Soc Choice Welfare (2003) 20: 307–350

Social Choice and Welfare

From preference to happiness: Towards a more complete welfare economics

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Received: 22 January 2001/Accepted: 3 April 2002

Abstract. Welfare economics is incomplete as it analyzes preference without going on to analyze welfare (or happiness) which is the ultimate objective. Preference and welfare may differ due to imperfect knowledge, imperfect rationality, and/or a concern for the welfare of others (non-affective altruism). Imperfection in knowledge and rationality has a biological basis and the resulting accumulation instinct amplifies with advertising-fostered consumerism to result in a systematic materialistic bias, as supported by recent evidence on happiness and quality of life. Such a bias, in combination with relative-income effects, environmental disruption effects, and over-estimation of the excess burden of taxation, results in the over-spending on private consumption and under-provision of public goods, and may make economic growth welfare-reducing. A cost-benefit analysis aiming even just at preference maximization should offset the excess burden of financing for public projects by the indirect effect through the relative-income effect and by the environmental disruption effect. A cost-benefit analysis aiming at welfare maximization should, in addition, adjust the marginal consumption benefits of public projects upward by a proportion determined by the proportionate excess of marginal utility over marginal welfare of consumption. The environmental disruption effects have also to be similarly adjusted upward. However, the productive contributions of public projects should not be so adjusted.

This paper is revised from the keynote paper of the same title at the Conference on 'Economics and the Pursuit of Happiness', Nuffield College, Oxford 2000, and combined with the paper 'Towards a welfarist cost-benefit analysis' presented at American Economic Association Meeting, New Orleans, 2001. The paper was revised during my visit to the Division of Applied Economics, Nanyang University, Singapore. I am also grateful to Maurice Salles and two anonymous referees of this journal for helpful comments.

Welfare economics has achieved much, though still with long-standing weaknesses (e.g., the inability to make non-Pareto comparisons due to the unwillingness or difficulties in making interpersonal comparisons of cardinal utilities). It is not the intention of this paper either to survey the achievements or to remedy the weaknesses. Rather, it is argued that welfare economics is too narrow in focus and should be expanded in a number of aspects to make the analysis more complete and hence more useful. Some of the aspects discussed below have long been known but largely ignored in welfare economic analysis. Some are less well known and controversial points which are nevertheless important for welfare.

1 Preference economics or welfare economics?

The main reason welfare economics is incomplete is that it really stops at the stage of individual preference and does not go on to analyze individual welfare or happiness.

Economics started with the analysis of the more objective variables like production, consumption, and distribution of income and products between individuals. The analysis of such purely objective variables cannot go very far or very deep, since we are mainly interested in these variables only in relation to our valuation of them. Thus, the introduction of utility analysis marked a great leap forward in the history of economic thought. The concept of utility is however rather ambiguous and could mean either one or a mixture of preference, satisfaction, and welfare. Modern economists attempt to be more precise by using utility as a representation of preference. Moreover, related to the indifference map analysis, preference is confined to ordinal preference only, banishing cardinal utility as something old fashioned, useless, or even meaningless. It is true that, for the analysis of consumer choice or demand functions, cardinal utility is redundant and hence should be abstracted away on the ground of Occam's razor. However, to deny the use of cardinal utility in other areas like social choice, optimum population, valuation of life, and uncertainty is to commit the fallacy of misplaced abstraction. It is like insisting that a person must shave off his moustache, as it is not needed for eating, even though he wants to keep it to increase his sex appeal. (See Ng 1997 on a case for cardinal utility and interpersonal comparability.)

Even without purging cardinal utility, welfare economics is incomplete in its depth of analysis as it stops only at the level of preference and does not go deeper to analyse welfare, the ultimate level. We want to consume products that satisfy our preferences. So going from the analysis of products to the analysis of preferences is going a layer deeper. However, the satisfaction of our preferences is not yet the ultimate level. What we want ultimately is happiness or welfare (which are used interchangedly), not just preference or even preference satisfaction, as argued below. Some economists may regard happiness as the pursuit of psychologists and sociologists and that economists should be confined to preferences only. At the wake of the utility revolution in econom-

ics, many economists probably also thought that economists should be confined to the more objective variables of production and consumption. Such self-imposed restrictions would stifle much interesting analysis of important issues.

I regard my (net) happiness (over any period of time) as the excess of my positive affective feelings over my negative affective feelings (over that period of time). For most of the time (including dreamless sleep and when I am feeling neutral), my affective feeling is zero. When I am enjoying myself (either bodily like eating delicious food or mentally/spiritually like being proud of my achievements), my affective feeling is positive. When I am suffering from pain, sickness, worries, etc., my affective feeling is negative. Apart from being positive or negative, there are also different degrees or intensities of affective feelings. If we put this intensity on the vertical axis (with the zero point representing the point of neutrality) and time on the horizontal axis, my affective feelings may be represented by a curve. (The relevant diagram is simple enough to be drawn by the reader in her mind. The temporal integration idea was formulated at least by the time of Edgeworth 1881 and have strong support; see Kahneman et al. 1997; Kahneman 1999, p. 5.) My (net) happiness over any period of time is the excess of the areas above the line of neutrality minus the areas below that line. Affective feelings are those feelings that the individual cares for either positively or negatively for their own sake. An individual may be able to distinguish yellow from green, but if she neither likes nor hates either of these colours, her feelings of these colours are not affective.

What about different qualities of different affective feelings? Obviously, the feelings of beautiful sights are qualitatively different from the feelings of delicious food. (The problem of qualia in philosophy.) However, for the same intensity, I do not care whether I am enjoying beautiful sights or delicious food, if they do not affect others and my enjoyment in the future. Thus, apart from their intensities, different pleasures may have different degrees of desirability only from their effects on others and on the future happiness and can thus be analysed accordingly. Thus, we do not need to distinguish between different qualities of affective feelings for our purpose here. (Cf., Kahneman 1999, pp. 9–10 on the possibility to measure different kinds of affective feelings on a common scale and Rozin 1999 for the argument that, though basic sensory pleasures and aesthetic pleasures are qualitatively different, they both feed into the same subjective and expressive system.)

When I prefer an apple to a pear (of the same cost, for simplicity of comparison), it is because I believe either that the apple tastes better (gives me more enjoyment) than the pear and/or that the apple gives me more nutrients (an apple a day keeps the doctor away) and hence makes me able to enjoy life better in the future. Thus, ultimately, it is the amount of happiness that counts. Happiness is more ultimate than preference. Moreover, happiness is the truly ultimate consideration. I want money to buy products. I want products to consume them. I want to consume products to satisfy my preference. I want to satisfy my preference in order to maximize my happiness (but subject to ignorance, irrationality, and a consideration for the happiness of others). But I want happiness for its own sake, full stop. It is true that being happy

may also make one healthier and more successful in social life or job. However, being healthier and more successful are ultimately valuable because they increase one's and possibly also others' happiness.

From casual observation, conversation, questionnaire surveys, psychological studies, and evolutionary biology, I know that my above views are not just special to myself but common to all of us, at least to a very large extent. Thus, we do not have to argue with philosophers for thousand of years but know within our mind that happiness is valuable in itself because we all enjoy the delicious taste of fresh and nutritious food when hungry and the very rewarding stimulation of sexual intercourse and hate the pain of injuries and sickness. If our grandparents do not have genes that give us such feelings but the reverse, they would not survive and would not be able to pass on their genes to us. We would not be born at all!

True, humans have gone past the more basic values of just sensuous pleasures and pains and also have higher spiritual and moral feelings like justice. However, I have argued elsewhere (Ng 1981, 1990, 1999, 2000a) that such moral and other principles should ultimately be based on the considerations of happiness. Ultimately speaking, injustice is the denial of due happiness. However, for the purpose of this paper, it is not necessary for readers to go along with my full welfarist view. Even within the confines where justice, freedom, etc. are not affected or held unchanged, there are sufficient scope for welfare economics to be extended to analyse the deeper level of happiness.

There are some economists who focus on things other than GNP and preferences. For example, Sen (1985) emphasizes the concepts of capabilities and functionings. To the extent that these may be used as better surrogates or at least as good supplementary indicators for estimating welfare in practice, these concepts are very useful. To the extent that they are used to replace welfare, they may be misguided, at least for those who believe that welfare is the ultimate objective. (This is not to deny that, at the non-ultimate level, considerations regarding non-welfare indicators may be important.) In any case, since there are other ways of estimating welfare, the usefulness of these non-welfare concepts does not preclude the need to be concerned with welfare directly.

Without going into the deeper level of happiness, the analysis of preferences (including intensities of preferences) alone may be adequate if the preference of an individual is always identical with her happiness. She prefers x to y if and only if she is happier at x than at y; she prefers x to y more strongly than she prefers u to v if and only if her happiness at x is higher than her happiness at y by an amount larger than the similar excess of her happiness at u over v, and so on. Then, information on the cardinal utility function (representing her preferences and intensities of preferences) of the individual is tantamount to information about her welfare or happiness function. Analysis of preferences would be sufficient. (However, even then, we still have to go beyond the ordinal preference framework and provide analysis of preference intensities and find ways to make interpersonal comparisons of utility.) However, individual preferences differ from individual happiness, as argued in the next section.

2 Preferences versus welfare

I have discussed the divergences between individual preferences (represented by the utility function) and individual happiness (represented by the welfare function) in Ng (1999) in some details. Here, only a brief outline is given. Readers finding some of the points unclear or contentious should consult Ng (1999).

If the welfare levels of other individuals do not enter a person's utility function (except through her own welfare function discussed below), she is said to be self-concerning. A self-concerning individual maximizes her own welfare which may nevertheless be affected by the welfare levels of others (through affective altruism or malice). For a non-self-concerning person, the welfare levels of others may enter her utility function directly, apart from the effects through her own welfare function. This may be due to non-affective altruism or malice. Thus, for a non-self-concerning individual, even in the absence of ignorance (subsuming imperfect foresight) and irrationality, her preference (utility) may differ from her happiness (welfare); she may not maximize her welfare. However, it is not the purpose of this paper to focus on this divergence.[1] (In the presence of this divergence, I argue in Ng 1999 that social choice should depend on individual welfares rather than preferences.) Hence, for simplicity, let us ignore this by assuming that individuals are self-concerning. (There is no need to assume the absence of affective altruism or malice.) However, if desired, the discussion below may further be extended to consider this source of divergence between preference and welfare.

For obvious reasons, the preference of an individual may also differ from her welfare due to ignorance. If an individual prefers A to B while her own welfare is higher in B than in A, due neither to ignorance nor to a concern for the welfare of others, she is said to be irrational. This paper focuses on ignorance and irrational preferences. While few if any individuals are perfectly ignorant and irrational, some degrees of ignorance (or imperfect information) and imperfect rationality clearly apply to most individuals (see Cohen 1983; Evans and Over 1996; Kahneman and Tversky 1996; Stein 1996 for reviews of the relevant literature in philosophy and psychology), though some alleged irrationalities could be simply due to errors, computational limitations, and incorrect norm by the experimenters (Stanovich and West 2000).

The importance of welfare and the imperfect representation of welfare by preference and similar related problems, though largely ignored by most economists, have not completely escaped their attention. For example, Harsanyi (1997) was vocal in arguing for the replacement of actual preferences by informed preferences in normative issues. (I followed his argument to its logical conclusion to go for happiness instead of stopping at informed preferences; see Ng 1999.) Scitovsky (1976/1992) laments the joyless economy with

[1] Some subtle differences not important for our purpose here are also ignored, e.g., preference is more binary (comparing between two alternatives) while welfare is more confined to the given situation, as noted by Maurice Salles.

abundant wealth but not much happiness. Mishan (1969/1993, 1977), Hirsch (1976) and many others are emphatic on the many social costs of economic growth. There have also been various calls for improving the measure of aggregate economic activities by revising national income accounting to take into account such factors as leisure and pollution (Nordhaus and Tobin 1972; Brekke 1997). However, while realizing the need to go beyond goods and services, Mishan (1960) disagrees on the possibility of analysis, especially formal analysis. Gintis (1972) emphasises the endogeneity of preferences, but believes that 'the required extended welfare model is *unoperational*' (p. 595). I emphasise imperfect knowledge and imperfect rationality since the endogeneity of preferences does not create problems in the absence of these imperfections. However, our argument on the existence of these imperfections does make the endogeneity of preferences and hence Gintis' arguments important. The 'hedonistic paradox' may also suggest that a sensible analysis may be impossible. This conjecture says that a person who seeks pleasure or happiness for themselves will not find it, but a person who helps others will find happiness. (For evidence supportive of the conjecture, see Benson et al. 1980; Switzer et al. 1995; Konow and Earley 2002.) Despite these, the rest of this paper (especially Sects. 4 and 5) shows that some useful analysis is possible.

