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Attitudes to Income Inequality: Experimental and Survey Evidence

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ABSTRACT

Attitudes to Income Inequality: Experimental and Survey Evidence[1]

We review the survey and experimental findings in the literature on attitudes to income inequality. We interpret the latter as any disparity in incomes between individuals. We classify these findings into two broad types of individual attitudes towards the income distribution in a society: the normative and the comparative view. The first can be thought of as the individual's disinterested evaluation of income inequality; on the contrary, the second view reflects self-interest, as individual's inequality attitudes depend not only on how much income they receive but also on how much they receive compared to others. We conclude with a number of extensions, outstanding issues and suggestions for future research.

JEL Classification: C91, D31, D63, I31

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[1] Chapter 14 of the *Handbook of Income Distribution,* Volume 2A.

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1. Introduction

A number of areas of research in Economics might sometimes be thought not to pass the '*So What?*' test: Do we really care about this issue? This would not seem to be the case for inequality, which looks like it passes the test with flying colours. Income inequality might be thought to occupy something like the same kind of place in the Economic Pantheon as unemployment: it is almost taken as an axiom that it is a bad thing.

Given this sense of unanimity, it might seem to be churlish in the extreme to want to write a chapter about individuals' attitudes to inequality: surely they are negative aren't they? We believe that the situation is not quite as simple as might be imagined. First, we have to ask the rather fundamental question of what we mean when we talk about income inequality, and then why would we expect any measure of such inequality to be correlated with individual well-being. Following on from this setting-out of the scene, there are a number of open questions. Is inequality equally bad for everyone? And on an extremely practical level, how can we tell? Last, the term inequality is used perhaps rather loosely in the empirical literature. It is of interest to ask which measures of the distribution of income are the most important (to individuals) in this context: is it (as is commonly assumed) the Gini coefficient, or rather something else? As we will discuss below, recent work using experimental and survey methods has allowed considerable progress to be made in answering some of these questions.

To set the stage, we first ask under which circumstances others' incomes should affect my own well-being.[2] We use the term income inequality to refer to any disparities in incomes between individuals (i.e. there is income inequality when some individuals have different incomes than others). As opposed to many of the other variables that have been related to individual well-being, the distribution of income does not exist at the individual level: income inequality is rather measured only at an aggregate, often societal, level. The key axiom in the measurement of inequality is the Pigou-Dalton principle of transfers, according to which inequality increases whenever a transfer of income from a poorer to a richer individual takes place.

We believe that people do indeed have preferences over inequality. It is helpful to consider two broad types of individual attitudes to the distribution of income in a society. The first can be thought of as the individual's disinterested evaluation of income inequality: if I see

[2] We limit ourselves here to discussion of individuals' evaluations of the inequality of income. Inequality in the distribution of other variables is of course of interest as well, including that of subjective well-being (as in Clark *et al*., 2014).

two distributions of income in some society, which do I believe is better? We will below call this the normative evaluation of inequality.

In addition to this disinterested reaction to income inequality, the individuals who we analyse when we carry out experimental or survey analysis do actually live in the society in question: their own income then forms part of the income distribution in which we are interested. This second inequality effect is at the individual level: income inequality will directly impact both the absolute income that individuals receive, and how much richer and poorer they are compared to others. The attitude to inequality here is not disinterested but rather self-interested, with the additional assumption that individuals care not only about how much income they receive but also about how much they receive compared to others. We will below call this the comparative evaluation of inequality.

The effect of the distribution of income on individual well-being will likely run through both of these channels. Even though income inequality as such in a society is not an individual-level concept, any distribution of income will have individual-level effects due to the way in which it changes the individual's own income and their standing with respect to those who are richer and poorer, as will be discussed below.

In the context of relative standing or comparisons, individual attitudes to inequality will depend critically on the *reference group* that the individual has in mind. This term was first used by Hyman (1942) in work on the evaluation of the rankings that individuals assign to themselves, and refers to the group or individuals to which or whom they compare themselves for the purpose of self-appraisal. The term has subsequently been refined and expanded in numerous contributions across the social sciences, with various definitions of the term now being proposed. Kelley (1952) distinguishes between two roles that any such reference group can play, and hence proposes separate definitions of the *comparative* and *normative* reference groups.

The first of these, the *comparative* reference group, is in the spirit of the original interpretation given by Hyman whereby the reference group acts as the standard of comparison for self-appraisal. The *normative* reference group is the source of norms, attitudes and values of the individuals concerned. Both groups can be further distinguished according to whether the individual in question *is* or *is not a member* of the reference group. Reinterpreting Shibutani's (1955) proposed conception of the terms, a comparative reference group is the point of comparison allowing the individual's own status to be calculated when the individual is part of the group (as in Hyman). However, the individual need not (yet) be part of the reference group. When the individual is not part of the group, but aspires to be, the

reference group acts as a relative aspiration, that is as the group of which the individual desires to be a member. A normative reference group is that whose perspectives constitute the frame of reference for the individual, and again a distinction between membership and non-membership can be effected. In the latter case, individuals may adopt the behaviour of the group as a result of anticipatory socialization (see Merton and Kitt, 1950).

Regarding the subject matter of the current chapter, the reaction of an individual to income inequality will depend on both the role assumed by the reference group and her membership status in the group. In a comparative reference group, of which the individual is a member, individual well-being is commonly assumed to be negatively affected by those who earn more than the individual, but positively affected by those who earn less. We say that the individual experiences *relative deprivation* from the income gaps with respect to those who are richer than she is in the reference group, but *relative satisfaction* from the income gaps with respect to those who are poorer. Both *relative deprivation* and *relative satisfaction* will very likely depend on the degree of income inequality within the reference group.

