and s^* must go to zero. We demonstrate this by contradiction. Suppose that, in this limt, either x^* approaches from above some positive lower limit $\underline{x} > 0$ or s^* approaches from above some positive lower limit $\underline{s} > 0$. From (47) we see that $D'(0) < G'(y^*)$, so that $y^* < \overline{y}$, where $\overline{y}$ solves $D'(0) = G'(y^*)$. The budget constraint (48) indicates that we must have $v^* > w(1 - \underline{x} - \underline{s}) - \overline{y}$. Since, by assumption, either $\underline{x}$ or $\underline{s}$ are strictly bounded away from zero, this inequality implies that v^* must increase without bound when w does. But this violates (45) if $\underline{s} > 0$ or (46) if $\underline{x} > 0$. This contradiction establishes that x^* and s^* must both go to zero when w becomes infinitely large.

The perverse role played by the Veblen good in dissipating social (and private) leisure now becomes apparent. When the marginal utility of the standard good declines relatively rapidly ($R(y^*) > 1$), we have seen that private and social leisure rise with higher productivity in the absence of a Veblen good. When a Veblen good is present, however, social and private leisure always go to zero in the limit of very large productivity. Since in equilibrium the

Veblen good contributes nothing to well-being, its presence is anathema to affluent societies.

The decline in social leisure may have serious consequences for society. Putnam (2000) has persuasively argued that the decline in civic engagement by Americans—a symptom of which is the fact that they are increasingly bowling alone rather than in bowling leagues—is leading to a reduction in social capital in the United States. The inevitable decline in social trust as a result of the fall in associational membership (churches, parent-teacher organizations, unions, etc.) weakens the very fabric of society. One may well attribute at least part of the increase in the incidence of broken families and crime in the United States[7] in the post war era to the fact that social leisure is decreasing and, therefore, eroding the nation's social capital.

5 Conclusions

This paper is motivated by a well-established paradox concerning the relationship between per capita income and perceived well-being in affluent societies: *over time, we get richer, but we don't get happier.* This result raises the disturbing possibility that in rich countries like ours, we are consuming our resources and despoiling our environment for no good purpose. And it suggests that our society's and our profession's emphasis on growth is misplaced.

In this paper we have explored the hypothesis, suggested by Frank (2000), Layard (2005), and Hopkins and Korneinko (2004) among others, that the happiness paradox is driven by a relative consumption externality associated with Veblen goods, and our results suggest that the hypothesis must be taken seriously. In all of our models, as productivity increases, affluent societies inevitably find themselves in a relative consumption trap in which productivity improvements are simply frittered away in the futile attempt by individuals to distinguish themselves by consuming more of the Veblen good than their fellows do. As productivity

[7] See Layard (2005, Ch. 6) for a review of the evidence on this.

increases, the Veblen good progressively crowds out all of the goods and activities that promote well-being – standard (that is, non-Veblen) goods, private leisure, and community (or social lesiure) – and, perversely, well-being is inversely related to productivity. In fact, in the limit as productivity increases without bound, virtually all productive resources are devoted to the production of the useless Veblen good.

Obviously, to say that the relative consumption externality *can* explain the happiness paradox does not mean that it *does*. Of course, there may be other forces at work. But, in the context of this paper, the key emperical question is this: is the relative consumption externality an important part of the explantion? On this question, affirmative evidence is mounting. See Layard (2005b), and especially Helliwell and Huang (2005) – the latter authors present extensive evidence in support of the relative consumption hypothesis.

There are many implications of preferences for relative consumption that remain to be explored. One that is currently on our agenda is the effect of such preferences on the rate at which exhaustible resources are depleted. It is commonplace that, if markets are competitive and there are no externalities, the price mechanism will ensure that the resources will be optimally exploited. Typically, the externalities that have been considered in the literature come from the production side. For Veblen goods, in contrast, the externalities are built into preferences. These could well have quantitatively far stronger implications for sustainable development because the self-defeating aspect of the relative consumption externality in equilibrium thwarts processes that might otherwise have induced satiation. The deleterious effects on the rate of depletion of the earth's resources and its attendant consequences for future generations derive from the same source as the effects that erode the well-being of the present generation: a reference point for one's consumption that lies outside oneself.