Economists typically ignore ignorance and assume perfect rationality in their analysis. Despite the importance of ignorance and imperfect rationality (discussed below), I believe that these simplifying assumptions are appropriate and even necessary in most cases to allow a sharper focus on the central relationships in question. Moreover, in many cases, the effects of ignorance and irrationality may go either way with largely offsetting or unknown net effects. Considering their effects will not add much. However, this may not be true for other cases. In particular, as discussed in the next section, individual preferences are very poor in representing individual welfare due to a number of demonstrable factors. Moreover, these factors tend to reinforce each other, resulting in a systematic bias in favour of materialism (in the sense of excessive consumerism, excessive accumulation of material wealth and the like; 'excessive' in the sense of placing more importance than can be justified by the real contribution to welfare, as represented by $\eta^{Uc} > \eta^{Wc}$ defined below). Even for those who are not convinced of this systematic bias despite the considerable supporting evidence discussed in the next section, this paper may still be of value, as Proposition 2a, the first statement in Proposition 3, Proposition 4b and 4c, Proposition 5 below are not dependent on the presence of divergences between preference and welfare.

3 Some background developments prompting a reconsideration

In the recent years and decades, there are developments in psychological and related studies that suggest that a reconsideration of the traditional economic analysis in general, and of welfare economics in particular, is needed. These developments include data on the failure of happiness and quality-of-life

indicators to correlate strongly with per capita income, the importance of relative standing, and evidence of significant ignorance and/or irrational (read 'imperfectly rational' if so preferred; similarly below) choices, as briefly reviewed below.

3.1 Socially, money buys neither happiness nor quality of life (at least, not much)

Studies by psychologists and sociologists show that, both within a country and across nations, the happiness level of people increases with the income level, but only slightly. For example, using regional and cultural classifications, the Northern European countries with high incomes score top on happiness, followed by the group of English-speaking US, UK, Australia, and Ireland. Central and South-American countries including Brazil come next, followed by the Middle East, the Central European, Southern and Eastern European (Greece, Russia, Turkey, and Yugoslavia), the Indian Sub-continent, and Africa which does not, however, come last. Southern and Western European (France, Italy, and Spain) score significantly lower than Africa. And the last group is East Asia, including the country that leads in income, Japan. Singapore has an income (per capita) level 82.4 times that of India. Even in terms of purchasing power parity instead of using exchange rate, Singapore is still 16.4 time higher than India in income. However, the happiness scores of both countries are exactly the same, both significantly higher than that of Japan. (See Cummins 1998. Cf., Diener and Suh 1999; Inglehart et al. 1998, Table V18.)

While there are notable cases like Japan and France that are far off the regression line, a statistically significant positive relationship between happiness and income exists cross-nationally *globally*. This is due mainly to the *inter-group* difference between the high-income and high-happiness advanced and free countries *and* the others. The analysis by Schyns (1998) shows that there is no positive relationship between income and happiness within either of these two groups. (Ruut Veenhoven assures me that a recent study controlling for more variables shows significant positive relationship for the poorer group of countries. This really strengthens the point here and is also intuitively more reasonable.)

When the above result was presented in a seminar, a colleague said, 'Cross-national relationship between income and happiness is affected by cultural differences. The relationship should be stronger within the same country.' In fact, the relationship between happiness and income level intertemporally within the same country (at least for the advanced countries which have such data) is even less encouraging in terms of giving a positive relationship. For example, from the 1940s to 1998, the real income per capita of the US trebled. However, the percentage of people who regard themselves as very happy fluctuated around 30%, without showing an upward trend; another measure of average happiness fluctuated around 72%. Since 1958, the real income level in Japan increased by more than 5 times. However, its average happiness

measure fluctuated around 59%, also without an upward trend. (See Diener and Suh 1997; Frank 1997; Myers 1996, p. 445; Oswald 1997; Veenhoven 1993. Blanchflower and Oswald 2000 show that the levels of happiness in the United States have declined slightly over the period from the early 1970's to the late 1990's while Hagerty and Veenhoven 1999 show a slight increase. 'Roughly unchanged' seems still to be the best bet.). Perhaps, dynamically, we need rising incomes just to sustain happiness at an unchanged level, the so-called 'hedonic treadmill'. However, there are also studies showing happiness to be *inversely* related to the pace of economic growth (Diener et al. 1993; Diener et al. 1995).

Many economists may doubt the reliability of happiness studies, which rely heavily on self assessments of happiness levels that are also difficult to compare interpersonally. For one thing, people now may require a larger amount of subjective happiness before describing themselves as 'very happy'. Thus, despite a possibly substantial increase in happiness, the percentage of people describing themselves as 'very happy' may not have increased. To overcome such difficulties, I have developed a method that yields happiness measures that are comparable interpersonally, intertemporally, and internationally (Ng 1996a). Stone et al. (1999) favour the use of momentary assessment and Larsen and Fredrickson (1999) favour the use of multiple measures. Even before the use of more reliable methods of happiness measurement, there are persuasive arguments that existing measures are rather reliable. For example, different measures of happiness correlate well with one another (Fordyce 1988), with recalls of positive versus negative life events (Seidlitz et al. 1997), with reports of spouses, friends and family members (Costa and McCrae 1988; Diener 1984; Sandvik et al. 1993), with physical measures like heart rate and blood pressure measures (Shedler et al. 1993), and with EEG measures of prefrontal brain activity (Sutton and Davidson 1997). Pavot (1991) finds that respondents reporting that they are very happy tend to smile more. Using the Marlowe-Crowne measure of social desirability, Konow and Earley (2002) find no evidence of bias in their reported happiness data. Moreover, correlationships of happiness show remarkably consistency across countries. All these do not rule out remaining problems (see, e.g., Schwarz and Stracek 1999; Bertrand and Mullainathan 2001). However, reported subjective well-being may still be used as good approximation (Frey and Stutzer 2002; Ch. 2). Furthermore, the picture is not much different even if we use more objective indicators of the quality of life. Analyzing a panel data set of 95 quality-of-life indicators (covering education, health, transport, inequality, pollution, democracy, political stability) covering 1960–1990, Easterly (1999) reaches some remarkable results.

While virtually all of these indicators show quality of life across nations to be positively associated with per capita income, when country effects are removed using either fixed effects or an estimator in first differences, the effects of economic growth on the quality of life are uneven and often nonexistent. It is found that '*quality of life is about equally likely to improve or worsen with rising income.... In the sample of 69 indicators available for the First Differ-*

ences indicator, 62% of the indicators had time shifts improve the indicator more than growth did' (Easterly 1999, p. 17–18). Even for the only 20 out of the 81 indicators with a significantly positive relationship with income under fixed effects, time improved 10 out of these 20 indicators more than income did.

The surprising results are not due to the worsening income distribution (there is some evidence that the share of the poor gets better with growth). Rather, the quality of life of any country depends less on its own economic growth or income level but more on the scientific, technological, and other breakthroughs at the world level. These depend more on public spending than private consumption. Many studies (e.g., Estes 1988; Slottje 1991; see Offer 2000 for a review) show that measures of social progress strongly correlates with income level at low incomes (to around US$3,000 at 1981 prices) but the correlation disappears after that. Others (e.g., Veenhoven 1991; Diener and Suh 1999) show a similar relationship between happiness and income.

Higher income and consumption may increase the preference for even higher levels but they may in fact decrease the happiness level if the consumption level remains unchanged. In other words, higher consumption makes us adapted to the higher level and makes us needing even higher consumption to remain at the same welfare level. As illustrated in Fig. 1, when one's customary consumption level is indicated by the point A, the (total) welfare curve is X. When one's customary level increases to B, the curve moves to Y. Thus, the welfare level does not increase to BB″ but only marginally to BB′. However, the marginal welfare of consumption (originally measured by the slope of the curve X at point A′) may increase (to the slope of the curve Y at B′). This makes the individual feel that having more money to spend becomes more important. However, the long-run welfare curve is the curve that passes through A′B′C′ which has a much lower marginal welfare of consumption.

If we take into account the costs of adjustment, the whole long-run welfare curve is also a function of one's accustomed level of consumption a higher level of which lowers the whole long-run welfare curve. To maximize happiness in the long run, one should start with not too high a consumption level so as to be able to gradually increase the level over time. In this perspective, children of the rich may really suffer a disadvantage. They start off being accustomed to very high levels of consumption which they may find difficult to surpass, hence suffering in happiness terms. Thus, wise rich people do not splash their children with money. But there are difficulties for the rich in limiting the consumption levels of their children, due to comparison with those of the parents and with peers. This may also partly explain why there is not much difference in happiness terms between the rich and the poor.

There is a consideration that qualifies the above principle of starting from a low consumption level. For certain items of consumption, especially those important for health, too low a level does not only fail to improve one's future ability to happiness, it actually lowers that ability. This is especially so in one's childhood and adolescent periods where sufficient (material and spiritual) nutrients are important for the healthy growth of the body, the development

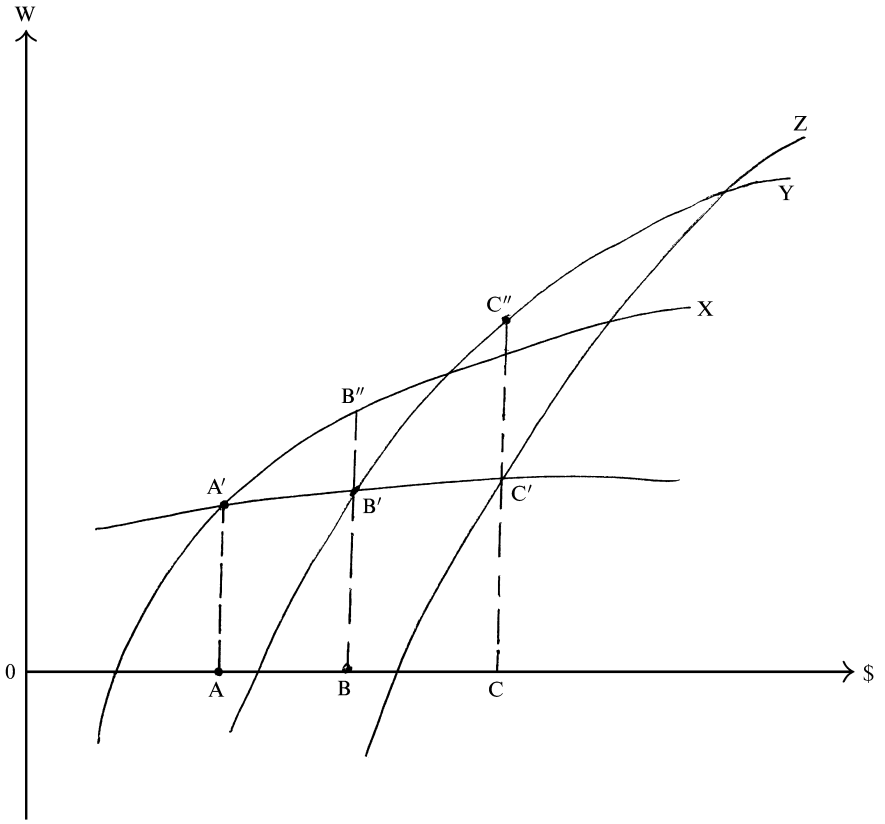

Fig. 1.

of healthy personality, and the build up of knowledge. If one is handicapped by serious deficiencies earlier in life, one may never catch up later. However, this consideration is more important than the adaptation effect only at very low consumption levels. It may be thought that an informed and rational individual would know and take account of the long-run effects and hence the problem does not arise. However, the evidence discussed in Subsect. 3.3 below suggests that most individuals are not perfectly rational and/or informed in this sense and that they are thus guided more by their short-run curves.