Comparative reference groups may also matter even if the individual is not currently a member of the group. If the individual aspires to be part of the group in question, then comparisons with respect to richer individuals in the group may give rise to positive feelings, as the individual anticipates being as rich as the group members once they join the group. This idea of a comparative reference group to which the individual aspires is akin to that of the tunnel effect in Hirschman (1973), which will be referred to in Section 2.1 below.

The rationale behind this comparative view of reference groups is that one's own position relative to others matters. We do not imagine that this is the only way in which others' outcomes may be viewed by the individual. It is very likely indeed that some groups will not be considered comparatively, but instead viewed with some kind of extended sympathy. The individuals to whom one compares and those for whom one feels sympathy are probably not going to be the same. As such, we may well see individuals whose position relative to their neighbours or work colleagues is paramount, but who at the same time vote for social programmes for those in need or give money to international charities. Here individuals have a preference for making some others better-off. We will explore this idea of empathy or altruism a little more in Section 4.4.

As opposed to the comparative view of reference groups, inequality in the normative view of reference groups is evaluated by the individual irrespective of where she appears in the distribution, or even irrespective of whether she appears in it at all. Concretely, a given distribution of income will be evaluated in the same way by an individual regardless of

whether she is in the top or bottom quartile of the distribution, so that there is no role for comparisons to the richer and poorer in the normative reference group. Equally, we can all now have a normative opinion about the distribution of income in our own countries in the 19th Century, even though we do not appear in that distribution ourselves. The normative evaluation of an income distribution can also be thought of as a mirror of preferences over inequality under the veil of ignorance (where the individual does not know where she will eventually be situated in the distribution).[3]

Both the normative and comparative view of income inequality will likely depend on how the distribution of income came about. We expect individuals to be more tolerant of the income gaps that result from effort than those that come about by luck. We will consider some of the work on the fairness of the income distribution further in Section 4.3 below.

The remainder of this chapter is organised as follows. Section 2 below considers empirical evidence for an impact of income inequality in the context of a comparative reference group. We appeal to two different ways via which we can evaluate whether income inequality does indeed reduce the well-being the individuals who are exposed to it. The first approach relies on various measures of subjective well-being as proxies for individual utility: these are used to establish whether income disparities are indeed significantly associated with measures of individual well-being (such as happiness or life satisfaction).[4] The second is to see whether individuals behave as if they wish to avoid income inequality. This is tantamount to a revealed-preference argument. As it is anything but obvious to obtain clean measures of behaviour and match these to income inequality in the field, we turn to experimental techniques in the laboratory to make progress here. Section 3 then follows the same structure, but this time with respect to the normative evaluation of income distributions. We propose a number of extensions, outstanding issues and suggestions for future research in Section 4. Last, Section 5 concludes.

[3] Considering only the level of one's own income, a richer-than-mean-income "impartial observer" will be more inequality-averse when she is not involved in the distribution of income (this is the pure normative preference) as compared to the case in which she is present in it.

[4] This kind of subjective well-being literature has grown very quickly over the past couple of decades. As an example, all three of the top-cited articles published in the *Economic Journal* over the past 20 years have the word "happiness" in their title.

2. The comparative view

When the reference group is viewed comparatively, individuals are not indifferent to others, and compare to them in order to evaluate their own status in society.[5] If the individual is a member of this reference group then higher incomes for others will reduce her well-being, while lower incomes have the opposite effect. Alternatively, if she is not in the reference group, but would like to be, then others' higher incomes will have a positive effect on her well-being. In both cases income disparities amongst others will be correlated with individual well-being.

We first consider evidence for the importance of such comparisons to others based on the measures of subjective well-being that are by now commonly available in many sources of survey data, before turning to the complementary work in experimental economics.

2.1 Subjective well-being and others' income

Arguably inspired by the salience of the Easterlin paradox[6] (Easterlin, 1974), and the increasing availability of information on various measures of subjective well-being in large-scale (including panel) datasets, there is by now quite a considerable stock of work on the relationship between income and well-being. One of the key questions in this literature has been '*Does money buy happiness*'? In standard economic theory, individual utility is not supposed to be affected by the behaviour or income of others, unless these latter impose an externality on the individual.

In the context of the comparative reference group evoked above, however, the incomes of others in the reference group do indeed impose just such an externality. An increase in the income of others reduces the individual's well-being, through either greater relative deprivation or lower relative satisfaction (depending on whether the others whose income rises earn more or less than the individual in question), while analogously a reduction in others' income increases the individual's well-being.

[5] Very generally, an individual's perception of inequality may depend on where she stands in the income distribution. An early contribution in this respect is Van Praag (1977).

[6] This paradox is based on an opposition of the cross-section and time-series estimates of the relationship between subjective well-being and income. At any point in time, richer individuals are typically happier than poorer individuals. But as per capita GDP rises over time, Easterlin suggested that average subjective well-being remains flat in many countries. The extent to which subjective well-being is actually flat over time is the subject of quite heated debate (for example, Stevenson and Wolfers, 2008, and Easterlin *et al*., 2010). The comparison of my income or consumption to that of others (or to myself in the past) has often been proposed as an explanation for this paradox.

There are any number of ways of attempting to show that individual well-being depends negatively on others' income. These were surveyed in Clark *et al*. (2008), and as such the current section will only provide a shorter run-through of some of the relevant findings. Of course, comparisons need not be restricted to income, and may well refer to comparisons of consumption, as initially suggested by Veblen (1949) and demonstrated empirically by, amongst others, Bloch *et al*. (2004), Brown *et al*. (2011) and Heffetz (2011). Comparisons could also cover leisure (Frijters and Leigh, 2008) or arguably almost any other observable economic attribute.