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APPENDIX

We demonstrate here that, in the absence of the Veblen good, the signs of the comparative static derivatives ds^*/dw and dx^*/dw are given by (53). Substituting $y^* = w(1 - x^* - s^*)$ from the budget constraint, we can rewrite the first order conditions for x and s as:

$$G'(w(1 - x^* - s^*)) = \frac{F'(x^*)}{w}$$

and

$$G'(w(1 - x^* - s^*)) = \frac{MV(s^*)}{w}.$$

Taking the total differential of these two equations we obtain

$$(-wG'' - F''/w)dx^* - wG''ds^* = -[(1 - x^* - s^*)G'' + F'/w^2]dw,$$

$$-wG''dx^* - (wG'' + MV'/w)ds^* = -[(1 - x^* - s^*)G'' + MV'/w^2]dw,$$

where we have dropped the arguments for brevity. Using Cramer's rule and simplifying, we obtain

$$\Delta\left(\frac{dx^*}{dw}\right) = (1 - x^* - s^*)G''MV'/w + (F''/w)G' + (F'/w^2)(MV'/w) - (MV/w)G'',$$

where

$$\Delta \equiv (wG'' + F''/w)(wG'' + MV'/w) - (wG'')^2$$

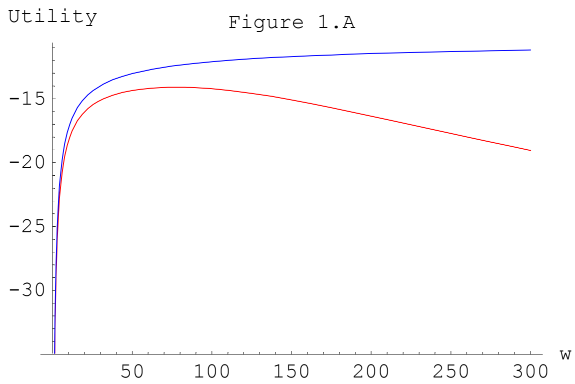
$$= (wG'')(MV'/w) + (F''/w)(wG'') + (F''/w)(MV'/w)$$

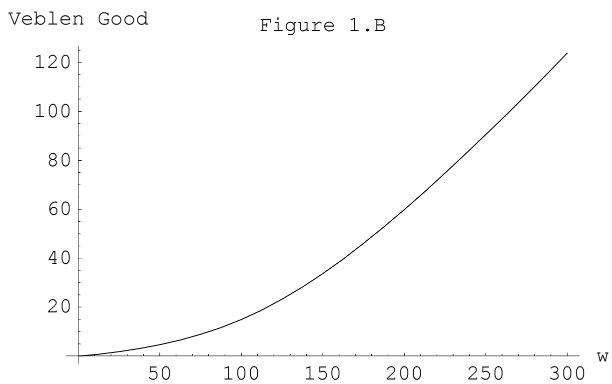
$$> 0.$$

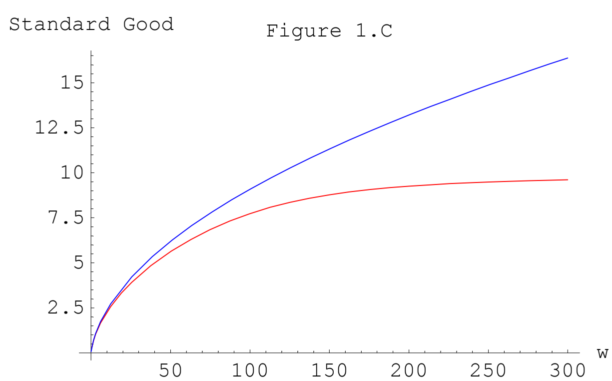
On using the first order conditions $F'/w = G' = MV/w$ and then the budget constraint, the above comparative static expression reduces to

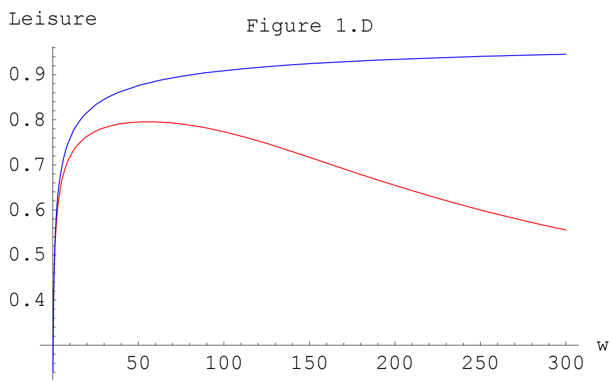
$$\left(\frac{dx^*}{dw}\right) = (y^* G'' + G')MV'/\Delta.$$

Using the definition of the index of relative risk aversion and the fact that $MV' < 0$, we see that the sign of the right hand side of the above expression is $Sgn[R(y^*) - 1]$. From this and (52)—which holds also in the presence of the Veblen good—the result in (53) follows.