3.2 The importance of relative standing

The importance of relative standing such as relative-income or relative-consumption effects has long been recognized by economists. While most economists refer to Veblen (1899) and Duesenberry (1949), Rae (1834) discussed the problem of relative income extensively much earlier. However, recent studies reveal the magnitude, scope, and relative (to absolute income) importance of relative standing that are beyond the imagination of most peo-

ple, myself included. For example, Clark and Oswald (1996) find that, while income have little effect on job satisfaction, comparison income has a significant effect. For another example, one may expect that the importance of relative standing is least in the area of health care where the absolute effects may be expected to dominate. However, Wilkinson (1997) shows that even in health care, relative standing is more important than absolute standards. The relatively poor, even with higher absolute incomes and health care, ended up with much lower level of healthiness than the absolutely poor but relatively well-off. Mortality is more a function of relative than absolute income and health care. (On relative-income concerns between sisters, see Neumark and Postlewaite 1998. For psychological evidence, see Smith et al. 1989; Tversky and Griffin 1991. For direct neurological evidence of the relativity of preference, see Tremblay and Schultz 1999; Watanabe 1999. See also Kockesen et al. 2000 on the strategic advantage of relative vs. absolute fitness maximization.) Other unexpected results are also found, for example, using seven waves of British panel data, Clark (2000) shows that a measure of individual well-being (i) rises with own income, (ii) falls with others' average income, and (iii) is significantly correlated with variables reflecting the distribution of others' income. A wider distribution of others' income often *increases* individual well-being. This finding runs counter to both the perceived public dislikes of inequality, and with risk-aversion (if individuals have a certain probability of both dropping down and climbing up the income distribution in their reference group). Do the very poor produce external benefits (by making others feel relatively well-off and lucky) larger than the external costs produced by the very rich? Obviously, a lot more studies are needed. (Interestingly, even ignoring such problems as identification and implementation, we may not be able to use the Pigovian subsidy to generate more external benefits of the very poor. As they receive subsidies, they become less poor. This is related to the paradox of redistribution discussed in Ng 1979/1983, Appendix 8A.)

The importance of relative standing may have, at least partly, a biological explanation. After reviewing biological and non-biological evidence, Frank (1999, p. 145) concluded that 'concern about relative position is a deep-rooted and ineradicable element of human nature'. Individuals compete for survival and in reproductive fitness. For an individual (and natural selection works mainly at the level of the individual) and beyond the absolute minimum standards for survival, reproductive fitness is determined largely by relative standing, especially for the male members. In the animal kingdom and in our long history of evolution, it is/was the dominant male that has/had the almost exclusive access to a whole harem of females. The (mainly male) fetishism on sports competition may also partly be traced to this biological factor of the 'winner takes all' in male competition (Deker and Scotchmer 1999). The male dominance in spheres where aggressive competition to get to the top is important (e.g., chief executive officers in business) may also be partly explained by the same factor. Of course, the biological inclination may also be reinforced by nurture, especially in our society that values competition and materialistic achievements. (On the biological basis of behaviour, see Wilson 1975; Daw-

kins 1989; Robson 2001.) In fact, our nurture-influenced nature to do better than others is also a factor contributing to imperfect rationality discussed in the next subsection, though it may also foster advances in knowledge that may be externally beneficial.

The importance of relative-income effects has been used to explain the failure of economic growth to increase happiness at the social level on the one hand and the rat race for making more money at the individual level on the other (Easterlin 1974; Frank 1999; Ng and Wang 1993; Ng and Ng 2001). Higher incomes contribute more to the individual as both the absolute and relative levels are increased. At the social level, relative incomes cannot be increased on average. Where absolute consumption is no longer very important for welfare, economic growth may make the whole society worse off through the environmental disruption effects. We may then have to rely in the advance in knowledge to keep the happiness level from falling. In the next subsection, it is further argued that, even at the individual level, the rat race for making more money may also be irrational.

3.3 Individual irrational choices, including the rat race for making more money

At the individual level, higher incomes increase not only the absolute but also the relative (income and consumption) levels and hence are perceived to be very important. However, at least after a certain minimum level, higher incomes do not really make the individual significantly happier. Millionaires are only slightly happier than the average person (Diener et al. 1985). Moreover, the direction of causation need not just be from money to happiness. In fact, 'if there is any causal relationship in rich countries, it appears to run from happiness to growth, not vice-versa' (Kenny 1999, p. 19). Taken together, the evidence suggests that income matters more for happiness at very low levels of income but it still accounts for less than 2% of the overall variance in individual happiness (Diener et al. 1993). In fact, all objective factors combined seem to contribute little to happiness. Thus, Campbell et al. (1976) found that demographic factors (including income, age, gender, race, education, and marital status) explain less than 20% of the variance in happiness. Andrews and Withey (1976) find that these factors account for only 8% of the variance in happiness or well-being. If we take away marital status (which correlates significantly with happiness; on the correlates of happiness, see Argyle 1999 for a survey), other objective factors are very unimportant indeed. This is consistent with studies of identical twins (Lykken and Tellegen 1996; Stones et al. 1995) which show that objective factors inclusive of social and economic status, education, family income and marital status account for no more than 3% of the variance in happiness.

There is evidence that the more materialistically inclined are less happy. People whose goals are intrinsic, i.e., oriented towards self-acceptance, affiliation, and community feeling, are happier than those whose goals are extrinsic, i.e., oriented towards some external rewards such as financial success,

popularity, and attractiveness. (See Kasser and Ryan 1993, 1996, 1998; Richins et al. 1992; Ryan et al. 1999; Wright and Larsen 1993). 'Materialism, a preoccupation with economic well-being, is negatively correlated with SWB [subjective well-being], and especially so in those that believe that more money would make one happier' (Offer 2000, p. 20, reviewing Ahuvia and Friedman 1998, p. 154, 161). Yet, people continue to be or even become more materialistically inclined.

If money is not very important for happiness but many people still sacrifice their health, leisure, and jeopardize their relationships with friends and family, and even violate moral principles and the law (thus threatening their own freedom and even lives) to make more money, are they not irrational? Why sacrifice things more important for happiness in order to make more money which is not very important for happiness? I believe that this is at least partly explained by the irrational materialistic bias influenced by both nature and nurture. Apart from the competition for relative standing discussed earlier, there is the accumulation instinct. Even without studying any biology, most people are aware of the instinctive storage of food by animals like mice, squirrels, ants, and bees. Many animals also have the instinctive behaviour regarding territorial guarding and resource grabbing. Obviously, the storage of food may enhance (survival and reproductive) fitness as it reduces the probability of death from starvation. While *Homo sapiens* is probably the most 'rational' species, it is still not perfectly 'rational'. (The inverted commas indicate that the word 'rational' here refers to the special meaning of 'rationality' defined in Ng 1996b, p. 304. A more 'rational' species is one whose behaviour is controlled relatively more by the reward-penalty system than by automatic, inflexible, hard-wired responses.) In other words, our behaviour is still partly (to say the least) affected by the hard-wired programs of our genetic makeup. (On the biological basis of social behaviour, see, e.g., Wilson 1975; Crawford and Kreps 1998.) Among others, we still have our animal spirit for accumulation.[2] Our instinctive inclinations and drives are programmed to maximize our reproductive fitness and hence may not be perfectly consistent with welfare maximization (Ng 1995, 1999). It has also been shown that, 'wanting' (preference) and 'liking' (welfare) are mediated by different neural systems in the brain and are psychologically dissociable from each other. In other words, an individual may prefer something without liking it and vice versa. In particular, neural sensitisation of brain dopamine systems by addictive drugs may create intense 'wanting' ways beyond that could be explained by 'liking' and the relieving of withdrawal symptoms. (See Berridge 1999 for a review.)

[2] Keynes also dubbed the spontaneous urge of the entrepreneur to action not based on rational and careful calculation but on 'habit, instinct, preference, desire, will, etc.' animal spirits. Thus, at one stage, I thought Keynes had in mind something similar to my concept of accumulation instinct. However, the documentation by Marchionatti 1999 shows that Keynes did not invoke the biological connection, at least not on the accumulation instinct.

We are also brought up in a consumption-oriented society with incessant and omnipresent advertisements encouraging us to consume more goods and services. (On the effects of advertising, see Dixit and Norman 1978; Galbraith 1958; Tremblay and Tremblay 1995; Wilkie 1994, Ch. 16 including appendices. Worse than just creating a consumption bias, much of advertising actively creates unhappiness, as a top executive of a large merchandise chain admits, 'It is our job to make women unhappy with what they have', as quoted in Walsh 1990, p. 5.) This bias in favour of consuming goods and services is because people can only profit by selling goods and services, not by selling leisure or happiness as such.

The animal spirit and the influence of a materialistic society interacted to cause a vicious cycle towards insatiable demand for higher incomes. For example, it seems that no income group is contented with their income level, as judged from the answers to the following question by Americans in 1980: 'What would be the smallest income ... your family would need to make ends meet?' (US Bureau of Labor Statistics 1986). As Lebergott (1993, p. 71) comments, 'the more one has, the more one wants. Families with incomes below $5,000 felt that $7,822 would suffice. Families with incomes from 5,000 to $10,000 felt $10,139 was needed. Those who averaged $44,837 knew that almost three times that sum was absolutely necessary'.

There are also psychological studies showing that most people are not perfectly rational. Here, I do not have in mind certain violation of transitive preference or some axioms for expected utility maximization as shown by Allais (1979) and Kahneman and Tversky (1982) and others, interesting as those paradoxes are. I have in mind even more significant violation of rationality. Psychological studies show that most people ignore or underestimate the negative effects of current consumption/enjoyment on future happiness and the positive effects of current abstinence/suffering on future happiness (Headey and Wearing 1991). Most people believe that, rather than becoming disabled (losing either two legs or both eyes), it is better to be killed in an accident. I have taken shows of hands at classes and public lectures, the answers are consistently about 3 to 1 in favour of being killed (i.e., about 3 times more people choosing being killed than those choosing being disabled). Studies show that quadriplegics are only slightly less happy than healthy people (Brickman et al. 1978). After a period of adjustment, the happiness levels of seriously disabled accident victims are restored to levels close to the pre-accident levels. They are then glad that they were not killed in the accidents.

Many people spend a lot of money and time buying lottery tickets. However, there is evidence that lottery winners are no happier than non-winners (Brickman et al. 1978). True, they are delighted after winning. However, their happiness levels fall back to the original levels within weeks. (A recent result of Frederick and Loewenstein 1999 shows a quick decline back to a level slightly above a control group.) Their original expectation of having a much happier life after winning is not fulfilled. It is thus not really worthwhile to spend say $10 per week plus the time and trouble when the expected return is

only $6, unless you get a big kick in daydreaming about the nice time of spending the big win. (Even so, the epistemological rationality of such preferences is still in doubt as the daydreaming is based on the incorrect expectation that the big win will bring high happiness.) Obviously, we are subject to big adaptation effect, making our welfare depending much on our reference position, not just on the actual position. However 'individuals seem unable to anticipate changes in their reference position' (Frijters 1999, p. 8). (On the related endowment effect, see Kahneman et al. 1991.) On the other hand, people fail to purchase flood insurance even when offered at less than its actuarial value (and hence expected-welfare increasing) (Kunreuther et al. 1978). The failure to take adequate account of the adaptation effect and the influence of the 'market culture' are also used by Lane (1993, 2000) to explain why people think that money is more important than it really is. Kahneman et al. (1999, p. x) conclude that the 'evidence available suggests that people may not have the ability to predict their future tastes and hedonic experiences with the accuracy that the economic model requires'. (On problems of predicting future feelings, see also Lewonstein and Schkade 1999.)

