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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 non-linear taxation, where an increase in concerns for conspicuous health has 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 empirical evidence of a comparison health effect.

Keywords: Simultaneous status races, Conspicuous health, Optimal taxation, Subjective well-being, 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, peer health is seen by agents as the baseline level of health that is expected of them in society (a health norm).[3] Individuals then envy and strive towards the health of their peers upon realising that their own health levels can be improved (an upward revision in societal norms), or otherwise feel a sense of personal relief as the health of the reference group deteriorates (due to reduced social standards and expectations). Analogous to the literature on relative income or conspicuous consumption (Easterlin 1995; McBride 2001), 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.[4]

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.[5]

The present paper is motivated by and adds to two main streams of literature; namely, the recent literature on status effects and social norms in health, and the rather scarce literature on multiple or simultaneous status races. Our focus on conspicuous health is partly motivated by a few recent

[3]Based on concepts from psychology and sociology, we refer to a 'norm' as the comparison point or social standard towards which an individual aspires and is expected to achieve. This is the same definition used and implied by other earlier studies on comparison effects. See, for example, Easterlin (1995), McBride (2001), Clark (2003), Eggers et al. (2006), and Graham and Felton (2007).

[4]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).

[5]Several theoretical studies have explored the optimal tax implications of conspicuous consumption; 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).

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. Clark and Etilé (2011) test for social interactions in BMI between spouses, and find the effect of own BMI on individual well-being to depend on partner BMI, suggesting the presence of social contagion effects in physical weight. Similarly, using survey panel data from the United States and Russia, Graham and Felton (2007) find individuals who depart from the BMI of their local peers to experience significant losses in reported well-being.

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 his or her peers. 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.

In addition to deriving the theoretical implications of conspicuous health, we are also interested in the empirical relationship between individual well-being and peer health. While some of the above studies uncover the presence of a status or envy channel in personal health, there also exists recent evidence of empathy in health comparisons (a positive relation between own well-being and better peer health). As an example, using survey data from Latin America, Graham et al. (2011) find the direction of estimated comparison effects in the health domain to oppose the commonly found negative well-being impacts from peer income. Similar results suggesting more altruistic preferences with respect to peer health in social networks are also presented by De Wan and Christakis (2009).

A key argument in support of these findings is that important aspects of people's health states (such as pain, anxiety, and mobility problems) are unlikely to be a strong source of self-esteem and social status for those individuals without such health issues.[6] While it is also accepted that changes in some health conditions are much less conspicuous and harder to observe (than, say, the consumption of material goods such as automobiles); this does not however rule out selected aspects of personal health from being perceived as 'status worthy', especially given the fact that healthier individuals are found to be more successful in labour and marriage markets (Becker et al. 1977; Smith 1999; Wu 2003; Garcia-Gómez 2011). Since we are not quite sure about the exact elements of the latter set of positional health characteristics, and at the same time cannot draw out such information from widely used measures of personal health, we can simply perform an empirical exercise to find out the direction and sign attached to some notion of social health norms and standards. This allows us to shed light on which of the two alternative psychological channels (envy or empathy) is more dominant in health comparisons.

We proxy for relative health norms (peer health) using a calculated aver-

[6]See Graham et al. (2011) and Lora (2012) for recent evidence about the effects of different individual health conditions on self-reported measures of happiness and health satisfaction.

age of self-assessed health ratings for persons near the survey respondent in a number of demographic and socioeconomic variables, as well as the person's time of response (as measured by survey wave). We term the latter reference group or cohort constraint as the 'time era of respondents' and examine the impact it has on comparison effect estimates.

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. As mentioned in the introduction, we can also interpret the status races in consumption and health as the result of private utility depending on individual expectations which are determined by social comparisons.[7]

[7]For instance, we can rewrite the utility function in equation (1) as $u = a \ln k + b \ln [k/E(k)] + c \ln h + d \ln [h/E(h)] + e \ln(1 - l_w - l_h) + G$, where $E(.)$ denotes the individual's

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

$$\frac{a+b}{l_w} = \frac{e}{1-l_w-l_h} \tag{2}$$

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

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:

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

expectation of a variable; capturing an internal comparison norm. If we then additionally assume expectations to be determined by the average in a group (or the whole population); we have $E(k) = \widetilde{k}$ and $E(h) = \widetilde{h}$, which leads to the main model presented above.