Utility
Figure 1.A
-15
-20
-25
-30
w
50
100
150
200
250
300


Veblen Good
Figure 1.B
120
100
80
60
40
20
w
50
100
150
200
250
300


Standard Good
Figure 1.C
15
12.5
10
7.5
5
2.5
w
50
100
150
200
250
300


Leisure
Figure 1.D
0.9
0.8
0.7
0.6
0.5
0.4
w
50
100
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250
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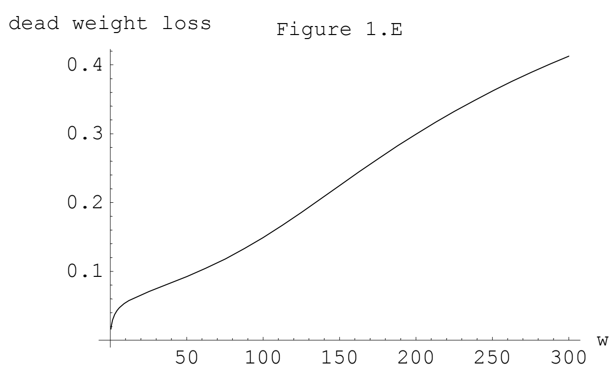
dead weight loss
Figure 1.E
0.4
0.3
0.2
0.1
w
50
100
150
200
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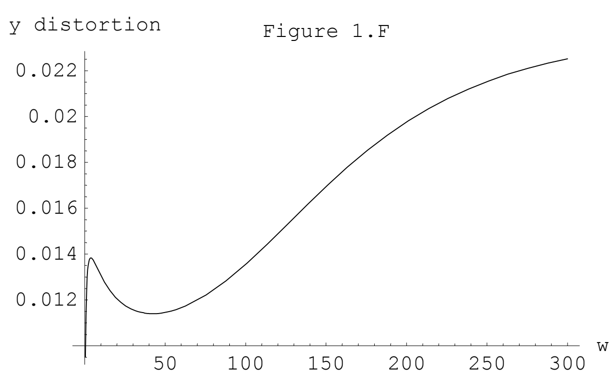
300


y distortion
Figure 1.F
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0.018
0.016
0.014
0.012
w
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100
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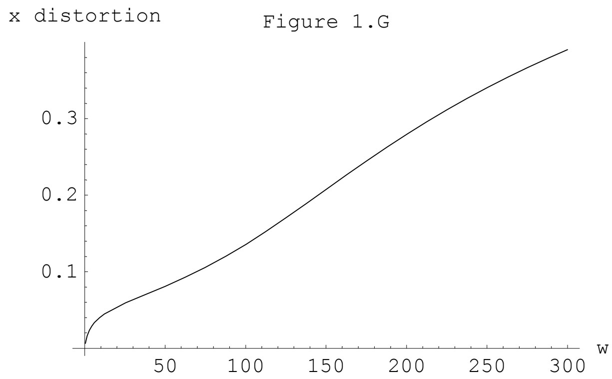
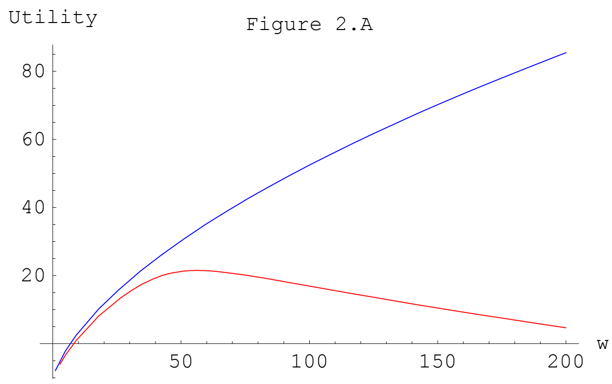
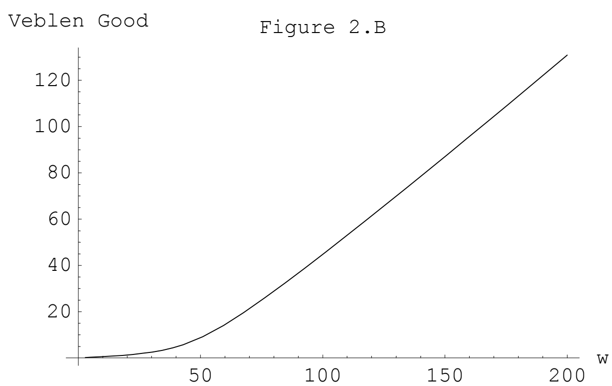
200
250
300