Some of the empirical work on the comparison of income has used a revealed-preference approach, in which observed measures of labour supply or consumption are argued to be more consistent with a relative utility function, in which either income or some consumption goods are compared to those of others in the reference group. A number of pieces of evidence along these lines can be found, for example, in Frank (1999), Layard (2005) and Schor (1992).

It is always difficult to convince sceptics that any such correlations do indeed reflect spillover effects within the utility function, rather than learning, a hidden common factor within the reference group, or endogenous selection into the reference group. The tightest evidence in this respect may well come from natural experiments, in which either reference group income or consumption randomly changes. A small number of these experiments are described below.

Card *et al*. (2012) appeal not to expected outcomes but rather the revelation of information on others' earnings. The natural experiment here is a court decision that made the salary of any California state employee public knowledge. A local newspaper set up a website making it easy to find this information. Following this website launch, Card *et al*. informed a random subset of employees at three University of California campuses about the site. Some days later, all employees on the three campuses were surveyed. Comparing those in the treatment group (informed about the website) to others reveals the impact of information regarding others' salaries. The reference group in this work was defined as co-workers in the same occupational group (faculty vs. staff) and administrative unit in the university. Finding out about others' earnings should reduce the well-being of those who find themselves to be relatively less well-paid than others in the reference group, and increase it if they find themselves to be better paid. The survey did indeed find lower job satisfaction for those with pay below the reference group median and a greater intention to look for a new job. The effect on both of these variables for those who were relatively well-paid was insignificant. There is

in addition some evidence of an actual quitting effect on those who were found to be in the bottom earnings quartile in the reference group.

Kuhn *et al*. (2011) consider observed large changes in close neighbours' incomes, which result from the design of the Dutch postcode lottery. Each week, this lottery randomly selects a postal code, and allocates a prize of €12,500 per lottery ticket purchased within the postcode. In addition, one participating household in the winning postcode receives a new BMW. These postcodes are small, comprising on average about 20 households. Individuals who do not live in the winning postcode area, and those who do but did not buy a ticket, receive nothing. Households in winning postcodes were surveyed six months after the prize was won. One of the paper's key findings is that lottery non-participants in winning postcodes (who live next door to winners) are significantly more likely to have purchased a new car since the date of the lottery draw than are other non-participants, as if individuals do indeed compare their own car to that of their near neighbours.

A last example of a natural experiment is one in which comparisons to a reference position or an expectation (rather than comparison to other individuals) affect observable behaviour (rather than subjective well-being). In New Jersey, police unions bargain over wages with their municipal employer and, in cases of dispute, an outside arbitrator has the final say. Mas (2006) finds that the per capita number of crimes solved (cleared) is 12% higher when the unions win their case compared to when they lose. He concludes that "*the change in performance of police officers following an arbitration loss depends not only on the amount of the pay raise, but on the counteroffer that was demanded but never implemented as well*" (p.785).

Natural experiments of this kind are relatively rare. A great deal of work has instead appealed to survey data, and modelled subjective well-being as a function of both the individual's own income and the income of a plausible reference group. This latter reference group is almost always imposed by the researcher as some measure of the income earned by those who are of the same age, sex and education, for example, or who live in the same region, or (in the case of linked employer-employee data, as in Brown *et al*., 2006, and Clark *et al*., 2009*b*) who work in the same firm. Direct information on who is in the individual's reference group in survey data is very rare (an exception is Clark and Senik, 2010).

Some of the by now large body of empirical literature is surveyed in Section 3.1 of Clark *et al*. (2008). For the income of 'people like you', Clark and Oswald (1996) use the first wave of British Household Panel Study (BHPS) data to show that the estimated coefficients on income and others' income in a job-satisfaction equation are statistically equal and

opposite, which is compatible with the Easterlin paradox. An early contribution by Cappelli and Sherer (1988) considered workers in the airline industry. The authors appeal to an occupational definition of others' earnings, and show that individual pay satisfaction is negatively correlated with an outside 'market wage', which is average pay by occupation in other airlines. Ferrer-i-Carbonell (2005) relates life satisfaction in the German Socio-Economic Panel (SOEP) to average income defined by sex, age and education; Luttmer (2005) also considers life satisfaction, which is shown to be negatively correlated with average income by local area identified in a number of waves of the US National Survey of Families and Households.

Instead of modelling reported subjective well-being as a function of own and others' income, an alternative is to ask how much income individuals need to attain a certain level of well-being. This is the method used in the Welfare Function of Income, associated with the Leyden school in the Netherlands. In this project, individuals are asked to assign income levels (per period) to a number of different verbal labels (such as "excellent", "good", "sufficient" and "bad"). It is then possible to estimate an individual lognormal 'Welfare Function of Income' using the responses for each individual: this function shows how much income each individual needs in order to hit a certain level of well-being. The estimated means (μ_i) of these lognormal functions can then be used as the dependent variable in regressions seeking to explain which types of individuals require a higher level of income in order to be satisfied. The mean μ was found to be positively correlated with reference-group income (average income by age, education and certain other individual or job characteristics): see Hagenaars (1986) and Van de Stadt *et al*. (1985). In other words, when the income of the reference group is higher, individuals need more money to attain a certain stated level of utility.

