Conspicuous Consumption, Conspicuous Health, and Optimal Taxation*

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Abstract

We present a simple model of status-seeking over multiple socioeconomic domains by introducing the concept of *conspicuous health* as an argument in the utility function, in addition to the well-established conspicuous consumption term. We explore the implications of such a utility function for optimal income taxation, where we show an increase in concerns for conspicuous health to have an opposite effect on the marginal tax rate, compared to an increase in concerns for conspicuous consumption. Using life satisfaction panel data from Australia, along with an improved measure of exogenous reference groups (that accounts for the 'time era' of respondents), we find evidence of a comparison health effect.

Keywords: Simultaneous status races, Conspicuous health, Optimal taxation, Exogenous reference groups, Panel data.

JEL: D03, H21, H51, I10, I18.

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1 Introduction

Often when individuals are asked about their general health level at any given point in time, the typical response is something along the lines: *'It could be better'*, or, *'It could be worse'*. Although such a response may be regarded as everyday convention, it nevertheless implies some notion of a health comparison to a reference level (for example, to oneself at an earlier point in time, or to other individuals familiar to the respondent). Moreover, people have always been known to compare their physical state or appearance such as beauty, height and weight to others they might know, hear about, or view on television, for example.[1] Thereby, individuals are bound to experience a positive shock (presumably of relief or, in some cases, pride and self-esteem) from knowing that they are better looking, taller, fitter or healthier than relevant others in society.

Within the economics literature, the role of relative concerns, or interdependent preferences, in explaining individual choice behaviour has been studied quite extensively in recent times (see Clark *et al.* 2008). The main focus has been on status effects arising from relative consumption (or income), usually defined as the ratio of own consumption to reference group or comparison consumption. The large number of studies using relative consumption as an argument in the utility function has lead researchers to view consumption as the premier signal of social status that individuals demand. As a result, little is currently known about the empirical importance and public policy implications of other social comparisons, i.e. the pursuit of status in other or multiple socioeconomic domains (see Veblen 1899; Layard 1980).[2]

In this paper we present a simple theoretical model of status-seeking over multiple socioeconomic domains by introducing the concept of *conspicuous health* as an argument in the utility function, in addition to the well-

[1]See Eckel and Petrie (2011) and Hamermesh (2011) for an overview of the importance of physical appearance on socioeconomic outcomes within society.

[2]A notable exception has been the leisure domain, first highlighted by Veblen (1899), and empirically examined by a number of recent studies, including Pingle and Mitchell (2002), Alpizar *et al.* (2005), Solnick and Hemenway (2005), Carlsson *et al.* (2007), and Frijters and Leigh (2009). Most of the studies find relative leisure to be of importance for individual well-being and choice behaviour, however less positional than income or consumption. Moreover, Layard (1980) makes note of other non-material domains where relative concerns are also of importance such as effort, education, and sporting ability, i.e. the presence of simultaneous status races.

established conspicuous consumption term. We hypothesise utility to be increasing in own health and decreasing in comparison health. Individuals are assumed to experience a negative utility shock as others in their social reference group become healthier; for instance, as relevant others increase health inputs such as physical exercise, or reduce their alcohol and cigarette consumption. Thus, individuals envy the health of others, or feel a sense of personal relief as the health level of others deteriorates. Analogous to the literature on relative income or conspicuous consumption, this implies that an individual's relative health confers *social status*, where the 'status return' from increased health may come from both a direct warm-glow of perceiving oneself to be more successful in a domain (a *direct* status effect), as well as from *indirect* increases in other final goods that come with higher status. These indirect advantages include superior mating partners, a better occupation or job title, enhanced social networks and social respect.[3]

We explore the implications of a utility function that includes a role for relative health concerns in terms of equilibrium labour choices and optimal income taxation, where we find an increase in concerns for conspicuous health to reduce the rationale for higher marginal taxation.[4]

The present paper is motivated by and adds to two main streams of literature; namely, the recent literature on status effects in health, and the rather scarce literature on multiple or simultaneous status races. Our focus on status-seeking in personal health is partly motivated by a few recent studies that relate individual utility to relative physical appearance and fitness. For example, using a similar framework to Oswald and Powdthavee (2007), Blanchflower *et al.* (2009) consider utility to be relative in people's body weight, or obesity, as measured by the body mass index (BMI). The authors find some empirical support for a relative obesity effect in Germany.[5] Clark and Etilé (2011) test for social interactions in BMI between spouses, and find

[3]For more detailed discussions about the economic and social value of status, and its importance for market behaviour; see, for example, Ball and Eckel (1998), Becker and Murphy (2000), Ball *et al.* (2001), and Johansson-Stenman and Martinsson (2006).