x distortion
Figure 1.G
0.3
0.2
0.1
50 100 150 200 250 300
w


Utility
Figure 2.A
80
60
40
20
50
100
150
200
w


Veblen Good
Figure 2.B
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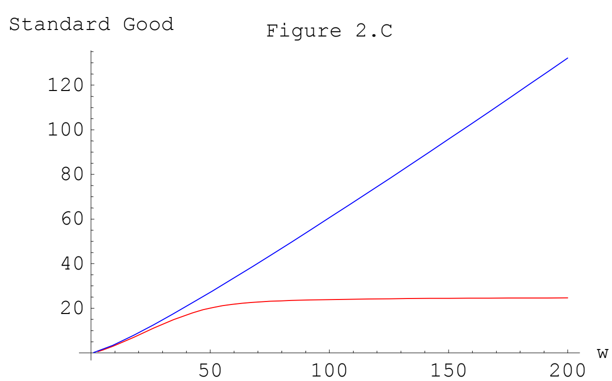
Standard Good
Figure 2.C
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200
w

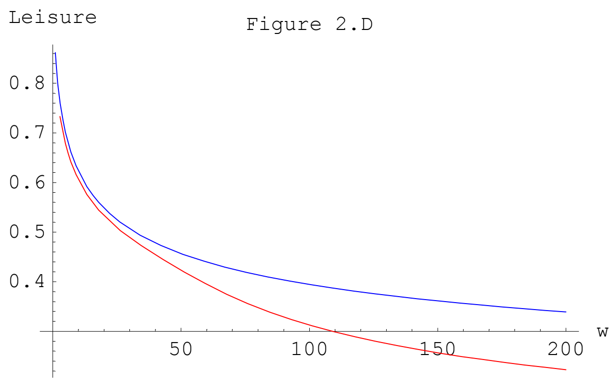


Figure 2.D

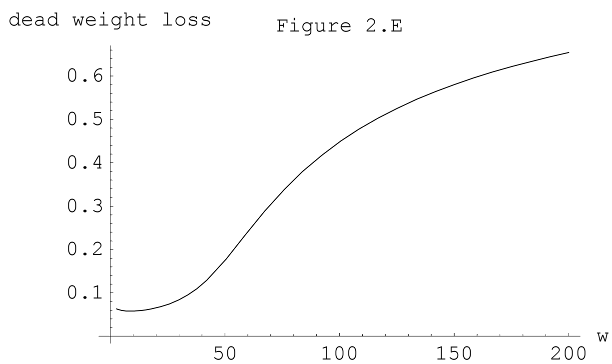


Figure 2.E

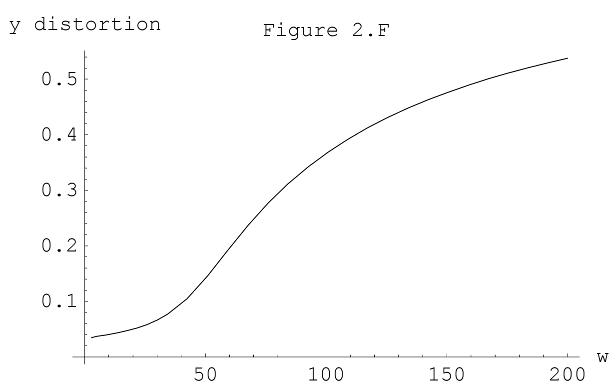
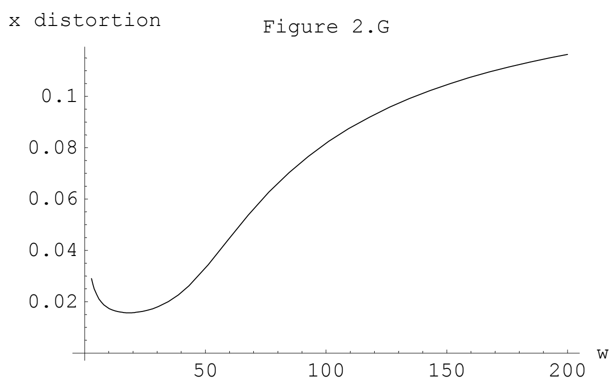


Figure 2.F


x distortion
Figure 2.G
0.1
0.08
0.06
0.04
0.02
50
100
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