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

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

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

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

$$\tau^* = \frac{ah_0\omega + b(h_0+\psi)\omega - a\psi(a+b+c+d+e-\omega)}{(a+b)(h_0+\psi)\omega} \tag{13}$$

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.[8] 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

[8]See studies cited in footnote 5.

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.

It should be noted that the presented model is very stylised and involves a particularly convenient functional form of individual utility in order to reach unequivocal solutions. That is, labour supply and health related time are inelastic (both do not depend on the wage). Furthermore, the income tax rate has no effect on either optimal time variable. This is a consequence of using a log-utility function, and excluding any source of non-labor income in the budget constraint. It is thus useful to briefly consider how deviations from some of these assumptions are likely to affect the derived results.

One possible extension is to consider individual agents to have non-labour income which is not as visible and hence taxable as formal labour income. This would imply private consumption to be $k = \omega(1-\tau)l_w + Y$, where Y is non-labour income that is taken to be heterogeneous over individuals. This changes the potential trade-offs which agents face since work hours are then no longer independent of marginal tax rates: individuals with higher levels of non-labour income will be more responsive to marginal taxation than other individuals with lower non-labour incomes.[9]

The net impact is to lower the optimal marginal tax rate since there now exists a work disincentive effect of marginal taxation (which is absent from the original model). The comparative statics on the optimal marginal tax rate then become further complicated by the fact that the status races in consumption ($k/\widetilde{k}$) and health ($h/\widetilde{h}$) no longer drop out from the social planner's problem since the average of the sum of individual utilities will not equal the utility of the average or representative individual, and hence will change with marginal taxation. The latter fiscal instrument will then have an additional redistributive effect via the status channel, however in

[9]See Appendix A for a more formal discussion. The comparative statics for this model are available upon request from the authors.

the opposite direction of the usual argument: for agents with very low levels of non-labour income there would be very low responsiveness to marginal taxation but a strong effect on relative status. This increases the overall importance to the social planner of the private consumption term ($\ln k$), and lowers the degree to which the status race produces negative external effects (essentially, because those agents with very high non-labour incomes have 'won' the wealth and health status race by means of their endowment, reducing the role of marginal taxation down to pure redistribution).

A further extension to the model is to consider the possibility of taxing personal health investments (i.e., health-enhancing activities). Intuitively, this nullifies the main distinction between health and income, whereby income is a proxy for the consumption of all other goods. The optimal taxation arguments in the given model depend on the reasonableness of the assumption that health investments are more difficult to observe and thus harder to tax than labour income (or other more visible forms of consumption). Hence, when health investments become just as taxable as other consumption goods, this distinction falls away and we expect the normal arguments on status or positional goods to apply: that is, every status-oriented activity should be taxed by the social planner in order to promote the consumption of activities and goods that do not involve status competitions, such as leisure (Frank 1985).[10]

3 Empirical Application

In this section we estimate the importance of relative concerns about personal consumption and health in a 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 nationally representative household survey that started in 2001. Face-to-face interviews and self-completion questionnaires have been conducted annually with members of each household who are at least fifteen years of age. The former technique is mainly used to gather demographic and socioeconomic information, while the latter is used to capture the health

[10] Another 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.

levels and lifestyle choices of respondents (see Watson and Wooden 2002). After excluding respondents with missing information on the key outcome and explanatory variables, our main sample consists of 97,225 person-year observations corresponding to 18,882 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% of the surveyed individuals report a life satisfaction score of 7 or above.