[4]Several theoretical studies have explored the optimal tax implications of conspicuous consumption; see e.g., Boskin and Sheshinski (1978), Layard (1980), Oswald (1983), Frank (1985), Ireland (1998), Ljungqvist and Uhlig (2000), Hopkins and Kornienko (2004), Abel (2005), Wedner and Goulder (2008), and Aronsson and Johansson-Stenman (2008).

[5]However, the reported results and derived conclusions in Blanchflower *et al.* (2009) are somewhat inconsistent. In their Table 3 (on page 535), the authors report a clear *negative effect* of 'relative BMI' on individual life satisfaction (from fixed-effect estimation), however conclude that 'relative BMI' enters positively (the *a priori* direction).

the effect of own BMI on individual well-being to depend on partner BMI, suggesting the presence of social contagion effects in physical weight.

In another study, Carrell *et al.* (2011) use a novel data set consisting of interactions between randomly assigned college students from the US Air Force Academy to study the effect of peer fitness on (own) individual fitness. The authors find that subjects do attempt to mimic the fitness levels of their peers, with the probability of failing a basic fitness test increasing by threefold when around fifty per cent of one's friends become out-of-shape. While the study does not directly model a utility function with a relative fitness term, it does appeal to such a motivation by arguing that an individual's desire to become fit depends on the fitness of their peer. The motivation is subtly different from ours in that the authors implicitly presume the strength of concern for fitness itself to increase if one's peers become fitter, which is more of an endogenous identity effect rather than a relativity effect.

At the same time, only a handful of studies have explicitly considered utility functions with multiple status effects. For example, Frijters and Leigh (2009) study a society where social competition over visible consumption and leisure is present. The importance of conspicuous leisure is assumed to decrease in the resident turnover rate of a given neighbourhood, thus leading the 'stayers' to substitute toward signalling their relative consumption. Aronsson and Johansson-Stenman (2012) provide a theoretical study on optimal income taxation when the importance of relative consumption depends on leisure, where the authors interpret Veblen's (1899) arguments on leisure to imply that conspicuous consumption becomes more visible and thus more salient for relative utility when leisure increases. The authors base their analysis on the Stern (1982) and Stiglitz (1982) 'two-type' optimal income taxation model, where informational asymmetries exist between the social planner and private sector households. Broadly similar to our findings, Aronsson and Johansson-Stenman find an increase in concerns for relative consumption to have a positive effect on marginal income tax rates, and better positionality in the relative leisure domain to entail the opposite effect (for particular individual-ability types). The main difference within our framework is that we allow for two *relative goods* (consumption and health) rather than one good to be endogenous.

The rest of the paper is organised as follows: Section 2 presents the theoretical model, where we study optimal tax policy responses when agents engage in multiple status-races in society. Section 3 provides a short empirical application, where we estimate the importance of relative concerns about private health and consumption using household survey data from Australia. Section 4 concludes.

2 Model

We consider a society with n individuals, two private goods, and a pure public good. The representative individual has preferences over private consumption k, private health h, and a public good G; which includes public health goods. In addition, individuals care about their *social status* across multiple domains, comparing themselves to an exogenous level of consumption and health denoted by $\widetilde{k}$ and $\widetilde{h}$, respectively. Utility is assumed to take the quasi-linear form

$$u = a \ln k + b \ln \left(k/\widetilde{k}\right) + c \ln h + d \ln \left(h/\widetilde{h}\right) + e \ln(1 - l_w - l_h) + G \qquad (1)$$

where $k/\widetilde{k}$ and $h/\widetilde{h}$ denote the relative (conspicuous) levels of consumption and health, respectively. The utility weights a and c measure the direct effects from private consumption and private health. On the other hand, b and d signify the status effects from consumption and health, where the 'status return' from increased health may come in the form of superior mating partners, a better occupation or job title, enhanced social networks and social respect. The relative magnitudes of b and d can alternatively be viewed as representing the relative intensity of each status race; where, for example, $b/d = 1$ implies equal intensity.