There are many studies showing that decisions made by individuals are much affected by the current emotional states (Elster 1999; Isen 2000). Hermalin and Isen (1999) analyze this within the rational choice framework by allowing emotions or utility at the beginning of a period (or rather the end of last period) to influence preferences. While this is a useful way of looking at certain aspects of the problem, it hides the point of imperfect information/rationality. One may explain the effect of mood on the willingness to help others by the fact that 'an increase in mood either increases an individual's pleasure from helping or lowers the psychic cost of helping' (Hermalin and Isen 1999, p. 2). However, it is difficult not to impute imperfect information/rationality when irrelevant current emotion influences choices affecting one's long-term opportunity. (On the effects of emotional states on cognitive abilities, see Kaufman 1999; Ashby et al. 1999. Also, the existence of self-deception is not in doubt. The debate is on explaining the cause of such irrationalities. See, e.g., Elster 1986; Lazar 1999.)

There is a particular source of potential incorrect choices due to imperfect memory. As noted earlier, a natural and generally agreed measure of total enjoyment or suffering over a period of time is the integral of the intensity of enjoyment (positive) or pain (negative) over that period. However, probably due to the difficulty of estimating such an integral, human subjects appear to extract only two key values from the temporal profile: the peak instantaneous intensity and the intensity at the end of the period. Some intermediate value, such as the average of the peak and end values, is then used as the 'remembered utility' (Kahneman et al. 1993). Such a peak-end heuristic is insensitive to the duration of the experience, as in fact confirmed in experiments for human subjects. For example, in retrospective evaluations of colonoscopy procedures varying in duration from 4 to 67 minutes, aversiveness was not correlated with duration but was strongly correlated with ratings of both peak pain and pain at the end (Redelmeier and Kahneman 1996). Obviously, such

a 'duration neglect' may cause incorrect choice from the viewpoint of net welfare maximization.

Intertemporal choices (see, e.g., papers in Lowenstein and Elster 1992) are well-known to be riddled with impulsiveness, inconsistencies, hyperbolic discounting, and excessive discounting. The inadequate concern for the future has been widely noted, including by economists. For example, Pigou (1929, p. 25) called it the 'faulty telescopic faculty'; Ramsey (1928, p. 543) called it the 'weakness of imagination' about the future; Harrod (1948, p. 40) regarded it as the 'conquest of reason by passion'. A discount on future consumption, income, and any other monetary values is rational as a dollar now can be transformed into more than a dollar in the future. A discount on future utility may still be rational if the realization of the future utility is uncertain. (For healthy people, this uncertainty is usually very small.) Discounting the future for more than these acceptable reasons is irrational. A manifestation of this irrationality is the insufficient amount of savings for old age, necessitating compulsory and heavily subsidized superannuation schemes. I came across an extreme example of such under-saving during a survey regarding how much people would be willing to save more if the rate of interest were higher (Ng 1992). The question implicitly assumed that everyone did some saving, as the answers were in terms of how many percentages more one would save. One subject declared that he did not save anything. I then asked him to change the answers to be chosen from 'saving 20% more' into 'saving $20 more per month', etc. He still said that he could not be induced to save anything even at annual interest rates of hundreds of percent. It was only when I said, 'If a dollar saved now could become a million dollar next year, would you save?' that he admitted he would save then. I was careful enough to find out that this healthy-looking young man was not expecting early death from a terminal disease or the like.

The faulty telescopic faculty appears to be opposite to the accumulation instinct. Yet the two may exist simultaneously even for the same individual. The accumulation instinct makes the individual engage excessively (from the viewpoint of welfare) in the rat race for making more money; the faulty telescopic faculty makes him having insufficient savings for the future. In addition, there are the omnipresent advertising of goods and services, demonstration effects, etc. of a materialistic society. The combined effects lead to excessive current consumption. The faulty telescopic faculty also has a biological explanation: the telescopic faculty is costly to program. (See Ng 1999 for details. However, some discounting may be fitness-maximizing; see Rogers 1994.)

Just as perfect intelligence is impossible to program, perfect rationality is also too costly. It is thus not surprising that some degrees of ignorance (or imperfect information) and imperfect rationality apply to most individuals, the present writer included. Denying the existence of irrationality is not only inconsistent with common sense and psychological studies (particularly on the effects of drives on behaviour), it also violates the basic principles of evolutionary biology (Ng 1999). Moreover, since mad people must have some irra-

tional preferences, it is incongruous to assume that people are either perfectly rational or mad; it is more realistic to accept that most people fall between the extremes of perfect rationality and complete madness.

4 A simplified analysis of welfare

To capture the effects of inadequate recognition of the adaptation effect, excessive discount rates, relativity in income, environmental quality, etc., we may use the following simplified two-period model of a representative individual maximizing her overall utility V which depends on her utility U now plus the discounted (at rate r) utility level in the future U^f. (There are other studies of the implication of relative-income effects and utility interdependence; e.g., Hochman and Rogers 1969; Akerlof 1976; Boskin and Sheshinski 1978; Ireland 1998, 2001; Cooper and Garcia-Penalosa 1998; Reiter 2000. The emphasis here is more on the divergence between utility and welfare and the interaction with other effects.) The utility level in each period depends on consumption c, leisure x, relative income R, environmental quality E, public good provision G. In addition, consumption now enters the utility function in the future to capture the health and adaptation effects. (For other studies of the effects of current consumption and other activities on future preferences, see Hahnel and Albert 1990 and the literature on changes in preferences surveyed in Bowles 1998.)

$$V = U(c, x, R, E, G) + (1 - r)U^f(c, c^f, x^f, R^f, E^f, G^f) \tag{1}$$

Where $R = y/Y$ and $y =$ income of the individual, $Y =$ average income.

At the same time, we have her overall welfare W as a sum of her happiness now H and a properly discounted (only for the rate of uncertainty of realizing the future happiness r') future happiness

$$W = H(c, x, R, E, G) + (1 - r')H^f(c, c^f, x^f, R^f, E^f, G^f) \tag{2}$$

As discussed in the text, c increases H^f (happiness in the future) at low level of c and decreases H^f at high level of c and happiness and utility need not coincide. Apart from the issue of non-affective altruism (and malice) ignored in this paper, the two may differ due to imperfect knowledge and imperfect rationality. The inadequate recognition of the adaptation effect may be reflected by the underestimation or even the complete ignoring of the true (absolute) value of the adaptation effect, resulting in $\partial U^f/\partial c < \partial H^f/\partial c$ in absolute value, the excessive discount is reflected by the excess value of r over r'. Confining our analysis to high consumption economies, $\partial U^f/\partial c$ and $\partial H^f/\partial c$ are negative. Thus, the excessive value of r and the underestimation of the absolute value of the adaptation effect both have the effect of overestimating the true contribution of c to W, i.e., both resulting in $\partial V/\partial c > \partial W/\partial c$. Thus, most of our points can be made by a further simplification into an atemporal model by combining the inadequate recognition of the adaptation

effect and the excessive discount into the overestimation of the true contribution of c, i.e., by $\partial V/\partial c = \partial U/\partial c \equiv U_c > W_c \equiv \partial W/\partial c$. (While there may also be some differences between U_i and W_i for $i = x, R, E, G$, we have less evidence on such divergences and hence, partly for simplicity, such possible divergences are ignored here.) We then have,

$$V = U(c, x, R, E, G); \quad U_c, U_x, U_R, U_E, U_G > 0 \tag{1'}$$

$$W = W(c, x, R, E, G); \quad W_c, W_x, W_R, W_E, W_G > 0 \tag{2'}$$

The individual takes the average and aggregate variables Y, E, and G as beyond her own control and maximizes V or U with respect to c, x, y subject to

$$c = (1 - t)y = (1 - t)(1 - x)p \tag{3}$$

where $t =$ income tax rate (also taken as given by the individual), $p =$ wage-rate (productivity or price of labour; no other price enters the picture in our completely real analysis), also determined exogenously. The first-order income/leisure choice condition

$$U_x = (1 - t)pU_c + (p/Y)U_R \tag{4}$$

differs from the textbook one by the additional last term for the relative-income effect.

Now consider the effect of an increase in the productivity or earning ability p of the individual in question, with that of the society remaining unchanged. (In the comparative statics analysis below, the total differentiation of the first-order condition is not used. The appendix explains that, despite this, the method gives valid and in fact the same results for the purpose here. Since the differentiation of first-order conditions usually yields very complicated equations difficult to handle, the justification of our method provides a simpler way of doing certain types of comparative statics analysis.) Differentiate (1′) with respect to p, taking t, Y, G, E as given (as a change in p for a single individual has negligible effects on these variables), yielding,

$$\frac{dU}{dp} = U_c\left(\frac{dc}{dp}\right) + U_x\left(\frac{dx}{dp}\right) + U_R\left(\frac{dR}{dp}\right) \tag{5}$$

Substituting in dc/dp and dR/dp from the differentiation of (3) and $R \equiv y/Y$, and substituting in (4), and multiplying through by p/U to express in proportionate terms, we have

$$\sigma^{Up} = \eta^{Uc} + \eta^{UR} \tag{6}$$

where $\sigma^{Up} \equiv (dU/dp)p/U$ is the proportionate total response of U with respect to a change in p ('total' in the sense of allowing other relevant variables to change endogenously; but t, G, E, Y are not relevant variables here), $\eta^{ab} \equiv (\partial a/\partial b)b/a$ for any a and b is the proportionate partial response of a with respect to a change in b ('partial' in the sense of holding other variables unchanged).

Similar to the derivation of (6), we may derive from the differentiation of (2′)[3]

$$\sigma^{Wp} = \eta^{Wc} + \eta^{WR} + [x/(1-x)]\sigma^{xp}(\eta^{Uc} - \eta^{Wc}) \tag{7}$$

Equations (6) and (7) show that the effect of an increase in earning ability of an individual on either her utility or her welfare both include an intrinsic consumption effect and a relative-income effect. (The last complex term in Eq. 7 will be discussed in a moment.) At low income/consumption levels, the relative-income effect may be low but the intrinsic consumption effect is high both for utility and for welfare. At high income/consumption levels, the intrinsic consumption effect on welfare η^{Wc} may be very low, even zero. The intrinsic consumption effect on utility η^{Uc} may be higher but could still be quite low. However, the relative-income effect on utility is likely to be rather high. Thus, for all income levels, individuals find higher incomes very important, explaining the rat race for making more money.

The last term in (7) needs some explanation. The expression $[x/(1-x)]$ is the proportion of time spent on leisure (all non-work activities really) to that spent on working; it is simply needed, when all variables are expressed in proportionate terms, to relate the leisure response elasticity to the other response elasticities. The expression σ^{xp} is the effect (in proportionate or elasticity form) of productivity (i.e., earning rate) on leisure. It is positive if the income effect offsets the pure substitution effect of a higher earning rate and negative otherwise. The expression $(\eta^{Uc} - \eta^{Wc})$ is positive from the discussion above (excessive consumerism). The rationale of the whole term may now be explained. If there is excessive consumerism, there is an over/under consumption of goods/leisure. Then, if an increase in earning rate increases leisure, it improves welfare as it serves to offset the over/under consumption of goods/leisure. Unless σ^{xp} is negative and large absolutely, the RHS of (7) is positive.

Comparing (6) and (7), it can also be shown that σ^{Up} is larger than σ^{Wp} (i.e., the increase in earning rate is perceived to increase utility more than it actually increases welfare). Ignoring the possible difference between η^{UR} and η^{WR} as noted earlier, taking the difference between the two equations, we have

$$\sigma^{Up} - \sigma^{Wp} = \{1 - [x/(1-x)]\sigma^{xp}\}(\eta^{Uc} - \eta^{Wc}) > 0 \tag{8}$$

Since $[x/(1-x)]$ is about $\frac{1}{4}$ to $\frac{1}{2}$ and certainly not significantly larger than one, while σ^{xp} is either positive or very small absolutely if negative, the whole term $\{1 - [x/(1-x)]\sigma^{xp}\}$ is definitely positive, making the RHS of (8) positive since η^{Uc} is positive and larger than η^{Wc}. We thus have

Proposition 1. *Excessive consumerism does not only make people overvalue the contributions of consumption, it also makes people overvalue the contributions of higher earning rates.*

However, the RHS of (7) is still positive. An increase in earning rate for an

[3] The normalization of either U or W to have $U = W$ to begin with is also needed; otherwise the term η^{Uc} in (7) has to be multiplied by U/W.

individual increases her welfare, though not by as much as it increases her utility. However, as all or most individuals earn higher incomes, the situation is quite different.