To date we have discussed empirical results that are consistent with a comparative reference group of which the individual is a member. The discussion in Section 1 above revealed a possible counteracting effect when incomes rise in a comparative reference group to which the individual aspires, but of which she is not yet a member. Some work has indeed found that individual well-being is *positively* correlated with reference group income, and has attempted to interpret this correlation in the light of aspirations and future outcomes. A positive correlation between my own well-being and others' income is consistent with Hirschman's tunnel effect, where others' earnings provide information about my own future prospects. In the terminology of Manski (2000), these are expectations interactions, where the individual updates their information set based on others' outcomes. The tunnel effect relates to

the literature on the 'prospect of upward mobility' (POUM), where both current and future income matter. This will be discussed further in Section 4.3 below.

Clark *et al*. (2009*b*) make the point that the estimated coefficient on others' earnings in a typical subjective well-being equation will likely mix together the comparison element (comprising relative deprivation and relative satisfaction, as discussed above) and the relative aspiration effect of the group to which the individual aspires. In the associated literature, this latter is often called an information or signal effect (whereas the former is called a jealousy or status effect). Positive subjective well-being effects from others' income are found, for example, in Senik (2004), Kingdon and Knight (2007) and Clark *et al*. (2009*b*). In each of these, the case can be made that the retained measure of others' income contains some element of my own likely future outcomes: an information or aspiration role for others' income is more likely the greater my probability of accession to the reference group in question. As will be discussed in Section 3.1 below, the inversion in the correlation between satisfaction and overall income inequality in Grosfeld and Senik (2010) in Poland can be interpreted in the light of such a tunnel effect. Individuals were initially happy with others' higher incomes (towards the top end of the income distribution), as this was thought to reflect their own future opportunities. Once it became clear that only relatively few people were actually going to be able to accede to these incomes, the correlation with satisfaction became more comparative, with a net negative effect in the later years of their sample.

Before describing the results of this literature any further, it is useful to set out the models of income comparisons formally. There is a fixed set $N = \{1, \dots, n\}$ of $n \geq 2$ individuals whose incomes are recorded in an income distribution $x = (x_1, \dots, x_n) \in \mathbb{R}^n_+$, where $\mathbb{R}^n_+$ is the set of *n*-dimensional vectors with non-negative components. The mean of *x* is $\lambda(x)$. For $x \in \mathbb{R}^n_+$, $B_i(x) = \{j \in N | x_j > x_i\}$ is the set of individuals with income greater than that of *i*, known as the Better-off set; analogously, $W_i(x) = \{j \in N | x_j < x_i\}$ is the set of individuals who have an income which is lower than that of *i*, the Worse-off set.

In the income-distribution literature, the most significant role of relative standing is in the determination of deprivation and satisfaction, which is related to inequality measurement as we will see below. As opposed to measures of income inequality, deprivation and satisfaction are defined at the individual level and aim to capture individuals' reactions when they compare their situation to that of others who have different levels of income (or of some other variable). Deprivation "*involve(s) a comparison with the imagined situation of some other person or group. This other person or group is the 'reference group', or more*

accurately the 'comparative reference group'" (Runciman, 1966, p. 11). In this literature, it is generally assumed that the reference group is the entire society.

The definition of relative deprivation adopted is the following: "*We can roughly say that [a person] is relatively deprived of X when (i) he does not have X, (ii) he sees some other person or persons, which may include himself at some previous or expected time, as having X (whether or not this is or will be in fact the case), (iii) he wants X, and (iv) he sees it as feasible that he should have X*" (Runciman, 1966, p.10). When we consider income as the object of relative deprivation, which is the *X* in the above citation, then individual deprivation is simply the sum of the gaps between an individual's income and the incomes of all individuals richer than her.

Formally, Hey and Lambert (1980) specify the deprivation felt by someone with income x_i with respect to a person with income x_j as:

$$\begin{aligned} d_i(x) &= (x_j - x_i) && \text{if } x_i < x_j \\ &= 0 && \text{else} \end{aligned}.$$

In this case, as also suggested by Yitzhaki (1979), the deprivation function of an individual with income x_i is the sum of all the gaps to those in the better-off set divided by the number of individuals in the society:

$$D_i(x) = \sum_{j \in B_i(x)} \frac{x_j - x_i}{n}.$$

Aggregate deprivation, that is deprivation at a societal level, is then given by the average value of all of the individual deprivations. This aggregate deprivation turns out to the absolute Gini coefficient, which is given by the most popular index of income inequality (the Gini coefficient) multiplied by mean income.

Following on from these early contributions, Chakravarty (1997) proposed the inclusion of mean income in the measurement of individual deprivation. The latter now becomes the gap as a fraction of mean income, $d_i(x)/\lambda(x)$. This normalization is argued to be more appropriate for the comparison of the same society at different points in time, or different societies. When we use this formulation, aggregate deprivation is equal to the Gini coefficient, which is the absolute Gini index divided by mean income.

Analogously, income can be compared to those who are poorer than the individual in question, i.e. those who are in the worse-off set. This comparison yields the relative satisfaction function of an individual with income x_i, $S_i(x)$, given by:

$$S_i(x) = \sum_{j \in W_i(x)} \frac{x_i - x_j}{n}.$$

These measures of deprivation and satisfaction are called disadvantageous and advantageous inequality in Fehr and Schmidt's (1999) utility function. On this point Runciman (1966, p.9) writes: "*If people have no reason to expect or hope for more than they can achieve, they will be less discontent with what they have, or even grateful simply to be able to hold on to it. But if, on the other hand, they have been led to see as a possible goal the relative prosperity of some more fortunate community with which they can directly compare themselves, then they will remain discontent with their lot until they have succeeded in catching up*".