Private consumption is defined as $k = \omega(1-\tau)l_w$, where $l_w \in [0, 1]$ denotes labour work hours; ω is the wage rate of labour (assumed to be homogenous across individuals); and τ is the marginal tax rate on income. An individual's private health level is given by $h = h_0 + \psi l_h$, where h_0 denotes the initial (genetic) health endowment; $l_h \in [0, 1]$ is the amount of hours spent on health enhancing activities such as physical exercise; and ψ captures the return to private health from each hour allocated to such activity. Finally, the leisure term $1 - l_w - l_h$ decreases in the number of work and health production hours.

Individuals maximise utility function (1) by choosing l_w and l_h, resulting in the following first-order conditions

$$\frac{a+b}{l_w} = \frac{e}{1 - l_w - l_h} \qquad (2)$$

$$\frac{(c+d)\psi}{h_0+\psi l_h} = \frac{e}{1-l_w-l_h} \tag{3}$$

Solving equations (2) and (3) simultaneously for an interior solution, we arrive at the chosen number of work and health production hours

$$l_w^* = \frac{(a+b)(\psi+h_0)}{(a+b+c+d+e)\psi} \tag{4}$$

$$l_h^* = \frac{(c+d)\psi-(a+b+e)h_0}{(a+b+c+d+e)\psi} \tag{5}$$

From the above, we can infer that an interior solution requires $(c+d)\psi > (a+b+e)h_0$; for otherwise the exogenous health level is so high that individuals no longer have an incentive to invest positive time amounts into their health.

2.0.1 Comparative Statics

From the point of view of the individual, the most interesting aspects of this solution are the comparative statics. We present some of these below:

$$\frac{dl_w^*}{db} = \frac{(c+d+e)(\psi+h_0)}{\psi(a+b+c+d+e)^2} > 0 \tag{6}$$

$$\frac{dl_w^*}{dd} = \frac{-(a+b)(\psi+h_0)}{\psi(a+b+c+d+e)^2} < 0 \tag{7}$$

$$\frac{dl_h^*}{dd} = \frac{(a+b+e)(\psi+h_0)}{\psi(a+b+c+d+e)^2} > 0 \tag{8}$$

$$\frac{dl_h^*}{db} = \frac{-(c+d)(\psi+h_0)}{\psi(a+b+c+d+e)^2} < 0 \tag{9}$$

The result in (6) gives the prediction that hours spent on labour production will increase as the importance of conspicuous consumption increases; that is, as the status race in consumption intensifies. On the other hand, as expected, work hours decrease in the concern for conspicuous health (equation 7). Result (8) leads to the prediction that time spent on health improving activities, such as going to the gym, increases as the importance of conspicuous health rises. And, finally, result (9) states that as the status race in consumption intensifies, people spend less time maintaining and showing off their health.

2.1 Optimal Taxation and Multiple Status Effects

Suppose the social planner's objective is to maximise the following utilitarian social welfare function

$$W(u_1, ..., u_n) = \sum_{i=1}^{n} u_i \equiv nu \tag{10}$$

where u_i denotes the utility of individual household $i \in \{1, .., n\}$. The last part of the expression results from the initial assumption of preference and wage homogeneity among individuals. The social planner knows that each member of society faces the same utility function, and hence that it is impossible for the representative individual to improve her relative position in a status race. That is, the representative individual enjoys average consumption, $k = \widetilde{k} = \overline{k}$, and average health, $h = \widetilde{h} = \overline{h}$, (and *status*) in equilibrium. Since both $k/\widetilde{k}$ and $h/\widetilde{h}$ are equal to 1, the social planner maximises a reduced version of utility function (1),

$$u = a \ln k + c \ln h + e \ln(1 - l_w - l_h) + G \tag{11}$$

where the relative consumption and relative health terms disappear due to the logarithm of 1 being zero. The planner maximises (11) subject to the balanced budget constraint

$$\tau \omega l_w = G \tag{12}$$

as well as the private sector solutions, (4) and (5), for the amount of work and health enhancing hours. The solution for the optimal tax rate, τ^*, is then obtained by substituting the above constraints into (11), and solving the first-order condition for

$$\tau^* = \frac{a(\omega h_0 - a\psi) + b(h_0 + \psi)\omega - a\psi(a + b + c + d + e - \omega)}{(a + b)(h_0 + \psi)\omega} \tag{13}$$