For the whole society, economic growth increases the earning ability not only of one person but also of most persons. Ignoring distributional changes, we consider the situation of the representative individual whose earning ability p increases at the same rate as that of the average earning ability P, i.e., we have $p = P$, $dp = dP$, $x = X$, $Y = (1 - X)P$, etc. where capital letter indicates the average value of the relevant variable. A more complicated formulation in terms of a continuous distribution of individuals of different earning abilities does not change the central conclusions. Differentiating (1′) with respect to P, at $p = P$, $dp = dP$, and allowing the aggregate variables Y, G, E to change correspondingly, we have

$$\frac{dU}{dP} = U_c\left(\frac{dc}{dp}\right) + U_x\left(\frac{dx}{dp}\right) + U_G\left(\frac{dG}{dP}\right) + U_E\left(\frac{dE}{dP}\right) \tag{9}$$

Note that U_R does not appear in (9) as y and Y change by the same proportion, leaving R unchanged. We should now introduce the determination of government spending on public goods G and environmental quality E. In our simple model, these are

$$G = N(1 - \alpha)tY \tag{10}$$

$$E = E(A, Y); \quad E_A > 0, E_Y < 0 \tag{11}$$

where N is the given number of individuals, α is the proportion of tax revenue used for the abatement (A) of environmental disruption, leaving the proportion $(1 - \alpha)$ for spending on public goods. That $E_Y < 0$ captures the environmental disruption effect of most production and consumption. We also have

$$A = \alpha tYN \tag{12}$$

Substitute dc/dp, dG/dP, dE/dP from the differentiation of (2), (3), (10), (11), taking N, t and α as given, we have, after simplification using (4) and multiplication with P/U to express in proportionate terms,

$$\sigma^{UP}_{|t,\alpha|} = \eta^{Uc} + \eta^{UG} + \eta^{UE}(\eta^{EA} + \eta^{EY}) + \left(\frac{x}{1-x}\right)\sigma^{XP} \times [\eta^{UR} - \eta^{UG} - \eta^{UE}(\eta^{EA} + \eta^{EY})] \tag{13}$$

where $\sigma^{ab} \equiv (da/db)b/a$ and $\eta^{ab} \equiv (\partial a/\partial b)b/a$ for any a, b as before, and $|t, \alpha|$ indicates that t and α are being held constant. The first three terms in the R.H.S. of (13) are the direct effects of an economy-wide increase in earning or productivity, including an intrinsic consumption effect η^{Uc} as the higher productivity allows higher per capita consumption, a public-good effect η^{UG} as higher national income allows more spending on public goods, and an (unabated) environmental disruption effect $\eta^{UE}(\eta^{EA} + \eta^{EY})$. For this last effect, the environmental quality effect η^{UE} has to be multiplied by both the abatement effect η^{EA} and the disruption effect η^{EY} because an increase

in production both increases the disruption and the abatement (through the higher tax revenue a constant share of which is used for abatement). The last complex term in (13) is the indirect effect through σ^{XP}, the (proportionate) effect of earning ability P on leisure X. As everything in (13) is put in proportionate terms, this has to be multiplied by $x/(1-x)$, the ratio of leisure to working hours. The rest of this complex term, i.e., $[\eta^{UR} - \eta^{UG} - \eta^{UE}(\eta^{EA} + \eta^{EY})]$, captures the external effects of individual income/leisure choice. An increased consumption of leisure reduces one's own income and hence benefits others through the relative-income effect η^{UR}, but harms others through a reduction in public goods provision (hence *minus* η^{UG}), and may benefit or harm others through the environmental effect η^{UE} depending on whether $(\eta^{EA} + \eta^{EY})$ is negative or positive. It is perhaps not unreasonable to assume that $(\eta^{EA} + \eta^{EY})$ is negative. Even if a given proportion (provided not excessively large to begin with) of tax revenue is used for abatement, an increase in production still causes more disruption to the environment.

Similar to the derivation of (13), if we start with (2′) instead of (1′), we have

$$\sigma^{WP}_{|t,\alpha|} = \eta^{Wc} + \eta^{WG} + \eta^{WE}(\eta^{EA} + \eta^{EY}) + \left(\frac{x}{1-x}\right)\sigma^{XP} \times [\eta^{WR} + \eta^{Uc} - \eta^{Wc} - \eta^{WG} - \eta^{WE}(\eta^{EA} + \eta^{EY})] \tag{14}$$

The RHS of (13) and (14), in contrast to that of (6) and (7), is of ambiguous sign. An individual may rationally engage in the rat race for making money. For the society, an increase in productivity may not be an unmixed blessing even if the higher production finances more public goods provision and more abatement. This is true even before we take into account imperfect foresight and imperfect rationality (including the inadequate recognition of the adaptation effect and excessive discount rates) which make $\eta^{Wc} < \eta^{Uc}$ and the right hand side of (14) even more likely to be negative than that of (13). Taking the difference of (13) and (14), we have

$$\sigma^{UP}_{|t,\alpha|} - \sigma^{WP}_{|t,\alpha|} = \{1 - [x/(1-x)]\sigma^{xp}\}(\eta^{Uc} - \eta^{Wc}) > 0 \tag{15}$$

The RHS of (15) and that of (8) are the same and also have similar meaning. We have

Proposition 2. *(a) Despite the rat race for making more money, economic growth may be welfare reducing due to the relative-income and environmental disruption effects, even though growth finances public goods and disruption abatement.*[4] *(b) Excessive consumerism may increase the possibility and degree of welfare-reducing growth if higher earning rates decrease leisure. (c) Excessive consumerism makes people overvalue the contribution of economic growth.*

[4] This part a of Proposition 2, as well as the first statement in Proposition 3 below are valid even in the absence of divergences between preference and welfare (and hence excessive consumerism); see Ng and Ng (2001).

So far, we have assumed that the tax rate t and the proportion of tax revenue used for abatement α are being held constant. However, as productivity P increases, the government may wish to change these ratios. Now, in choosing these ratios, what does the government maximize? I do not mean the public choice issue (though real enough) of self-serving individual members of government. Rather, even if the government pursues the public interest (which must be true to a large extent in constitutional democracies, though not perfectly), does it maximize the utility U or welfare W of the representative individual? It is more realistic to assume that it maximizes U, especially if the pursuit of the public interest is mainly to win votes. However, since the result to be demonstrated below is negative, the case is strengthened by allowing the government to maximize welfare. In other words, even if the government is good and wise enough to choose the tax rate and the abatement ratio to maximize welfare, we shall see that we still have problems (in terms of welfare) due to individual irrationality and external effects. (The case of preference maximization is discussed in Subsect. 5.2 below.)

Allowing t and α to change with P, we have, instead of (14),

$$\sigma^{WP} = \sigma^{WP}_{|t,\alpha|} - \left(\frac{t}{1-t}\right)\sigma^{tP}\eta^{Wc} + \left[\eta^{tP} - \left(\frac{\alpha}{1-\alpha}\right)\sigma^{\alpha P}\right]\eta^{WG} + (\sigma^{tP} + \sigma^{\alpha P})\eta^{WE}\eta^{EA} \tag{16}$$

where $\sigma^{WP}_{|t,\alpha|}$ is as given in (14).

Now, suppose that t and α have been both chosen optimally to maximize W, with P given. Differentiating W in (2′) with respect to t, allowing endogenous variables c, x, y, G, E to change but taking α as given (one thing at a time; this does not really matter since, if we allow α to vary, we will just get some additional terms which sum to zero when we take account of the first-order condition for the optimal choice of α), and allowing the average values to change with the individual values ($dy/y = dY/Y$, etc.), we have, after substituting in (4) and multiplying through by t/W to express in proportionate terms,

$$\sigma^{Wt} = \eta^{WG} + \eta^{WE}\eta^{EA} - \left(\frac{t}{1-t}\right)\eta^{Wc} + \left(\frac{x}{1-x}\right)\sigma^{Xt} \times [\eta^{WR} + \eta^{Uc} - \eta^{Wc} - \eta^{WG} - \eta^{WE}(\eta^{EA} + \eta^{EY})] \tag{17}$$

where σ and η to the double superscripts are as defined under (13). Similar to (14), the first three terms in the R.H.S. of (17) are the direct effects and the last term is the indirect effect. Except for the excessive perception of the usefulness of private consumption captured by $\eta^{Uc} - \eta^{Wc}$, the indirect effect is analogous to that in (14) and has the same interpretation (discussed under Eq. 13 with respect to utility). The direct effects (of an increase in tax rate t) consist in a public goods provision effect η^{Wg}, an (environmental disruption) abatement effect $\eta^{WE}\eta^{EA}$ (as a higher tax revenue finances for both public goods provision and abatement), and a (reduced) consumption effect $\left(\frac{t}{1-t}\right)\eta^{Wc}$. The

last effect has the term $[t/(1-t)]$ because of the proportionate nature of all terms. For this particular effect, it is easier to see its rationale in non-proportionate terms. If we multiply both sides by W/t to undo the proportionality, we have, showing in the R.H.S. the reduced consumption effect only,

$$\frac{dW}{dt} = \cdots \frac{y\partial W}{\partial c} \cdots$$

In this form, it is clear that an increase in t reduces welfare at the rate y through the consumption effect as an increase in t reduces c at the rate y.

Similarly, differentiating W in $(2')$ with respect to α, reasonably assuming that α has negligible effects on the hours of work, we have

$$\sigma^{W\alpha} = \eta^{WE}\eta^{EA} - \left(\frac{\alpha}{1-\alpha}\right)\eta^{WG} \tag{18}$$

Obviously, the R.H.S. of (18) indicates that an increase in α entails a benefit of increasing abatement and a cost of reducing the provision of other public goods. Reasonably assuming continuity and interior solutions for t and α, optimal choice of t and α entails setting (17) and (18) to zero. Substitute the resulting equations into (16), yielding for the special case where leisure does not respond to earning and tax rates (the general case will be discussed presently)

$$\sigma^{WP}_{|t^*,\alpha^*|} = [(1/(1-t)]\eta^{Wc} + \eta^{WE}\eta^{EY} \tag{19}$$

where $|t^*, \alpha^*|$ indicates that the tax rate and the proportion of revenue used for abatement are being optimized. Thus, (19) gives in proportionate terms, for the case of offsetting income and substitution effect on working hours of a change in post-tax earning, the effect of an exogenous increase in productivity on welfare, while both the tax rate and the abatement ratio are being optimized to maximize welfare before and after the increase. Despite this optimization, the R.H.S. of (19) is of ambiguous sign. The first term (consumption effect) is positive (but likely to be small for rich economies), the second term (environmental disruption effect) is negative (and likely to be absolutely sizable for rich economies). Thus, if environmental disruption is significant as is likely to be the case, economic growth may be welfare-reducing even if the size of the public sector and the abatement spending are being optimized. To prevent this, environmental disruption may have to be taxed directly rather than just indirectly through the income tax.[5] It may seem odd that growth may be welfare-reducing even if the tax rate and abatement ratio are being optimized. The explanation is that taxation only transfer resources from pri-

[5] It may appear that (19) is too simple to be correct and ignores the effect on G. In fact, before substituting in the equation obtained by setting (17) to zero, (19) appears as $\sigma^{WP}_{|t,\alpha|} = \eta^{Wc} + \eta^{WG} + \eta^{WE}(\eta^{EA} + \eta^{EY})$ where the effects of a higher P on G and A are also allowed. However, the optimal choice of t when leisure X does not change with t gives $\eta^{WG} + \eta^{WE}\eta^{EA} = [t/(1-t)]\eta^{Wc}$ from setting (17) to zero, yielding (19).

vate production to public goods which also have environmental disruption effects. If the disruption effects are large and abatement is difficult, growth may be welfare-reducing unless it is not too costly to tax disruption activities directly.