While Fehr and Schmidt imagine that individuals are averse to both kinds of inequality, in the income-distribution literature it is most often implicitly assumed that individual well-being depends negatively on relative deprivation but positively on relative satisfaction. One of the main reasons for individuals not being inequality-averse, as will be set out in the following section, is that real income is not manna from heaven, and how that income comes about matters for individual attitudes.

This same concept of deprivation, which is at the core of the Gini coefficient, is also found also in the literature of polarisation (see Chapter 6). Deprivation is there called alienation. In general, alienation is assumed to be symmetric, while only the comparison to better-off individuals matters for deprivation. The interaction between alienation and identification is at the basis of the measure of polarisation proposed by Esteban and Ray (1994). Bossert *et al*. (2007) reinterpret alienation and (the lack of) identification in terms of deprivation in a multivariate setting where functioning failures are analysed. In this setting, individual deprivation is a multiple of the product of the share of agents with fewer functioning failures than the agent under consideration (the lack of identification) and the average of the functioning-failure differences between the individual and those who are better off (the alienation component).

The empirical subjective well-being literature described in this sub-section has arguably made a key contribution in reminding social scientists (and maybe especially economists) that

there are spillovers in individual income. The more you earn, the less happy I am, if you are in my reference group. Unless you are in a reference group to which I aspire, in which case my subjective well-being may well be higher (your position today provides me with an idea of what I can aspire to tomorrow).

The news is not only good, however. It can be argued that there are a number of drawbacks in this literature. In particular, the pertinent reference group is only a guess at who really matters in terms of the individual's own specific group that matters for income comparisons. In almost all cases, the best that we can do is use a series of likely reference groups and show that the effect of others' incomes seems to be consistent across them. An arguably useful piece of additional information comes from the identification of reference groups to which the individual aspires (for which there is an information or signal effect): we expect the correlation between individual subjective well-being and others' income in these groups to be less negative, or even positive. Even so, in both cases we can only guess at the correct reference group, with obvious implications for the accurate measurement of the relevant income gaps. As noted earlier in this sub-section, we practically never ask individuals about their comparative reference group, and have to our knowledge never asked about the reference group to which the individual aspires.

In the context of contributing to the analysis of relative deprivation and relative satisfaction described above, this literature has also not been an overwhelming success. Almost every paper here appeals to one single measure of the centrality of others' incomes, independently of whether the individual in question finds herself above or below that level. As such, there has been little attempt to distinguish relative deprivation from satisfaction.[7] Equally, knowing both my own income and the mean (or median) of my reference group income actually tells me fairly little about the gaps between me and others. Someone who has an income of 1000 Euros above the mean or median reference-group income, say, can have widely-varying values of relative deprivation and relative satisfaction.

The set of empirical subjective well-being work explicitly appealing to deprivation and satisfaction is not entirely empty. D'Ambrosio and Frick (2007) provide an empirical counterpart to the theoretical measures above by exploring the relationship between self-reported income satisfaction and relative deprivation. Using panel data from the SOEP, they

[7] One exception, which arguably does fall into the group of survey work on satisfaction, is Loewenstein *et al.* (1989). Here individuals evaluate a series of hypothetical scenarios involving disputes between two people, where they are told to assume the role of one of the individuals, and evaluate how satisfied they are with the final outcome in each situation. These satisfaction scores are shown to be related to both own and the other person's payoff. The correlation between satisfaction and advantageous inequality is much weaker than that with disadvantageous inequality.

show that subjective well-being depends more on a measure of relative deprivation than it does on absolute income, since the correlation between income satisfaction and absolute income is 0.357 while that between satisfaction and relative deprivation is larger in absolute value at -0.439. As predicted by the income-distribution literature, the effect of relative deprivation on well-being is negative. This finding holds even after controlling for other influential determinants of well-being in a multivariate setting. Cojocaru (2014*a*) also estimates an individual well-being regression as a function of advantageous and disadvantageous inequality in the reference group, using uses 2006 data from the Life in Transition Survey (LiTS). Disadvantageous inequality is associated with lower life satisfaction, but advantageous inequality is not significantly so.

Bossert and D'Ambrosio (2007) introduce time as an additional dimension in the determination of the level of deprivation felt by an individual. They suggest that, as is usual, an individual's feeling of relative deprivation today depends on a comparison with those who are better off today. They then propose an additional consideration: the feeling of deprivation relative to someone who has a higher income today is more pronounced if this someone was *not* better off than the individual in question yesterday. In other words, relative deprivation is more keenly felt relative to those who, between yesterday and today, have passed the individual in question in the income distribution. Individual relative deprivation in this framework is then determined by the interaction of two components: the average gap between the individual's income and the incomes of all those who are richer than her (this is the traditional way of measuring deprivation), and a function of the number of people who were ranked below or equal in the previous period's distribution but who are now above the individual in question in the current distribution. A similar modification can be effected for the measurement of relative satisfaction, with the latter rising with the number of people that the individual has passed in the distribution between yesterday and today.

In a similar spirit to Bossert and D'Ambrosio (2007), D'Ambrosio and Frick (2012) propose a utility function including dynamic-status considerations which is tested on SOEP data. Individual well-being, measured in the SOEP by individual income or life satisfaction, depends at time t on four different elements: (i) the absolute component, *i.e.* the standard of living of the individual at time t; (ii) the absolute dynamic component, *i.e.* how the individual's own income changed between $t-1$ and t; (iii) the relative component, which is the individual's income at time t compared to others' incomes at time t; and (iv) the relative dynamic component, which reveals how the result of the individual's income comparison in

(iii) changed between $t-1$and t. This utility function is a generalization of that proposed by Fehr and Schmidt (1999), with the addition of individuals' income histories.[8]

This separation of income comparisons into those with respect to richer and poorer individuals, and explicitly distinguishing the others who have passed (or have been passed by) the individual in question, can be argued to shed some light on the debate regarding the potential status and signal effects of comparison income.