2.1.1 Comparative Statics

The main question for the social planner is: *What happens to τ^* as concerns for relative consumption and relative health (parameters b and d) increase in society?* The answer is given by the comparative statics:

$$\frac{d\tau^*}{db} = \frac{a\psi(c + d + e)}{(a + b)^2(\psi + h_0)\omega} > 0 \tag{14}$$

$$\frac{d\tau^*}{dd} = \frac{-a\psi}{(a + b)(\psi + h_0)\omega} < 0 \tag{15}$$

where a higher marginal tax rate on labour income prevails as the status race in consumption intensifies (equation 14), a finding that is consistent with existing theoretical literature on optimal nonlinear taxation.[6] The intuition is that a greater degree of concern for relative consumption (higher b) increases the amount of effort individuals allocate to earning more income, which in turn increases the benefits of higher taxation for the provision of the public good, G. The greater amount of own consumption relative to leisure increases the negative externality on others (as their social rank declines), giving the social planner an added incentive to promote leisure by increasing income taxation (see e.g., Frank 1985).

On the other hand, the novel result in (15) suggests that increased competition and envy in the health domain leads to a lower optimal marginal tax rate in society. This is due to individual households substituting work hours (l_w) for health production hours (l_h) which reduces the marginal benefits of taxation to the social planner. Since we can interpret G to include public health expenditures, the result also states that increased concerns for conspicuous health reduce the importance of public health goods.

The model thus predicts that positional concerns need not necessarily lead to higher optimal taxes. It does not even have to be true that an overall increase in relative concerns ($b+d$) increases taxation: in the knife-edge case, when $(a+b) = (c+d+e)$, the two marginal tax rates are equal in magnitude and an equal increase in parameters b and d would cancel out, maintaining the equality above.[7]

3 Empirical Application

In this section we estimate the intensity of each status race, that is, the importance of relative concerns about private consumption and health in society. The data we use come from the first nine waves of the Household, Income and Labour Dynamics in Australia (HILDA) survey. HILDA is a household-based panel study which started in 2001, with the latest data

[6] See studies cited in footnote 4.

[7] A possible further extension to the simple model above is to specify labour income (hence consumption) as an increasing function of personal health $k(h)$ where $k_h > 0$. Hence, as individuals become healthier they are able to work harder and also become more productive. While such an addition may capture some observable facts from the labour market, it leads to indeterminacy in the comparative statics.

release at this time being in 2011. Interviews have been conducted annually with members of each household who are at least fifteen years of age.[8] There are $101,050$ person-year observations corresponding to $19,270$ individuals.

3.1 Data and Specification

The outcome variable used to proxy individual utility is *self-reported life satisfaction*. Life satisfaction is measured annually using responses to the following question: *"All things considered, how satisfied are you with your life?"* Respondents are informed to: *"Pick a number between* 0 *and* 10 *to indicate how satisfied you are. The more satisfied you are, the higher number you should pick. The less satisfied you are, the lower the number."* The responses to this question follow a negatively skewed distribution, with a mode and median equal to 8. More than 85 per cent of the surveyed individuals report a life satisfaction value of 7 or above. We estimate the following (baseline) life satisfaction equation:

$$ls_{it} = \alpha \ln h_{it} + \beta \ln \widetilde{h}_{it} + \gamma \ln y_{it} + \delta \ln \widetilde{y}_{it} + \eta \mathbf{z}_{it} + \nu_i + \mu_{it} \tag{16}$$

where ls_{it} is the life satisfaction of person i in period t; h_{it} denotes absolute health; $\widetilde{h}_{it}$ is the reference or peer level of health; y_{it} is absolute disposable income from all sources, a proxy for private consumption; $\widetilde{y}_{it}$ is reference income; and $\mathbf{z}_{it}$ is a vector of other socioeconomic and demographic explanatory variables such as age, gender, years of education, marital status, and government non-income social support expenditures; ν_i denotes an individual unobserved effect that is constant over time, such as cognitive ability and motivation; and μ_{it} is an *iid* random error term.[9] We hypothesise life satisfaction (and utility) to be increasing in own income and own health ($\alpha > 0$, $\gamma > 0$), and decreasing in comparison income and comparison health ($\beta < 0$, $\delta < 0$). Thereby, individuals are expected to experience a negative shock to happiness as others from their social reference group become healthier or wealthier, or both.

[8] For a detailed description of the HILDA survey, see Watson and Wooden (2002).