We estimate the following life satisfaction equation:

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

where ls_{it} is the life satisfaction of person i at time period t; h_{it} denotes own health; $\widetilde{h}_{it}$ is the peer or reference level of health; y_{it} is own disposable income from all sources (a proxy for private consumption); $\widetilde{y}_{it}$ is peer income; and $\mathbf{z}_{it}$ is a vector of other socioeconomic and demographic explanatory variables such as age, gender, years of education, employment status, marital status, family composition, and government non-income social support expenditures. The term ν_i captures time-invariant unobserved characteristics or individual fixed effects, and μ_{it} is a random error.[11]

We hypothesise life satisfaction (and experienced utility) to be increasing in own income and own health ($\alpha > 0$, $\gamma > 0$), and decreasing in peer income (a status or envy effect: $\delta < 0$). The empirical slope attached to the peer health variable is of most interest to us: where a negative coefficient ($\beta <$

[11] 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), and Van Praag and Ferrer-i-Carbonell (2004).

0) would imply individuals to experience a negative shock to own happiness as others in their reference group become healthier (an 'envy' or 'expectations adjustment' effect), while a positive coefficient ($\beta > 0$) would suggest individuals to feel happier as relevant others become healthier (an 'empathy' effect).

The comparison effects in health may differ from those in the income domain due to personal health levels having multiple dimensions or aspects which induce separate status and empathy channels. For instance, physical fitness and slimness are likely to be considered by most people as status signals, given the many positive social and economic outcomes that these health attributes bring about. People would then elicit a strong tendency to compete and overtake others in the physical fitness and slimness domains; leaving the less fit and more obese individuals feeling envious. On the other hand, some physical and mental health aspects (such as bodily pain and anxiety) are likely to be considered more negative (less competitive) and hence lead to feelings of empathy from individuals observing their peers in such ill-health states.[12]

Moreover, a negative estimate of β could come about via two closely related and complementary explanations. First, better peer health may well induce social competition and feelings of envy within individuals, making them feel less satisfied with their own lives. Second, by observing healthier peers, individual agents are likely to realise that they have not yet met the health norms and expectations of their social group (Sen 2002); making them feel left out and less happy. Hence, the latter adjustment of expectations could arguably be seen as the psychological step or motive which leads to the status-oriented behaviour described above. Overall, a finding that life satisfaction is negatively affected by peer health would suggest the envy effect to dominate the empathy effect (and vice versa).

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 (SAH) question is 3.4, with more than 80% of respondents choosing 3 or above.

An issue with the above SAH measure also relates to the concept of

[12]It could nevertheless be argued that altruism is more likely to be directed towards closer family members, as opposed to the more distant individuals in society such as the broad respondent or exogenous reference groups typically analysed in nationally representative household surveys. See, for example, Powdthavee (2009).

norms and expectations, whereby respondents are inclined to rank their current health status based on their social context and experience. That is, an individual's perception of their own health state may be seriously limited by the quality of his or her environment. As discussed by Sen (2002), Salomon et al. (2004) and Lora (2012), a person living in an area surrounded by sick people is bound to report a different health score relative to someone with the same objective health but who has adapted to a much healthier community. That is, the former individual would be much more resilient to the negative emotional effects of ill-health. Such a link between the health of others and perceptions of own health make it difficult to declare self-assessed health as being exogenous. At the same time, while individual fixed effects capture and eliminate some unobserved psychological traits of respondents, there still remain other personal attributes, such as optimism levels, which arguably change over time and in turn influence individual life satisfaction ratings.[13]

Using this same SAH measure, Powdthavee (2009) examines the importance of health norm effects within British households. He shows that the estimated negative correlation between SAH and individuals' own health problems declines with the average number of health problems per (other) family member. However, the magnitude of this reference effect is relatively small, implying SAH scores to unlikely suffer from large health-norm effects.[14]

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 ge-

[13]The validity of self-assessed health measures has further been questioned by Deaton (2008) and others. Despite the shortcomings, such SAH ratings are an increasingly common measure of personal health in empirical research (Deaton and Paxson 1998; Smith 1999; Frijters et al. 2005; Graham et al. 2011). This is supported by studies that show SAH to be correlated with actual health (Cutler and Richardson 1997; Kaplan and Baron-Epel 2003), as well as being a strong predictor of subsequent use of medical services (van Doorslaer et al. 2004).