Individual wellbeing being negatively affected by comparisons to those who are permanently richer (and positively affected by comparisons to the permanently poorer) is completely in line with the standard empirical findings in the literature on relative income. At the same time, the presence of newly richer and poorer individuals can be argued to play the informational role described in Hirschman's (1973) tunnel effect. Someone who is today richer than me, but was yesterday poorer than me provides me with a positive signal about my own future prospects. And indeed in the empirical application, D'Ambrosio and Frick (2012) show that individual satisfaction is positively correlated with the income today of such people. Analogously, the income gap with respect to those who are now behind the individual but who were ahead of her reduces the individual's satisfaction, which is consistent with a negative signal that the individual could well be one of this group tomorrow. Finding such an effect in an advanced stable economy such as Germany is new and perhaps unexpected, in that previous work in the literature had rather underlined the relevance of the tunnel effect in societies that were either volatile or in earlier stages of economic development.

The broad conclusion from this work, which is by now far too voluminous to be listed in detail, is that others' incomes often do play a role in determining my well-being. As the income of others to whom I compare rises, my well-being falls; but this status effect may be diminished or even entirely neutralised by a signal effect if what happens to others today informs me about what may happen to me in the future.

In general, however, the link between the formal models of income gaps (which are behind the measurement of inequality) and empirical work in the subjective well-being literature has been weak. The subjective well-being spillovers in society consist of a many-to-many mapping. As incomes in a society change, we both need to know who is affected by a movement in the income of individual *i*, and who is in individual *i*'s reference group. We then have to identify the nature of the relationship between each pair: relative deprivation, relative

[8] Senik (2009) uses 2006 LiTS data, covering 28 post-Transition countries (plus Turkey). She concludes that dynamic income comparisons (to oneself in the past) are more important than a number of other comparison benchmarks.

satisfaction, or rather aspirations? Put in this light, it is obvious that we are asking a great deal of the information that is contained in standard surveys, all of which contain significant lacunae in this respect. To complement our understanding of how my well-being depends on my comparison to your income, we turn to experimental economics, where all of the relevant parameters of the comparison process can arguably be controlled.

2.2 Experimental economics

Experimentalists appeal to the notion of interdependence in preferences to explain the behaviour of subjects who repeatedly violate game-theoretic predictions. Extensive surveys of work in this area can be found in Fehr and Schmidt (2003), Sobel (2005) and Camerer and Fehr (2006).

Interdependent preferences, that is preferences that depend directly on the situation of others, were modelled formally for the first time in the theory of consumer demand. The phenomenon whereby individual utility functions depend on other people's income or consumption is known generically as the relative income hypothesis (Duesenberry, 1949). This can be further differentiated into *Keeping up with the Joneses*, where the preference interaction with others depends on current consumption, and *Catching up with the Joneses* where it depends on lagged consumption. Leibenstein (1950) was the first to introduce demand functions that explicitly took into account the desire to be 'in style', bandwagon and snob effects, and conspicuous consumption. Since then the literature has advanced to a considerable degree of sophistication, exploring the implications of such preferences on the theory of asset pricing (Abel, 1990, Campbell and Cochrane, 1999, Galí, 1994), Pareto optimality (Collard, 1975, and Shall, 1972), the theory of optimal taxation (Aronsson and Johansson-Stenman, 2008, Boskin and Sheshinki, 1978, Dupor and Liu, 2003, Ljungqvist and Uhlig, 2000, and Abel, 2005), the determination of work hours (Bell and Freeman, 2001, Bowles and Park, 2005), public spending (Ng, 1987), and the allocation of resources in general (Fershtman and Weiss, 1993), amongst others. A theory of social interactions has been proposed using varying formulations, where preferences are either defined over general consumption goods or an individual's identity. See Becker (1974) and Stigler and Becker (1977) for the first group, and Akerlof and Kranton (2000) for the second. Sobel (2005) provides a thought-provoking discussion of the similarities and differences between these two strands of the literature.

Experimental work has made significant contributions to this area, in particular in considering the distribution of income across players, and distinguishing between doing better than others and doing worse than them.

2.2.1 Models of the distribution of income

The experimental economics literature fully incorporated distributional concerns into the utility function for the first time in Bolton (1991), with the modelling of *inequity* or *inequality aversion*. The two terms are very often used as synonyms in the literature to refer to the single phenomenon: that "*people resist inequitable outcomes; i.e. the fact that they are willing to give up some material payoff to move in the direction of more equitable outcomes*" as Fehr and Schmidt (1999, p.819), to whom the definition of inequity aversion is due, put it.

The effect of inequality clearly results from some comparison being made to the reference group. On this point Fehr and Schmidt (1999, p.819) continue by explaining that "*Inequity aversion is self-centered if people do not care per se about inequality that exists among other people but are only interested in the fairness of their own material payoff relative to the payoff of others*".

Fehr and Schmidt (1999) incorporate inequality into the individual utility function via the inclusion of all of the pairs of the differences between the individual's own income and others' incomes. Bolton and Ockenfels (2000), who refined the earlier work of Bolton (1991), propose an inequality-averse utility function which depends on the individual's own income and their share of the total income. The survey in Engelmann and Strobel (2007) compares these two approaches, together with that of Charness and Rabin (2002). Charness and Rabin's model is more related to social welfare than to inequality aversion, and will not be analysed in what follows: preferences in Charness and Rabin are a combination of the individual's own payoff and the payoff of the worst-off individual only.