[9] We consider both cardinal and ordinal views of individual utility, and hence make the following assumptions: (i) individuals are willing and able to answer life satisfaction questions; (ii) reported life satisfaction, or happiness, is related to the concept of utility; and (iii) responses are cardinally comparable, that is, the satisfaction difference between a 4 and a 6 is the same as the difference between an 8 and a 10, and so on. For a review of different methodologies in analysing happiness data, see Ferrer-i-Carbonell and Frijters (2004).

The variable used to define individual health is based on answers to the following question: *"In general, would you say your health is: poor, fair, good, very good, or excellent,"* with the possible responses coded as 1 (poor) to 5 (excellent). The mean response to this self-assessed health question is 3.4, with more than 80 per cent choosing 3 or above.

3.1.1 Measuring Peer Health

We derive the *reference* or *peer health* variable using the cell mean approach, where social reference groups comprise individuals of similar demographic and socioeconomic characteristics such as age, gender, education, and geographical region.[10] After respondents are grouped into 'cells', the mean value of the socioeconomic variable of interest is computed as the reference or comparison point (see e.g., Clark and Oswald 1996; McBride 2001; Ferrer-i-Carbonell 2005; Luttmer 2005; Vendrik and Woltjer 2007).

We extend the existing cell-mean methodology by taking the 'time era' of responses into account, as otherwise respondents are taken to compare themselves to others of similar attributes from much earlier and later survey waves (that could be several years or even decades apart). When one does not take time era into account, such as in the studies of McBride (2001) and Vendrik and Woltjer (2007), one groups respondents who are of similar recorded age, but who have lived in totally different time periods and whom are quite unlikely to consider each other as peers.

We thus compute the cell mean of *self-assessed general health* for a set of reference groups, where each group contains individuals of similar age, gender, education level, geographical region, and time era. We divide age into six groups: (i) 25 or younger, (ii) between 26 and 35, (iii) between 36 and 45, (iv) between 46 and 55, (v) between 56 and 65, and (vi) older than 65. Similarly, education is categorised according to the number of years at school: less than 10, 10, 11, 12, and more than 12. The regions correspond to the 8 states/territories in Australia: New South Wales, Victoria, Queensland, South Australia, Western Australia, Tasmania, Northern Territory, and Australian Capital Territory. Additionally, to capture the time dimension of peer groups, we sort respondents by survey wave (9 waves in total). This process results in 4320 different and exogenous reference groups. We calculate the

[10]The *comparison* or *peer income* variable is constructed using the same cell mean approach.

average self-assessed health level for each group and match the corresponding value to each member. It should be also noted that an individual's own health level is excluded when computing his or her cell mean.

Prior to estimating the above life satisfaction regressions, it is important to understand that any identified relations between individual and peer group outcomes cannot be interpreted as strictly causal. The main reason is that people residing in the same region are exposed to identical economic and environmental constraints, such as prices for goods and services, and distance to fast-food outlets, recreation parks and fitness centres, for example. Such common unobserved contextual factors make it difficult to separately estimate peer effects from the common circumstances and changes affecting both individuals and their peers. Another related problem is that we are making a particular assumption as to whom the peers are (those in the same cell), and that deviations from these exogenously defined peer groups would invite measurement error in the peer variables.

3.2 Results

Table 1 presents the estimation results. For completeness, we treat life satisfaction both as a cardinal (columns 2 to 6) and ordinal (columns 7 to 9) measure. The coefficient on *ln(own health)* is significant and positive, confirming that individuals feel happier as their health levels improve. At the same time, the coefficient estimate on *ln(reference health)* is highly significant and negative, suggesting that people are less satisfied with their lives as their peers become healthier, i.e. the presence of a comparison health effect. This finding is consistent across all three methodologies and empirical models. The absolute magnitudes of the two coefficients are not very similar, rejecting the hypothesis that utility is totally relative in health.[11] Thus, a

[11]The log-linear specification in (16) is equivalent to

$$\begin{aligned} ls_{it} &= \alpha \ln h_{it} + \beta \ln \left(h_{it}/\widetilde{h}_{it} \right) + \gamma \ln y_{it} + \delta \ln \left(y_{it}/\widetilde{y}_{it} \right) + \eta \mathbf{z}_{it} + \nu_i + \mu_{it} \\ &\equiv \alpha \ln h_{it} + \beta \left(\ln h_{it} - \ln \widetilde{h}_{it} \right) + \gamma \ln y_{it} + \delta \left(\ln y_{it} - \ln \widetilde{y}_{it} \right) + \eta \mathbf{z}_{it} + \nu_i + \mu_{it} \\ &\equiv (\alpha + \beta) \ln h_{it} - \beta \ln \widetilde{h}_{it} + (\gamma + \delta) \ln y_{it} - \delta \ln \widetilde{y}_{it} + \eta \mathbf{z}_{it} + \nu_i + \mu_{it} \end{aligned}$$