For the general case where work time or leisure may respond to post-tax earning rates, we have instead of (19)

$$\sigma^{WP}_{|t^*,\alpha^*|} = [1/(1-t)]\eta^{Wc} + \eta^{WE}\eta^{EY} + \left(\frac{x}{1-x}\right)[\sigma^{XP} - \sigma^{Xt}(1+\sigma^{tP})] \times [\eta^{WR} + \eta^{Uc} - \eta^{Wc} - \eta^{WG} - \eta^{WE}(\eta^{EA} + \eta^{EY})] \tag{19'}$$

Now, even if the response of leisure (σ^{XP} and σ^{Xt}) is not negligible, the RHS of (19′) may still be negative. With likely opposing income and substitution effects, both σ^{XP} and σ^{Xt} (they should have the same absolute value and be opposite in sign in models where only the post-tax earning rate is relevant) are of ambiguous sign. From historical evidence, it is likely that σ^{XP} is positive (leisure increases as earning rate increases) for the very long term. However, empirical evidence (see Pencavel 1986) for the last half a century shows that leisure no longer increases with higher earning rates. Thus, for specific economies and periods (e.g., some Asian economies in the last few decades), it is possible that the substitution effect may offset the income effect to make working time increase with earning rates over time. (On the excessive hours of work due to international competition, see Gratton and Holliday 1996, p. 218.) It is likely (as is consistent with historical evidence and shown to follow from reasonable assumptions in Ng 2000a) that σ^{tP} is positive (the optimal tax rate increases with productivity). (A negative but less than unity value of σ^{tP} does not change the conclusion.) This makes the term $[\sigma^{XP} - \sigma^{Xt}(1+\sigma^{tP})]$ negative. Then, if the relative-income effect η^{WR} is large, the environmental disruption effect is larger than the abatement effect (the negative η^{EY} is absolutely larger than η^{EA}), and excessive consumerism caused by ignorance/irrationality and advertising makes $\eta^{Uc} - \eta^{Wc}$ positive and large relative to η^{WG}, the last square bracketed term in (19′) may be positive and large, making the second line in (19′) negative. We have

Proposition 3. *Despite the optimal choice of the income tax rate and disruption abatement ratio, economic growth may still be welfare-reducing if disruption is not taxed directly at low costs. Excessive consumerism may still increase the possibility and degree of welfare-reducing growth if higher earning rates decrease leisure.*

It may seem odd (as it did to me initially) that σ^{XP} and $-\sigma^{Xt}\sigma^{tP}$ are combined together to reinforce each other. I first thought that if a higher earning rate P allow t to be increased, this higher tax rate will partly offset the effect of the original higher P. Thus, I suspected that the sign before $\sigma^{Xt}\sigma^{tP}$ should be a 'plus', not a 'minus'. After checking that there is no mistake in the manipulation, I finally came up with the following explanation. Before we substitute in the equation obtained from setting (17) to zero, (19′) appears as

$$\sigma^{WP}_{|t^*,\alpha^*|} = \eta^{Wc} + \eta^{WG} + \eta^{WE}(\eta^{EA} + \eta^{EY}) + \sigma^{tP}\left[\eta^{WG} + \eta^{WE}\eta^{EA} - \left(\frac{t}{1-t}\right)\eta^{Wc}\right]\left(\frac{x}{1-x}\right)\sigma^{XP} \times [\eta^{WR} + \eta^{Uc} - \eta^{Wc} - \eta^{WG} - \eta^{WE}(\eta^{EA} + \eta^{EY})] \quad (19'')$$

The intuitive meaning of all terms in (19″) can be seen clearly. The first three terms on the RHS are the direct effects of higher productivity and the last two complex terms are the indirect effects through the responses of t and X to P. However, the term $[\eta^{WR} + (\eta^{Uc} - \eta^{Wc}) - \eta^{WG} - (\eta^{EA} + \eta^{EY})]$ comprising external and ignorance/irrationality effects of the work/leisure choice is also of ambiguous sign. Higher leisure (less work) is beneficial to others through reducing the relative-income effects and the unabated environmental disruption effect, but is harmful to others through reducing the supply of public goods. It is also beneficial to oneself if there is excess consumerism or the like, making $\eta^{Uc} - \eta^{Wc}$ positive. When t is being optimized, the RHS of (17) is set to zero, making the first two term equal to the negative of the last two term. The substitution of this equality into (19″) turn it into (19′).

5 Towards a welfarist cost-benefit analysis

With our welfare economics extended to the level of welfare, other areas of economic analysis related to welfare evaluation are similarly affected. Partly as an example and partly for its own interest, this section shows how a cost-benefit analysis aiming at welfare maximization differs from the traditional one.

5.1 Ignoring environmental quality

To examine whether a public project is utility-increasing or welfare-increasing, we may examine how an increase in public goods provision G associated with this project affects utility and welfare, taking into account the budget constraints of both the government and individuals and the maximization behaviour of individuals. To make the commencing analysis simple, let us temporarily abstract away the issue of environment quality (i.e., ignoring E and taking abatement ratio α to be zero; to be re-introduced later). Differentiating the simplified (1′) with respect to G, substituting in dc/dG from the differentiation of (3), U_x from (4), dt/dG from the differentiation of (10) (after using dy/dG from the differentiation of the second equation in Eq. 3) into (6), we have, after dividing both sides by U_c to put in the form of marginal rates of substitution and with the constant N normalized at unity,

$$TMV^U_G \equiv (dU/dG)/U_c = U_G/U_c + (1-x)(dp/dG) + (p/Y)(U_R/U_c)(dx/dG) - 1 - tp(dx/dG) \quad (20)$$

where TMV_G^U is the total (in the sense of being inclusive of the indirect and financing effects) marginal value of increasing G and the superscript U indicates that it is evaluated in terms of utility (representing preference) as distinct from that evaluated in terms of welfare discussed below. The right hand side of (20) then gives the monetary benefits and costs of the relevant public project, including:

a. The direct consumption benefit of the project U_G/U_c (which may be negative for a productivity-oriented project),
b. the benefit through the productivity enhancement effect dp/dG of the public good (which may be negative for a consumption-oriented project),
c. the indirect cost/benefit through the relative-income effect U_R if the project (including its financing through a change in the tax rate t) changes leisure x,
d. the direct cost of the project,
e. the excess burden due to the disincentive effect of the project and its financing $tp(dx/dG)$.

If the substitution effect of a higher tax rate t dominates its income effect, dx/dG is positive and the disincentive effect could be very high if the existing tax rate t is already very high. This is a point emphasized by economists (e.g., Feldstein 1997). (It is rather puzzling that, apart from the pre-existing tax rate, it is the gross disincentive effect rather than the pure substitution effect that determines the size of the excess burden. This puzzle is explained graphically in Ng 2000b) However, Kaplow (1996) and Ng (2000b) argue that, when we take into account the effects of both the spending and financing sides, there is no presumption of a positive disincentive effect or distortion.

The indirect effect through the relative-income effect is positive/negative if the project (together with the financing of it) increases/decreases leisure. This is so because the relative-income effect means that, from the social viewpoint, individuals spend too much time earning incomes, since an increase in the relative income of one individual implies some decrease in those of others.

From (20), it may be seen that, even for the case where a public project (together with the financing of it) involves a substantial disincentive effect ($dx/dG > 0$), the resulting excess burden through the positive pre-existing tax rate has to be offset by the indirect benefit of the project through the relative-income effect. The estimation of the magnitudes of these two effects is thus important. Economists have spent some time estimating the excess burden but have done little in estimating the relative-income effect.

It may be noted that, whether the indirect effect through the relative-income effect is positive or negative (i.e., whether dx/dG is positive/negative), it always offsets the excess burden effect through the disincentive effect $tp(dx/dG)$. This offset may be partial, full, or more than full, depending on whether $(U_R/U_c)/Y$ is smaller than, equal to, or larger than the tax rate t. Alternatively, it depends on whether,

$$\eta^{UR}/\eta^{Uc} <, =, > t/(1-t) \tag{21}$$

In words, the indirect effect through the relative-income effect less/more than offsets the excess burden effect if the proportionate responsiveness of utility to relative income (which may be called the coefficient of relative-income effect) relative to that to consumption (coefficient of intrinsic or absolute consumption effect) is smaller/larger than the ratio of the tax rate to the untaxed fraction of income. For a country with as high a tax rate of 33%, the coefficient of relative-income effect only has to be half the size of that of absolute consumption for at least full offset to be the case. This may well be true for many cases. However, more empirical studies are needed.

The above is still within the framework of preference instead of welfare. To aim at welfare maximization, we may start from (2′) instead of (1′). Then, in a similar process described above for the derivation of (20), we may derive,

$$\begin{aligned} TMV_G^W &\equiv (dW/dG)/W_c \\ &= W_G/W_c + (1-x)(dp/dG) \\ &\quad + (p/Y)(W_R/W_c)(dx/dG) - 1 - tp(dx/dG) \end{aligned} \tag{22}$$

where TMV_G^W is the total (in the sense of being inclusive of the indirect and financing effects) marginal value of increasing G evaluated in terms of welfare. If utility and welfare always go exactly together, (22) and (20) are equivalent. However, as argued in a previous section (3.3), the accumulation instinct and the influence of a materialistic society interacted to cause a materialistic bias, making us placing higher emphasis on consumption than really justified in terms of welfare even at the individual level. This means that U_c is larger than W_c. Since public goods are neither possessed by nor sold to individuals, neither the accumulation instinct nor the advertising-induced bias applies to G, at least not as much as they apply to private consumption c. We may thus take U_G and W_G to be similar in value. (Where this is not the case, some adjustment has to be made accordingly. However, even with $U_G > W_G$, we are still likely to have $U_G/U_c < W_G/W_c$, making the argument below still hold qualitatively, though the quantitative adjustment factor β mentioned below may be somewhat smaller.) The accumulation instinct and the advertising-induced bias may apply to the relative-income effect. However, at most, this is unlikely to be more than the effects on consumption. Thus, taking the case most unfavourable to the point I want to make here, we may assume $U_R/U_c = W_R/W_c$. Then, comparing the RHS of (22) with that of (20), we note that W_G/W_c in the former is larger than U_G/U_c in the latter, while other terms are similar. This means that, due to the materialistic bias, the benefits of a public project are underestimated in the traditional cost-benefit analysis in terms of preference or utility. An adjustment is needed when doing a cost-benefit analysis aiming at welfare maximization. Thus, the size of the difference $W_G/W_c - U_G/U_c$ is of interest. As $W_G = U_G$, we may write

$$W_G/W_c = (U_G/U_c)U_c/W_c = (U_G/U_c)(1+\beta) \tag{23}$$

where $\beta \equiv (U_c - W_c)/W_c$ is the proportion of materialistic bias defined as the excess of marginal utility over the marginal welfare of consumption as a pro-

portion of the latter. (In terms of the marginal rates of substitution, $\beta \equiv [(W_G/W_c)/(U_G/U_c)] - 1$.) Thus, the required adjustment is to add this proportion to the traditional estimate of the marginal consumption benefits of public projects. If W_c is small relative to U_c (as indicated by the happiness data; but more studies are needed), β is very large. The needed adjustment may be in terms of x times rather than y%.