[14]See Clark (2003) and Eggers et al. (2006) for empirical evidence on social norm effects in the context of unemployment. The authors find the negative impact of unemployment on average happiness levels to be less severe the higher the unemployment rate in the local region (or household).

ographical region.[15] After survey respondents are grouped into 'cells', the mean value of the socioeconomic variable of interest is computed as the reference or comparison point (see Clark and Oswald 1996; McBride 2001; Ferrer-i-Carbonell 2005; Luttmer 2005; Vendrik and Woltjer 2007; Graham et al. 2011).

We additionally take 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 study by McBride (2001), one simply 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). In order to avoid peer groups of small size, we omit all cells which comprise less than 10 individuals. This results in 746 different and exogenous reference groups; with an average group size of 135 individuals, and an overall range between 10 and 423 peers. The constructed reference groups are thus of similar size and range to those found in existing happiness studies also using large household surveys (e.g., Ferrer-i-Carbonell 2005; Vendrik and Woltjer 2007; Blanchflower et al. 2009; Graham et al. 2011). We calculate the 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

[15]The peer income variable is constructed using the same cell mean approach.

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 (Manski 1993). 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, with corresponding p-values shown in the parentheses. 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 statistically significant and positive, confirming that individuals feel happier as their health levels improve. At the same time, the coefficient estimate on *ln(Peer 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.[16] Thus, a 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

[16]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 derivation holds for the income variable.

being roughly about twice as large in most of the estimated models (except for the fixed effects ordered logit).

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). However, after accounting for individual fixed effects, the peer income variable becomes statistically significant only at the 10% level (for the full sample and male subgroup).

There is also some evidence of gender differences in relative concerns across the different life domains, 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 from Table 1 (for both the cardinal and ordinal treatments). The latter gender-specific result is consistent with Darwinian views on natural fitness and reproduction (Frank 2011). On the other hand, finding the intensity of comparisons 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.

To directly compare the relative importance of the peer health and peer income variables for mean life satisfaction scores (i.e., the estimates of β and δ), we deviate from the theoretical log specifications above and estimate the same set of regression equations using standardized self-assessed health and income variables (with means of 0 and standard deviations of 1). The newly estimated coefficients can be referred to as standardized or beta coefficients. In Table A1, the peer health variable attracts a much higher and statistically significant utility weight than peer income. This is mainly evident in the fixed effects models for all three sample groups (columns 4 to 9); where the null hypothesis of equality between the two coefficients is rejected at the 1% level in almost all cases. Overall, there is sufficient evidence that people compete with others in the personal health domain, even more so than over monetary income.

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 and significant).[17] 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.[18]

3.2.1 Reference Group Variation

Finally, to examine the importance of the 'time era' constraint on the exogenously defined reference groups, we perform an additional estimation and robustness exercise by simply removing peer groupings based on survey wave. That is, individuals are now assumed to compare with relevant others from all of the nine survey waves 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 many years apart. Removing this restriction leads to only 95 distinct social references groups, with an average number of 1,063 peers within each group (and an overall range of 10 to $3,131$ individuals). One could also further argue that such large peer

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

[18] To test the relevance and validity of health comparisons on optimal income taxation, we use the above parameter estimates to perform a simple calculation of the optimal tax rate τ^* (expressed by equation 13); with and without the effect of relative health. By looking at the utility parameters in equation 1 and using the empirical identities derived in footnote 16, along with the estimated coefficients from the first column of Table 1; we have the following parameter inputs for the optimal taxation formula: $a = 0.063$, $b = 0.190$, $c = 1.571$ and $d = 0.726$, where d corresponds to the utility weight on relative health. We set the other parameter values in equation 13 as follows: $e = 0.5$, $h_0 = 1$, $\omega = 0.5$, and $\psi = 1$. In the absence of any status races in health ($d = 0$), the optimal marginal tax rate equals $\tau^* = 0.42$. On the other hand, with the presence of conspicuous health ($d = 0.726$); the optimal marginal tax rate on labour income is reduced to $\tau^* = 0.24$. The direction of this approximated change is hence consistent with the theoretical predictions and comparative statics derived in Section 2.1.1.

groups fail to exist in actual societies (see Hill and Dunbar 2003).