As the estimated coefficient on *own health* corresponds to $\widehat{\alpha} + \widehat{\beta}$, and that on *comparison health* to $\widehat{\beta}$, the finding that the coefficients are statistically equal and opposite is then consistent with a fully relative utility function. That is, the benefit from an additional unit of absolute health is effectively zero, $\alpha = 0$. A similar result holds for the income higher level of absolute health in society does raise the average happiness of individuals. Moreover, own health (on average) plays a greater role in people's lives compared to peer health, with the magnitude of the estimated coefficient on the former being roughly about twice as large in most of the estimated models.

In terms of the importance of income (or 'broad' consumption) for life satisfaction, we find a significant and positive effect of absolute income on people's happiness, and a significant and negative effect of peer income. These results are consistent with the empirical literature on 'reference effects' (see Van de Stadt *et al.* 1985; Ferrer-i-Carbonell 2005; Luttmer 2005; Vendrik and Woltjer 2007; Knight and Gunatilaka 2011; Akay *et al.* 2012; Corazzini *et al.* 2012).

There is also robust evidence of gender differences in relative concerns, with women being more sensitive to the health levels of their peers than men, and males being primarily more interested in competing over monetary income, or material goods, with others from their reference group. This is especially true in the fixed effects equations (for both the cardinal and ordinal treatments). The latter gender-specific result is consistent with Darwinian views on natural fitness and reproduction (see Frank 2011). On the other hand, finding the intensity of the status race in health to be higher among women (than men) supports the recent literature on comparison BMI effects, where, for example, Clark and Etilé (2011) find females to experience a relatively greater decrease in well-being as they become fatter than their partner.

Overall, there is sufficient evidence that people compete with others in the personal health domain, even more so than over monetary income (the magnitude of relative health coefficient is consistently greater than that of relative income, across all empirical models).

A potential issue that could bias our findings is the presence of multicollinearity. This is due to some of the explanatory variables, namely age and education, being also used to construct the social comparison variables. To test for this problem, we estimated the equations from Table 1 without either age or education, or both. Omitting any of the two variables does not cause major changes to the coefficient magnitudes and their significance in any of the models (as above, own health and own income effects are positive and significant, and reference health and reference income effects are negative

variable.

and significant).[12] We can interpret these robustness findings as a sign that the health of the peer group differs sufficiently from a linear combination of own variables (age, health, income, gender, time) to separately identify the relative health effects.

3.2.1 Reference Group Variations

Finally, the definition of the peer group that we employ (and in our view, the 'true' definition) implies an average group size of 4.5 individuals. It could however be argued that actual reference groups should consist of a greater number of peers. To this end, we perform two additional estimation/robustness exercises, redefining the peer group each time.

In the first augmentation, we allow individuals to compare with both sexes (males and females), hence removing groupings by gender. This is also the baseline definition of reference groups used by Ferrer-i-Carbonell (2005). The resulting estimates are shown in Table 2 of Appendix A.

As expected, there is a general increase in the magnitude of the estimated coefficients on *ln(reference health)* across all three estimation methods, with no changes in the direction of comparison (envy over peer income and health still prevails). Based on the t-statistic $\frac{\beta_1-\beta_2}{\sqrt{\sigma_1^2+\sigma_2^2}}$, this difference is however not statistically significant.

In the second peer group variation, we remove the 'time era' component of social comparisons (leading to an average group size of 40.15 individuals). That is, individuals are now assumed to compare with relevant others from each survey wave as the time difference between waves is fully discounted from the analysis. Such an exercise tests the plausibility of our key methodological argument from Section 3.1.1 above; that the peer group variable should be constructed to include the 'time era' of social comparisons. If this is not the case, then individuals are unrealistically taken to compare themselves with others who have responded even decades apart. The corresponding coefficient estimates are presented in Table 3 of Appendix A.

The general findings support our proposed definition with the effect of the *ln(reference income)* variable becoming statistically insignificant and positive across all of the main specifications. Thus, the inclusion of a time era constraint in the definition of reference groups leads to more plausible behavioural parameters.