It is interesting to note that, while the consumption benefit of the public project should be so adjusted, the productive benefit (i.e., the contribution of the project to productivity) need not be adjusted. This asymmetry may be explained intuitively. The consumption benefits of public projects should be adjusted upward since excessive materialism biases individuals in favour of private consumption. The productive benefits need not be so adjusted because the higher productivity increases both private consumption and public revenue (through the tax on incomes). While this asymmetry may not be surprising after being derived and explained intuitively, I was not aware of its validity before comparing (20) with (22). The main conclusions of this subsection may be summarized as[6]

Proposition 4. *(a) In the presence of excessive consumerism (defined by the positive excess of the marginal utility over marginal welfare of consumption) as may be caused be the accumulation instinct and advertising, a cost-benefit analysis aiming at welfare maximization should adjust the marginal consumption benefits of public projects upward by a proportion determined by the proportionate excess of marginal utility over marginal welfare of consumption; the productive contributions of public projects should not be so adjusted. (b) Even in the absence of excessive consumerism, a cost-benefit analysis aimed at either preference or welfare maximization should offset the excess burden effect due to the disincentive effect of a public project and its financing by the indirect effect through the relative-income effect. Whether the indirect effect through the relative-income effect is positive or negative (this depends on whether the disincentive effect is positive or negative), it always offsets the excess burden effect through the disincentive effect. (c) The indirect effect through the relative-income effect less/more than offsets the excess burden effect if the proportionate responsiveness of utility to relative income (the coefficient of relative-income effect) relative to the proportionate responsiveness of utility to consumption (coefficient of intrinsic or absolute consumption effect) is smaller/larger than the ratio of the tax rate to the untaxed fraction of income.*

5.2 Accounting for environmental disruption and abatement

In this subsection, the role of environmental quality E and abatement proportion α are re-introduced. We may then derive, in a similar way as the derivation of (20) but taking account of (11) and (12),

[6] The first half of Part a of this proposition is already contained in Ng and Ng (2001) which however operates within the traditional framework of preference/utility while the present paper goes to the level of welfare.

$$
\begin{aligned}
TMV_G^U &\equiv (dU/dG)/U_c \\
&= \left(\frac{U_G}{U_c}\right) + (1-x)\left\{1 + \left(\frac{U_E}{U_c}\right)E_y\right\}\left(\frac{dp}{dG}\right) \\
&\quad + \frac{1-\alpha(U_E/U_c)E_A}{1-\alpha} - \frac{tY}{1-\alpha}\left\{1 - \left(\frac{U_E}{U_c}\right)E_A\right\}\frac{d\alpha}{dG} \\
&\quad - p\left\{t - \frac{U_R}{YU_c} + \left(\frac{U_E}{U_c}\right)E_Y\right\}\frac{dx}{dG} \qquad (24)
\end{aligned}
$$

Comparing (24) with (20), we may observe that the presence of environmental disruption and disruption abatement gives rise to the following adjustments to a cost-benefit analysis (either aimed at preference or welfare maximization):

a. The productive benefits of the project have to be offset by the disruption effect of higher production (noting that $E_Y < 0$);
b. The direct costs have to be adjusted to account for the effects on abatement. For example, with α held unchanged, an increase in G necessitates higher t which, at given α, also finances for more abatement. Hence, while the direct cost has to be inflated by the ratio $1/(1-\alpha)$ to account for the indirect cost of higher abatement, it has also to be deflated by the benefit through higher abatement. If α is changed as G increases, the additional costs and benefits have to be similarly assessed. (More below).
c. The indirect cost through the disincentive effect and the existing tax rate has to be offset not only by the effect through the relative-income effect but also by the environmental disruption effect $-\left(\frac{U_E}{U_c}\right)E_Y$.

From the third and fourth terms on the right hand side of (24), it may be seen that, the benefit of higher abatement, whether for a given α, or through an increase in it, is larger/smaller than the cost of higher abatement, depending on whether $\left(\frac{U_E}{U_c}\right)E_A$ is larger or smaller than one, i.e., on whether $U_E E_A$ is larger or smaller than U_c. (In words, whether a dollar abatement expenditure yields more utility than a dollar consumption. However, recall that $\frac{U_E}{U_c}$ has really to be summed over all individuals when we apply the analysis to the real world where the number of individuals is not normalized to one.) Alternatively, it depends on whether

$$\eta^{UE}\eta^{EA}/A >, < \eta^{Uc}/c \qquad (25)$$

where A is the per capita abatement expenditure as N is normalized at one. In words, if utility is proportionately more responsive to abatement than to consumption, higher abatement generates more benefits than costs. Intuitively, if abatement is sub-optimal and yields higher benefits than costs (at the margin), any positive (negative) effects of a project on abatement should be counted as

a benefit (cost) which may be used to offset (supplement) the direct costs of the project. The reverse is true if abatement is excessive and yields fewer benefits than its costs (at the margin).

Considering the proportion of government spending on abatement as a variable, we should really consider alternative cases with respect to the value of α as G increases, as this affects the required cost-benefit analysis. The following three cases may be considered:

A. α is held constant as G and t increase;
B. α is changed in such a way to hold the total abatement expenditures A unchanged;
C. Both α and t are chosen to maximize utility. (The case where only α is chosen to maximize utility and t is not so chosen does not make much conceptual sense and is also mathematically complicated.)

For Case A, we may just take the $d\alpha/dG$ in (14) as zero. For Case B, from the differentiation of (10) and (12) with respect to G and the requirement $dA/dG = 0$, we have $d\alpha/dG = -\alpha/tY$. The substitution of this last equation into (24) yields,

$$\begin{aligned} TMV_G^U &\equiv (dU/dG)/U_c \\ &= \left(\frac{U_G}{U_c}\right) + (1-x)\left\{1 + \left(\frac{U_E}{U_c}\right)E_Y\right\}\left(\frac{dp}{dG}\right) \\ &\quad + 1 - p\left\{t - \frac{U_R}{YU_c} + \left(\frac{U_E}{U_c}\right)E_Y\right\}\frac{dx}{dG} \end{aligned} \tag{26}$$

The third and fourth terms in (24) is replaced by one. With abatement A held unchanged, we do not have to adjust the direct costs by the effects through abatement.

For Case C, for simplicity, we consider the case where changes in α and t have negligible effects on the amount of leisure x. (For the case where these effects are not negligible, we get terms reflecting the indirect effects similar to the term associated with dx/dG in (24) and (26) above in the optimal choice of α and t. Due to the offsetting nature of substitution and income effects, the effects on x is usually small. The secondary effects of these on the optimal choice of α and t are even more negligible.) Then the differentiation of U in (1′) with respect to α and t and the equating of the resulting expressions to zero (for optimal α and t) yields $U_E E_A = U_G = U_c$. The substitution of these into (24) again gives us (26). This means that, with optimal choice of α and t, we again do not have to adjust the direct costs by the effects through abatement.

We may start with (2′) instead of (1′) and analyze the implications of environmental disruption and disruption abatement in terms of welfare instead of preference maximization, obtaining equations similar to (24)–(26) but with U replaced by W. Then, comparing the value of W_G/W_c in the new set of equations (24′)–(26′) (only Eqs. 25′ and 26′ are shown below) with U_G/U_c in (24)–

(26), we may conclude that, in the presence of excessive consumerism, a similar adjustment to the consumption benefits of public projects is needed as discussed in the last subsection. On top of this, two further points may be added. First, consider (26′) below.

$$TMV_G^W \equiv (dW/dG)/W_c$$
$$= \left(\frac{W_G}{W_c}\right) + (1-x)\left\{1 + \left(\frac{W_E}{W_c}\right)E_Y\right\}\frac{dp}{dG}$$
$$+ 1 - p\left\{t - \frac{W_R}{YW_c} + \left(\frac{W_E}{W_c}\right)E_Y\right\}\frac{dx}{dG} \qquad (26')$$

Even in the absence of under-perception of the benefits of environment quality, such that $U_E = W_E$, the presence of excessive consumerism ($U_c > W_c$) alone makes the valuation of environmental quality in accordance to preference lower than the true value in accordance to welfare, i.e., $\frac{U_E}{U_c} < \frac{W_E}{W_c}$. This under-valuation means that we have to make another adjustment for a cost-benefit analysis aimed at welfare maximization. The environmental effect $\left(\frac{U_E}{U_c}\right)E_Y$ has to be adjusted upward by a similar proportion $\beta \equiv (U_c - W_c)/W_c$ to become $\left(\frac{W_E}{W_c}\right)E_Y$ (similar to the adjustment on the consumption benefits of the public project mentioned in the previous subsection) both as an offset to the productive benefits of the public project and as an offset to the disincentive effect of the project and its financing.

Secondly, consider

$$\eta^{WE}\eta^{EA}/A >, < \eta^{Wc}/c \qquad (25')$$

which is the condition determining whether an increase in abatement A yields positive or negative net benefits (equivalent to whether A is under- or over-provided) for welfare maximization, while (25) is the corresponding condition for preference maximization. One may reasonably argue that, due to the long-term nature of the effects of abatement (not to mention its global public-good nature, at least to some extent), myopic governments usually under-spend on abatement even according to the objective of preference maximization. However, for the present purpose, we may suspend pursuing this point and suppose that abatement is optimized in accordance to preference maximization. In other words, condition (25) is satisfied with equality. Then, even in the absence of under-perception of the benefits of environmental quality (provided that there is no over-perception, i.e., $W_E \geq U_E$), we may conclude from the comparison of (25′) and (25), that abatement will be under-provided from the welfare point of view in the presence of excessive consumerism. Going back to (24) and (24′), this in turn means that, if a project (together with its financing) results in a higher/lower level of abatement, positive/negative net benefits will accrue and should be taken account of accordingly.

We may summarize the results of this subsection into two propositions.

Proposition 5. *In the presence of environmental disruption, either for utility or welfare maximization, (a) The productive benefits of a public project have to be offset by the environmental disruption effect of higher production. (b) The indirect cost of the project through the disincentive effect and the existing tax rate has to be offset not only by the effect through the relative-income effect but also by the environmental disruption effect. (c) Either when abatement expenditures are held constant or when the tax rate and abatement proportion are being optimized, the direct costs of the project do not have to be adjusted to account for the effects on abatement. In other cases, the direct costs may have to be adjusted downward/upward (upward/downward) if abatement is increased (decreased) by the project inclusive of its financing, if abatement yields positive net benefits at the margin. The reverse is true if abatement yields negative net benefits.*

Proposition 6. *(a) In the presence of excessive consumerism, for a cost-benefit analysis aimed at welfare maximization, not only the consumption benefits of a public project (discussed in Proposition 4) but the environmental disruption effects (discussed in Proposition 5) have also to be similarly adjusted upward. (b) If a project and its financing results in an increase (decrease) in disruption abatement, it is likely to generate positive (negative) net benefits, as abatement is likely to be under-provided from the welfare viewpoint.*

6 Concluding remarks

All economists are familiar with the following simple point. As production or income is not the ultimate thing we value, an increase in GNP (even in real and per capita terms) may not be desirable, as a high enough decrease in leisure and/or increase in environmental disruption may offset the benefits of the increase in GNP. So modern economists are willing to go beyond production to the level of preference. However, preference is also not what we really ultimately value. As I argue above and elsewhere (Ng 1999), what we really ultimate want is welfare or happiness. Thus, a Pareto improvement in terms of preference may similarly be undesirable if happiness decreases. Individuals of inadequate knowledge, faulty telescopic faculty, and imperfect rationality (including the animal spirit of the accumulation instinct and the inadequate recognition of adaptation effects), and amplified by the influence of our competitive and commercial society, may all be eagerly engaged in the rat race of making more money without really increasing happiness. (This possible and deplorable result is also related to the external effects on each other.) Thus, whether economic growth increases happiness and what public policies increase happiness are truly the most important questions that economists should try help answering.

If it could be established more reliably that further increases in private consumption do not increase happiness socially, funding for public projects may be costly in money terms but not in happiness terms. Since happiness is

more fundamental, this has profound implications for policy. Among others, funding for public projects that can increase happiness (such as in environmental protection, education, and research; clearly much of government spending is not on public **goods**) may be worthwhile even at very high monetary costs. In fact, Di Tella and MacCulloch (2000) find some positive correlations between government consumption and happiness but Veenhoven (forthcoming) finds no correlation between government spending on social security benefits and happiness. Putting the two pieces of evidence together, it seems that government spending on public goods (which accounts for the bulk of the difference between government consumption and social security benefits) should correlate even more positively with happiness. (I was tempted to regress this but feel that I should leave it to unbiased researchers.) If we take into account the global public-good and long-term nature of spending on such items, we may see that an international concerted increased spending on these items may well be most welfare-improving, as consistent with Easterly's (1999) results mentioned above. This does not negate the existence of gross inefficiency in public spending. (See Tanzi and Schuknecht 2000 for the argument that public spending in most large-government countries may be significantly reduced without reducing social well-being.) However, the inefficiency in public spending may in fact increase the optimal size of public spending (Ng 2000, Sect. 8.2.)

In fact, as argued by Kaplow (1996) and Ng (2000), even just on dollar terms, the true costs of public spending have been much overestimated by economists. Economists emphasize the excess burden of taxation (including disincentive effects), ignoring the largely offsetting benefits on the spending side in increasing incentives and the corrective nature of taxation due to the increasingly important relative-income effects (though discussed as early as 1834 by Rae), diamond-goods effect (Ng 1987), and environmental disruption effects of most production and consumption.