The corresponding coefficient estimates are presented in Table A2. The general findings support our proposed peer group definition with the effect of the *ln(Peer Income)* variable becoming statistically insignificant and positive across all of the main specifications. Thus, the inclusion of a time constraint in the definition of reference groups leads to more plausible behavioural parameters.

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 overall results do not rule out the

actual presence of an empathy channel in health comparisons (as found in other studies), but do imply the envy channel to be more dominant for the studied sample.

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 Equations: Hilda Survey 2001−2009

	Pooled OLS			Fixed Effects			FE Ordered Logit		
	All	Male	Female	All	Male	Female	All	Male	Female
ln(Own Health)	1.571	1.569	1.570	0.902	0.875	0.924	1.509	1.492	1.524
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln(Peer Health)	−0.726	−1.005	−0.692	−0.625	−0.459	−0.826	−1.263	−0.939	−1.634
	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)	(0.00)	(0.00)	(0.03)	(0.00)
ln(Own Income)	0.063	0.062	0.061	0.028	0.025	0.030	0.051	0.046	0.054
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln(Peer Income)	−0.190	−0.136	−0.242	−0.082	−0.120	−0.054	−0.180	−0.264	−0.121
	(0.00)	(0.00)	(0.00)	(0.08)	(0.07)	(0.41)	(0.06)	(0.07)	(0.36)
Number of Observations	100,403	47,133	53,270	100,403	47,133	53,270	220,137	99,680	120,457
R^2	0.16	0.16	0.16	0.08	0.10	0.07	0.03	0.03	0.03
Number of Individuals				19,229	9,243	9,986			

Notes: Robust p-values 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. Peer Health and Peer 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), where the overall fit is measured using a pseudo-R^2.

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Appendix A

A1. Estimation results with standardized health and income variables

Table A1: Life Satisfaction Equations: Hilda Survey 2001−2009

	Pooled OLS			Fixed Effects			FE Ordered Logit		
	All	Male	Female	All	Male	Female	All	Male	Female
Own Health	0.523	0.519	0.525	0.288	0.275	0.298	0.546	0.532	0.556
	(0.00)	(0.00)	(0.00)	(0.00)	(20.63)	(0.00)	(0.00)	(0.00)	(0.00)
Peer Health	−0.069	−0.087	−0.078	−0.072	−0.056	−0.088	−0.147	−0.116	−0.178
	(0.00)	(0.00)	(0.00)	(0.00)	(2.90)	(0.00)	(0.00)	(0.00)	(0.00)
Own Income	0.100	0.109	0.091	0.049	0.052	0.046	0.110	0.119	0.100
	(0.00)	(0.00)	(0.00)	(0.00)	(5.14)	(0.00)	(0.00)	(0.00)	(0.00)
Peer Income	−0.070	−0.055	−0.079	0.005	0.004	0.002	0.005	0.004	−0.003
	(0.00)	(0.00)	(0.00)	(0.71)	(0.20)	(0.92)	(0.87)	(0.92)	(0.95)
Number of Observations	100,403	47,133	53,270	100,403	47,133	53,270	220,137	99,680	120,457
R^2	0.16	0.16	0.16	0.03	0.04	0.03	0.03	0.03	0.04
Number of Individuals				19,229	9,243	9,986			

Notes: Robust p-values 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. Peer Health and Peer Income are defined as cell means given by *age*, *gender*, *education*, *geographical region*, and *time era* (see Section 3.1.1). These variables are also standardized with a mean of 0 and standard deviation of 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), where the overall fit is measured using a pseudo-R^2.