[12]These results are available upon request from the authors.

4 Conclusion

This paper studied a simple model of status-seeking over multiple socioeconomic domains, namely conspicuous consumption and *conspicuous health*, and the apparent implications for public policy. We showed that an increase in concerns for conspicuous consumption has the well-established positive effect on the optimal income tax rate, where individuals are made to internalise the negative externality placed on others from increased own consumption (due to the reduced social status experienced by others). Such comparative statics reduce the social cost of redistribution as income taxes internalise the externalities arising from conspicuous consumption.

On the other hand, we showed that increased social competition in the personal health domain (that is, a higher concern for relative health) has an offsetting role by leading to a decrease in optimal taxation: a greater concern for conspicuous health leads to an overconsumption of health that reduces the available time for other activities. In the model presented, this health overconsumption is implicitly taxed by reducing taxation on labour time. An equivalent interpretation is that an increase in conspicuous health reduces the need for public goods (such as public health) and as such conveys a positive externality on the public purse.

We then introduced an empirical definition of exogenous reference groups that controls for the time period of respondents within the survey panel, and tested for the presence of comparison consumption and health effects using life satisfaction data from Australia. There is evidence that individuals envy both the income and health level of their peers. Absolute health was found to matter more than peer health, however the latter factor is of notable importance for individual happiness. Moreover, women seem to care more about relative health than men, whilst men were found to care more about relative income (or consumption).

The finding that individuals engage in simultaneous status races in health and income gives a more complex picture of optimal health policy: as conspicuous displays of health become a prevalent means of obtaining status in society, the argument for taxing conspicuous consumption via income tax reduces as well as the need for public health provision because individuals themselves invest more in health. On the other hand, conspicuous health is itself a source of inequality, which leads to the question of whether it can be redistributed.

Table 1: Life Satisfaction Equatons: Hilda Survey 2001−2009

	Pooled OLS			Fixed Effects			FE Ordered Logit		
	All	Male	Female	All	Male	Female	All	Male	Female
ln(Own Health)	1.569	1.567	1.567	0.902	0.874	0.925	1.510	1.493	1.524
	(55.89)	(37.51)	(41.42)	(31.74)	(20.57)	(24.18)	(35.60)	(24.10)	(26.22)
ln(Reference Health)	−0.639	−0.922	−0.595	−0.524	−0.373	−0.697	−1.046	−0.762	−1.344
	(3.84)	(3.85)	(2.44)	(3.27)	(1.77)	(2.88)	(3.45)	(1.85)	(3.01)
ln(Own Income)	0.063	0.063	0.062	0.028	0.025	0.029	0.051	0.047	0.054
	(10.00)	(6.44)	(7.50)	(5.39)	(3.26)	(4.26)	(5.93)	(3.55)	(4.76)
ln(Reference Income)	−0.191	−0.133	−0.247	−0.095	−0.124	−0.075	−0.210	−0.277	−0.165
	(7.13)	(3.36)	(6.77)	(1.90)	(1.75)	(1.07)	(2.21)	(1.98)	(1.27)
Number of Observations	101,050	47,459	53,591	101,050	47,459	53,591	221,870	100,449	121,421
R^2	0.16	0.16	0.16	0.09	0.10	0.08	0.03	0.03	0.03
Number of Individuals				19,270	9,267	10,003			

Note: Robust (absolute) *t-statistics* are in parentheses. Life Satisfaction (dependent variable) is measured on a scale from 0 to 10, with a mean and standard deviation of 7.49 and 1.49, respectively. Reference Health and Reference Income are defined as cell means given by *age*, *gender*, *education*, *geographical region*, and *time era* (see Section 3.1.1). Other explanatory variables include age and age^2, ln(years of education), ln(number of children), government (non-income) support expenditures, an unemployment dummy, a couple (married) dummy, a single parent dummy, a dummy for couples with children under the age of 15, and a dummy for couples with independent children. Constant terms are included in models. The main pooled OLS equation also includes a male dummy. FE Ordered Logit estimates are based on the BUC estimator developed by Baetschmann *et al.* (2011).