Fehr and Schmidt (1999), who we henceforth call FS, propose a utility function for individual i, $i = 1, \dots, n$, which depends on the individual's own outcome, and the gaps to those in the better-off set and the worse-off set, as defined in Section 2.1 above:

$$U_i(x) = x_i + \alpha \sum_{j \in B_i(x)} \frac{x_j - x_i}{n} + \beta \sum_{j \in W_i(x)} \frac{x_i - x_j}{n} \qquad (1)$$

where $\alpha \leq \beta \leq 0$. In this formulation, the utility of an individual depends positively on their own income, but negatively on both their levels of disadvantageous inequality (the gaps to

those who earn more than them: the second term in (1)) and advantageous inequality (the gaps to those who earn less than them: the third term in (1)). According to Fehr and Schmidt, individuals dislike inequitable distributions. "*They experience inequity if they are worse off in material terms than the other players in the experiment, and they also feel inequity if they are better off. (...) (H)owever, we assume that, in general, subjects suffer more from inequity that is to their material disadvantage than from inequity that is to their material advantage*" (Fehr and Schmidt, 1999, p.822). As such, α is larger in absolute terms than is β.

In the approach taken by Bolton and Ockenfels (2000), individuals are motivated by both their own pecuniary payoff and their relative payoff standing. They propose a theory of Equity, Reciprocity and Competition (ERC) in which the individual utility function is given by $U_i(x) = U_i\left(x_i, \frac{x_i}{\sum_{j=1}^{n} x_j}\right)$. The derivative of U_i with respect to the second argument is non-monotonic, exhibiting a hump-shape. This utility function satisfies a number of properties and, in a two-player game, with player *i* and *j*, one example of such an additively-separable utility function is:

$$U_i(x) = a_i x_i + \frac{b_i}{2}\left(\frac{x_i}{x_i + x_j} - \frac{1}{2}\right)^2 \qquad (2)$$

where $a_i \geq 0, b_i < 0$. In equation (2), the utility of player *i* rises with her share of income when her share is under 50%, and falls with her share when this share is over 50%.

In most experiments, these two models (FS and ERC) yield similar predictions. However, the predicted outcomes can differ for games where there are three or more players, since ERC is not sensitive to all of the inequalities in payoffs. In the ERC formulation, individuals want the average payoff of others to be as close as possible to their own but do not dislike the presence of richer and poorer individuals *per se*; in Fehr and Schmidt, individuals dislike inequality in all of the outcomes. The experiment conducted in Engelmann and Strobel (2000) is designed to compare the performance of these two models: their results suggest that the formulation proposed by Fehr and Schmidt performs better than the ERC. A similar conclusion is reached by Dawes *et al.* (2007): humans appear to be strongly motivated by egalitarian preferences.

The various contributions to the experimental literature measure inequality aversion via a number of alternative methods which we will describe below. We believe that the appropriate term that should be used here is indeed inequality aversion, and not the original one proposed of inequity aversion. All of the empirical contributions here are based on the

assumption that the equality of payoffs is the fair, and hence equitable, outcome. But this need not necessarily be the case. If the distribution of income is not random, but depends (or is thought to depend) on individual effort or some other kind of merit-worthy individual characteristic, the individual's view of what is equitable will depend on her own moral standards and the normative reference group. Opinions regarding what distribution of income is equitable will then very likely differ among subjects (see the discussion in Tyran and Sausgruber, 2006, and Güth *et al*., 2009).

Experimental work has test for the presence of inequality aversion and its consequences for economic outcomes in a number of different settings, such as ultimatum games, dictator games, dynamic bargaining games, public-good games with punishment, and redistribution games.[9]

2.2.2 Experimental evidence from Ultimatum, Dictator and Dynamic-Bargaining Games

In the ultimatum game, some subjects, the proposers, are asked to suggest a division of a certain sum of money, say 100, between themselves and the other subjects, the responders. The proposer suggests a division which the responder can either accept or reject. If the latter accepts the proposal, both the proposer and the receiver receive the money in accordance with the proposed division; if the responder refuses, neither player receives anything. Both the proposer and the respondent are fully aware of the rules of the game. The standard economic prediction based on sub-game perfection is that the resulting outcomes will be very unequal: the proposer should make an offer of just over zero, and the responder should accept any positive offer that is made to them (as something is always better than nothing).

This prediction is not borne out by the behaviour that is actually observed in the lab. The experimental results reveal a far more equal division of the pie, with responders frequently rejecting offers that are under 25% of the total sum (see Camerer, 2003, and Levitt and List, 2007; see also Thaler, 1988, for a more comprehensive discussion of the general anomalies of these results). Bellemare *et al*. (2008) provide representative estimates of inequality aversion for the Dutch population. They find considerable differences between socio-economic groups. Inequality aversion, in particular advantageous inequality, rises with age and falls with education level. Young and highly educated participants are one of the most selfish subgroups of the population under consideration. Fehr and Schmidt (1999), in their

[9] More unconventional experiments have also been carried out showing preferences for fair redistributions (in experimental settings where effort can be controlled for) amongst Capuchin monkeys (Brosnan and de Waal, 2003) and 19-month old infants (Sloane *et al*., 2012).

survey of experimental results from the ultimatum game, note that the vast majority of offers are consequently between 40% and 50% of the total sum, and no offers are below 20%. These results seem to hold regardless of the size of the sum that is to be divided, and in particular are also found in high-stake games.