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

Table A2: Life Satisfaction Equations: Hilda Survey 2001−2009

	Pooled OLS			Fixed Effects			FE Ordered Logit		
	All	Male	Female	All	Male	Female	All	Male	Female
ln(Own Health)	1.574	1.570	1.572	0.901	0.874	0.923	1.507	1.491	1.520
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln(Peer Health)	−1.280	−1.781	−1.355	−1.014	−1.331	−0.721	−2.095	−2.800	−1.500
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.04)	(0.00)	(0.00)	(0.03)
ln(Own Income)	0.057	0.057	0.054	0.027	0.025	0.029	0.050	0.046	0.053
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ln(Peer Income)	0.027	0.117	−0.054	0.061	0.077	0.038	0.120	0.153	0.075
	(0.50)	(0.07)	(0.33)	(0.18)	(0.22)	(0.55)	(0.21)	(0.27)	(0.57)
Number of Observations	100,963	47,421	53,542	100,963	47,421	53,542	221,562	100,368	121,194
R^2	0.16	0.16	0.16	0.05	0.05	0.05	0.03	0.03	0.03
Number of Individuals				19,267	9,265	10,002			

Notes: Robust p-values 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. Peer Health and Peer 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), where the overall fit is measured using a pseudo-R^2.

A3. Augmented model with non-labour income

Consider the addition of non-labour income to the main theoretical model from Section 2. Intuitively, this would introduce individuals with high endowments in wealth who would be expected to spend that endowment on personal health investments and hence reduce their work hours. Under a homogenous distribution of non-labour income, the same previously derived comparative statics should nevertheless hold, both for individual choice behaviour and optimal income taxation (however, with a more complicated formula for τ^*). On the other hand, assuming that $k = \omega(1-\tau)l_w + Y$, where $Y \geq 0$ differs over individual agents (i.e., non-labour income is not fixed but presumed low enough such that every individual supplies a positive number of labour hours), we have the utility function

$$u = a\ln k + b\ln\left(k/\widetilde{k}\right) + c\ln h + d\ln\left(h/\widetilde{h}\right) + e\ln(1-l_w-l_h) + G \quad (17)$$

with the following first-order conditions

$$\frac{a+b}{l_w + \frac{Y}{\omega(1-\tau)}} = \frac{e}{1-l_w-l_h} \quad (18)$$

$$\frac{(c+d)}{\frac{h_0}{\psi}+l_h} = \frac{e}{1-l_w-l_h} \quad (19)$$

Solving equations (18) and (19) simultaneously, we again arrive at the chosen number of work and health production hours

$$l_w^* = \frac{(a+b)(1+\frac{h_0}{\psi}) - \frac{Y(e+c+d)}{\omega(1-\tau)}}{(a+b+c+d+e)} \quad (20)$$

$$l_h^* = \frac{(c+d)(1+\frac{Y}{\omega(1-\tau)}) - (a+b+e)\frac{h_0}{\psi}}{(a+b+c+d+e)} \quad (21)$$

In this case, the optimal time variables depend on the labour wage and tax rate. Given these equations, all of the previously derived comparative statics (in Section 2.0.1) still go through qualitatively in terms of their sign.

The social planner's objective function is the average utility (of the representative agent). However, the problem here is that the relative income $(k/\widetilde{k})$ and health $(h/\widetilde{h})$ terms do not disappear since the inclusion of the distribution of non-labour income (Y) involves an added mechanism absent

from the original model. Agents with low levels of non-labour income will then be affected relatively strongly in terms of their social status by taxes on labour time; leading to a direct benefit of increased overall status from lower taxation. The latter effect increases with b and hence goes against the previous comparative statics on the optimal marginal tax rate. The strength of this effect will depend on the distribution of non-labour income, however the more unequal the distribution of Y is; the more important the above consideration becomes.

Overall, the status race in the consumption domain does not fall out from the social planner's equation in the augmented model, and a heterogeneous distribution of non-labour income introduces a whole layer of additional complexity to the optimal taxation problem. Similarly, the inclusion of Y in total wealth means that changes in taxation now do impact the optimal labour and health related time variables, with higher income taxation reducing labour supply and increasing health production. It is thus not as clear whether the same comparative statics from the simpler model also hold true in the extended model.