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Appendix A

A1. Reference group not defined by '*gender*'

Table 2: Life Satisfaction Equatons: Hilda Survey 2001−2009

	Pooled OLS			Fixed Effects			FE Ordered Logit		
	All	Male	Female	All	Male	Female	All	Male	Female
ln(Own Health)	1.569	1.567	1.567	0.901	0.874	0.925	1.510	1.492	1.524
	(55.94)	(37.52)	(41.43)	(31.73)	(20.57)	(24.17)	(35.56)	(24.07)	(26.19)
ln(Reference Health)	−1.049	−1.243	−0.802	−0.776	−0.797	−0.735	−1.509	−1.611	−1.372
	(4.99)	(4.05)	(2.81)	(3.67)	(2.92)	(2.38)	(3.68)	(3.03)	(2.36)
ln(Own Income)	0.063	0.063	0.062	0.028	0.025	0.029	0.051	0.047	0.054
	(9.99)	(6.46)	(7.50)	(5.39)	(3.26)	(4.26)	(5.93)	(3.55)	(4.76)
ln(Reference Income)	−0.186	−0.140	−0.224	−0.075	−0.066	−0.089	−0.179	−0.161	−0.202
	(6.73)	(3.50)	(5.90)	(1.36)	(0.87)	(1.13)	(1.68)	(1.08)	(1.36)
Number of Observations	101,053	47,462	53,591	101,053	47,462	53,591	221,876	100,455	121,421
R^2	0.16	0.16	0.16	0.08	0.08	0.09	0.03	0.03	0.03
Number of Individuals				19,270	9,267	10,003			

Note: Robust (absolute) *t-statistics* are in parentheses. Life Satisfaction (dependent variable) is measured on a scale from 0 to 10, with a mean and standard deviation of 7.49 and 1.49, respectively. Reference Health and Reference Income are defined as cell means given by *age*, *education*, *geographical region*, and *time era*. Other explanatory variables include age and age^2, ln(years of education), ln(number of children), government (non-income) support expenditures, an unemployment dummy, a couple (married) dummy, a single parent dummy, a dummy for couples with children under the age of 15, and a dummy for couples with independent children. Constant terms are included in models. The main pooled OLS equation also includes a male dummy. FE Ordered Logit estimates are based on the BUC estimator developed by Baetschmann *et al.* (2011).

A2. Reference group not defined by '*time era*'

Table 3: Life Satisfaction Equatons: Hilda Survey 2001−2009

	Pooled OLS			Fixed Effects			FE Ordered Logit		
	All	Male	Female	All	Male	Female	All	Male	Female
ln(Own Health)	1.573	1.570	1.570	0.900	0.872	0.923	1.510	1.488	1.520
	(56.01)	(37.63)	(41.44)	(31.69)	(20.54)	(24.15)	(35.52)	(24.03)	(26.18)
ln(Reference Health)	−1.226	−1.743	−1.283	−0.911	−1.306	−0.550	−1.852	−2.751	−1.117
	(5.45)	(4.83)	(3.94)	(3.25)	(3.51)	(1.33)	(3.45)	(3.77)	(1.48)
ln(Own Income)	0.057	0.057	0.054	0.028	0.025	0.029	0.050	0.046	0.053
	(9.26)	(6.10)	(6.79)	(5.32)	(3.21)	(4.21)	(5.84)	(3.48)	(4.69)
ln(Reference Income)	0.022	0.119	−0.064	0.048	0.077	0.018	0.090	0.153	0.027
	(0.55)	(1.86)	(1.15)	(0.95)	(1.11)	(0.24)	(0.94)	(1.12)	(0.21)
Number of Observations	101,057	47,462	53,595	101,057	47,462	53,595	221,900	100,455	121,445
R^2	0.16	0.16	0.16	0.05	0.05	0.05	0.03	0.03	0.03
Number of Individuals				19,270	9,267	10,003			

Note: Robust (absolute) *t-statistics* are in parentheses. Life Satisfaction (dependent variable) is measured on a scale from 0 to 10, with a mean and standard deviation of 7.49 and 1.49, respectively. Reference Health and Reference Income are defined as cell means given by *age*, *gender*, *education*, and *geographical region*. Other explanatory variables include age and age^2, ln(years of education), ln(number of children), government (non-income) support expenditures, an unemployment dummy, a couple (married) dummy, a single parent dummy, a dummy for couples with children under the age of 15, and a dummy for couples with independent children. Constant terms are included in models. The main pooled OLS equation also includes a male dummy. FE Ordered Logit estimates are based on the BUC estimator developed by Baetschmann *et al.* (2011).