While agreeing with the importance of excessive consumerism, relative-income effects, and environmental disruption effects, a commentator suggests that all that is needed is 'a corrective income tax ... with the proceeds distributed in lump-sum form'. (It has in fact been proposed that higher taxes on income or consumption may be used to take account of the effects of relative status; see Akerlof 1976, Frank 1999, Ireland 1998, 2001). To see why this may be insufficient, consider the case where the elasticity of substitution between income/consumption and leisure is very low. (This is also likely to be realistic as many people are willing to work, in the long run, about 6–8 hours a day over a wide range of pay even abstracting away the income effect. Such hours of work may be the 'necessity of life'. Note the happiness studies showing that the unemployed are ways more unhappy than accounted for by the loss of incomes.) Then the higher tax rate plus the transfer will only reduce work/income/(private)consumption marginally. If we continue to use the traditional cost-benefit rules based on preferences (which are distorted by the accumulation instinct, relative-income effects and advertising), we continue to believe that most public projects are not worth the money. Then private con-

sumption, production, and environmental disruption remain high, but welfare remains low. (This may explain why compulsory working hours may be desirable.) But it may really be certain public projects that can really increase welfare. Secondly, using only a higher tax rate misses out the distinction between the consumption benefits of public projects, which should be adjusted upward by the degree of excessive consumerism, and the productive benefits which should not be so adjusted (Proposition 4 above) and some intricate interrelationships of relative-income effects, disruption effects, and abatement effects both in the presence and in the absence of excessive consumerism (Propositions 4–6).

Due to the prohibitive costs of paternalism, I do not advocate that the government should directly attempt to interfere with the day-to-day activities of individuals, despite the existence of substantial ignorance and irrationality. That could be disastrous to a free society on which individual welfare so much depends. (Veenhoven 2000 shows the positive correlation between freedom and happiness. Frey and Stutzer 2000 show the positive correlation between democracy and happiness.) Also, where government spending is typically very inefficient or used in a way that is welfare-reducing (η^{WG} low or negative), the case for higher public spending may not be applicable. However, this does not mean that research on the divergence between welfare and preference may not contribute positively in practical matters. First, when individuals are aware of such divergences as discovered by research, they may adjust their preferences accordingly. For example, hopefully, they may put more emphasis on things that are really important for welfare and spend less time and resources on competitive (both interpersonally through the relative-income effect and intertemporally through the habituation, aspiration formation, and myopia effects) and largely fruitless consumption. Instead, competition on activities such as the discovery of new knowledge that have external benefits may be (and should be) encouraged. Secondly, our analysis suggests adjustments to cost-benefit analysis in general and on the importance of environmental protection in particular that could be taken account of without directly interfering with individual free choice. Public policies could be adjusted in the light of better understanding of the divergences between preference and welfare in areas where such adjustments do not impose significant costs of paternalism. However, a lot of more studies are needed, including making the measurement of happiness more accurate (Kahneman 1999) and more interpersonally and intertemporally comparable (Ng 1996a). Also, the recognition of imperfect rationality may help explain many widely used practices against free choice such as fluoridation and the prohibition of hard drugs and gambling. (This does not rule out the possibility that a reduction in such prohibition may be welfare increasing at least in certain cases.)

Using a representative individual approach, our analysis does not address the issues of income distribution and individual differences. Elsewhere (Ng 1979/1983, 1984), I have argued that, for any specific issue of economic policy or cost-benefit analysis, we should follow the principle of 'a dollar is a dollar', i.e., concentrating on efficiency only, without regard to distributional effects,

leaving the objective of equality to be achieved more efficiently through the general tax/transfer system. While the latter may have disincentive effects, the policy of trying to achieve equality at each specific issue also has similar disincentive effects (this point is usually ignored) but imposes additional distortions. This conclusion is derived assuming rational individual choice. In the presence of significant imperfect information and rationality, some adjustments may be needed. However, such adjustments are to achieve efficiency from the welfare viewpoint, not for equality as such. Nevertheless, if additional incomes are not very important in increasing welfare, it may be desirable to move more in the direction of equality in the general tax/transfer system. But this should not affect the applicability of the principle of 'a dollar is a dollar' on specific issues unless imperfect information and rationality cause specific biases on specific areas, possibly calling for adjustments (but see the next paragraph) for the purpose of welfare efficiency.

Using an analysis of welfare also allows us to tackle problems created by changes in preference (which are frequent and omnipresent; see Bowles 1998. In fact preferences may be changed by the conscious choice of the individual; see Ng and Wang 2001). Economists know how to compare different situations in terms of a given preference ordering of an individual. In the presence of preference changes, alternative situations cannot be compared using the standard tools of economic analysis. Some examples are the effects of advertising, education, social influences, etc. that necessarily change preferences. Since advertising changes preferences, standard methods cannot evaluate the desirability of advertising satisfactorily. (See, however, some alternative analyses by Becker and Murphy 1993; Brester and Schroeder 1995; Pollak and Wales 1992.) With changes in preferences, a satisfactory analysis regarding the desirability of relevant alternatives may still be possible if we can compare the levels of happiness or welfare before and after the change. Gintis (1974) emphasizes the endogeneity of preferences and the havoc it plays to the traditional welfare analysis. However, he realizes that the traditional analysis 'will not loosen its grasp on the minds of economists until a replacement is found' (p. 429). Analysing alternative sets of preferences and other factors on happiness is the replacement we need as happiness is our ultimate objective. With the recent interest on the study of happiness (as witnessed, among others, by the conference on 'Economics and the pursuit of happiness' at Nuffield College in 2000, a session on 'Economics and happiness' at the AEA 2001 Meetings, and the recent appearance of the *Journal of Happiness Studies*) and more interdisciplinary studies, some useful advances along this line may be possible.

Our analysis throws lights on the difference in views between most economists and the general public. For example, many economists (myself included before I formulated ideas of this paper) fail to understand why people are so much preoccupied with issues like unemployment and inequality. (On the importance of equality, rather than absolute income levels, for health and happiness, see Eckersley 1998, p. 15; Wilkinson 1997.) In many instances, the efficiency costs of certain measures like protective tariffs or quotas are many

times the entire incomes of all the protected employees. Even if it is true that the dismantling of protection will cause some transitory unemployment, it seems clearly inefficient to persist with the protection when we figure in terms of monetary gains and losses, with or without distributional weights. However, when we reckon in terms of happiness, the picture is less clear. As summarized by Winkelmann and Winkelmann (1998), the unemployed are extremely unhappy, ways beyond that could be explained by the reduced income levels. The frustration from failing to get a job and the resulting loss of confidence and self-esteem inflict a heavy toll on happiness much more than any gain from having more leisure. In a society where higher income/consumption levels have little effects on happiness socially, sacrificing an amount (shared by the whole society) several times the entire incomes of the relevant workers need not necessarily be a bad choice. I hasten to add that, the validity of this observation does not mean that the public may not be misguided, ignoring the secondary costs of protection and the efficiency gains of liberalization in the longer term. Thus, despite the validity of this observation, economists still have an important role to play to clarify these costs and gains. However, at least for some occasions, the choice may not be as clear-cut as most economists believe, reckoning in terms of monetary costs and benefits only. When we go to the deeper level of welfare on which we have less information, the picture becomes less clear. Due to this lesser degree of available information in terms of welfare instead of in terms of preferences and dollars, economists have a vested interest in denying either the existence of significant divergences between preference and welfare or the normative relevance of welfare. Working with just income or even preference is much easier, but welfare is really the ultimately important thing. The existence of significant divergence between preference and welfare is also difficult to deny. Economists should face the challenge despite the difficulties. Economists are not born to live an easy life!

Methodological Appendix
Comparative statics without the differentiation of first-order conditions

It is well known that a, if not the, crucial step in a comparative statics analysis is the total differentiation of the first-order conditions. It is thus not surprising that a referee regarded the comparative statics of the text as incorrect, as the first-order condition (4) is not totally differentiated and the resulting equation used in the analysis. However, this appendix shows that this method is in fact correct for the purpose of this paper. This method may have much wider applicability as the total differentiation of first-order conditions may not be manageable in many complicated models and as such differentiation may not be needed for certain problems. For simplicity, I will illustrate the point using a model much simpler than the one in the text – the familiar textbook case where the utility of the individual depends only on consumption c and leisure x.

$$U = U(c, x) \tag{A1}$$

$$c = (1 - x)p \tag{A2}$$

The maximization of (A1) subject to the budget constraint (A2) gives the first-order condition (the equation of the MRS to the wage rate or productivity level p)

$$U_x/U_c = p \tag{A3}$$

where a subscript denotes partial differentiation.

The normal comparative-statics analysis with respect to w as the exogenous parameter is to totally differentiate both the budget constraint (A2) and the first-order condition (A3), giving

$$p\,dx + dc = (1 - x)\,dp \tag{A4}$$

$$(U_{xx} - pU_{cx})\,dx + (U_{xc} - pU_{cc})\,dc = U_c\,dp \tag{A5}$$

Rewriting (A4) and (A5) in matrix-vector form and solve by Cramer's rule to give

$$dx/dp = [U_c - (1 - x)(U_{xc} - pU_{cc})]/D \tag{A6}$$

$$dc/dp = [(1 - x)(U_{xx} - pU_{cx}) - pU_c]/D \tag{A7}$$

where $D \equiv U_{xx} - pU_{cx} - pU_{xc} + p^2U_{cc}$ is negative from the second-order condition. This is the normal comparative statics manipulation which may be used to sign or evaluate the effects of a different set of values for the exogenous variables (p in the current example) on the endogenous variables (x and c). For such purposes, the total differentiation of the first-order conditions is necessary, as the resulting equations define the combined changes in the endogenous variables that continue to satisfy the first-order conditions which remain satisfied before and after the change in the exogenous variables.

However, the purpose of the exercise in the text is not to evaluate the effect of p on c and x, but on U. In the example here, the method used in the text is to differentiate U with respect to p to obtain

$$dU/dp = U_c(dc/dp) + U_x(dx/dp) \tag{A8}$$

which must be valid in the analysis here as U depends only on c and x. Next, the budget constraint (A2) is differentiated with respect to p to obtain

$$dc/dp = 1 - x - p(dx/dp) \tag{A9}$$

the substitution of which into (A8) gives

$$dU/dp = (1 - x)U_c \tag{A10}$$

or in proportionate terms after multiplication with p/U,

$$\sigma^{Up} = \eta^{Uc} \tag{A10$'$}$$

where $\sigma^{ab} \equiv (da/db)b/a$ and $\eta \equiv (\partial a/\partial b)b/a$ for all a, b. (A10$'$) is the counterpart of equations like (6) in the text for our simplified model here. To see

that this method of obtaining equations like (A10) or (A10′) and (6) is valid, we may note that we will obtain exactly the same equation (A10) if we use the conventional method of total differentiation of the first-order equations to obtain (A6) and (A7) and substitute them into (A8). We may also show that (A10) and (6) are valid by using the envelope theorem. However, while we may use the envelope theorem to derive (A10) and (6), we cannot use it to derive equations like (13). This is so because an individual chooses x to maximize U at the individual level, allowing the use of the envelope theorem, but the society does not choose x to maximize U at the social level, precluding the use of the envelope theorem. The individual optimum for x differs from the social optimum due to the presence of external effects through the relative-income, revenue generation, and environmental disruption effects, as discussed in the text. Since the use of the envelope theorem is precluded, and since the total differentiation of the first-order conditions gives rather complicated results difficult to handle, our method provides a simple way to derive some results that may be useful for many cases. In (13), the result depends on the value of σ^{XP}. It may thus be regarded as incomplete in a certain sense. However, even if we go through the total differentiation, the effect of a change in P on X is still indeterminate in sign, depending on the balance between income and substitution effects. Thus, we really lose nothing in comparison. The basic message of this appendix may be summarized as

Proposition A. *The differentiation of the first-order conditions may not be needed in a comparative static analysis that evaluates the effects of some exogenous change on variables (such as utility in the example above) other than the decision variables (such as consumption and the hours of work/leisure) directly involved with the relevant first-order conditions.*

Ng and Yeh (forthcoming) provide a more general proof of this proposition.

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