The second type of experiment used to reveal preferences over inequality is the dictator game. This is a simple variation of the ultimatum game, with the advantage of being non-strategic. Here, as the name suggests, the proposer behaves like a dictator in proposing a split of the sum to be divided, with the responder having to accept the offer and thus having no decision to make. Experiments using the dictator game yield, as perhaps might be expected, distributions of income between the two players that are less egalitarian than those from the ultimatum game above, with the proposer offering lower amounts. Even so, and despite the proposer running no risk of rejection, positive amounts of money are still offered. The survey of 616 such experiments in Engel (2011) concludes that dictators give on average 28.35% of the sum of money to be split to the responder, which is far from the self-interested economic prediction of no money being offered at all.

Abbink *et al*. (2009) also consider dictator games, but in the novel context of the destruction of others' income. This destruction is both negatively and positively framed. In the latter, individuals can decide to award their partner 50 points, and by doing so gain 10 points themselves. The decision not to make this award is analogous to the destruction of 50 of their partner's points at a cost of 10 points to themselves (and this is how the decision appears in the negative framing). Abbink *et al*. find destruction rates of about 25 per cent with both framings. One surprising finding is that initially-equal income distributions are actually more likely to be burnt, and the authors conclude as to the presence of a certain amount of equity aversion. One potential reading of this result is that, in their set up, the initially-equal distribution is the only one from which the individual can gain rank by burning money (see their Table 1). We will return to the question of the rank comparisons of income in Section 4.2 below.

Last, in dynamic bargaining games, the evolution of bargaining proposals over time and the reasons that individuals provide for their behaviour during the bargaining process can be examined jointly. In this framework, the experiments in Herreiner and Puppe (2010) show that Pareto-inferior solutions pertain due to the players' inequality aversion. For example, it is found that a majority (51%) of bargaining partners will reject the unequal payoff distribution of (46, 75) in favour of the Pareto-inferior equal split of (45, 45).

2.2.3 Public-good contributions and punishment

In the public-good game, players are given an endowment and then secretly choose how much of this endowment they wish to put into the public pot (in order to finance the supposed public good, which will benefit everyone) and how much they would like to keep for themselves. Once the donation decisions have been taken by all players, the total sum of money in the public pot is multiplied by a factor of greater than one, and the resulting amount is evenly divided amongst all players. The Nash equilibrium in this game is for each player to contribute nothing to the public good. However, in experiments subjects are found to contribute an average of 40-60% of their endowment (Camerer and Fehr, 2004).

The public-good game can be refined by introducing a second stage in which information on others' contributions is provided, and players can punish each other. Introducing potential punishment in this second stage causes a sharp jump in co-operation in the first stage public-good game, as shown in Fehr and Gächter (2000). Masclet and Villeval (2008) assess the role of inequality aversion in determining individuals' decisions to punish. They show that individuals will punish others even when this punishment does not immediately affect the distribution of payoffs (in some situations the cost of one punishment point to the punisher is the same as the cost of this point to the target). Consistent with previous work, punishers are not primarily motivated by a desire to increase equality. Inter-individual comparisons of outcomes do play a decisive role in the punishment decision in all treatments: the intensity of punishment is strongly correlated with the size of the difference in contributions and earnings between the punisher and the target. This result indicates that, irrespective of the willingness to directly reduce payoff differences, individuals may be willing to punish those whose decisions give rise to payoff differences, and that this inequality arouses emotions that trigger punishment. Punishment is shown to reduce inequality over time, as potential free-riders are incited to increase their contributions.

An open question in this literature is why individuals decide to spend their own resources in order to punish others. This decision could be self-centred, as today's punishment enhances my own future interests, or carried out altruistically in order to confer an advantage on my kin or group (see van Veelen, 2012). Of course, any pro-social behaviour can be self-interested if we include non-pecuniary moral preferences in the utility function (Levitt and List, 2007).

The sequential public-good game can be used to estimate separately the advantageous and disadvantageous inequality aversion suggested by Fehr and Schmidt (1999). In this game with two players, the first mover chooses his contribution to the public good under strategic

uncertainty, as he does not know what the second mover will decide. The second mover does know what the first mover has decided, and can choose to contribute either the same amount as the first mover or zero. Teyssier (2012) confirms the theoretical predictions: first movers with greater risk aversion or disadvantageous inequality aversion contribute less to the public good than do others, and second movers with a sufficiently high degree of advantageous inequality aversion contribute more than do others. (For an analysis of risk-aversion in the experimental literature see Section 3.2.)

Inequality aversion as in Fehr and Schmidt has been also applied to the analysis of the results of voting over redistribution. While traditional economic models predict no redistribution, Tyran and Sausgruber (2006) show that inequality aversion can predict the opposite result in their experiments, in which subjects have different endowments and decide how to redistribute from the rich to the poor by majority vote. On this point see also Farina and Grimalda (2011). In taxation games, Bolton and Ockenfels's ERC can predict the opposite allocations to those in Fehr and Schmidt, as shown by Engelmann and Strobel (2004), since the middle class would no longer be in favour of redistribution.

2.2.4 Deservingness: the source of income

One of the critiques of inequality aversion models and the experiments used to test them is that they often neglect the procedure which is behind the money to be allocated. Money appears here out of nowhere as 'manna from heaven': see, on this point, Bergh (2008) and Güth *et al*. (2009), amongst many others. In the majority of experiments, income is an allocation, so that having more than others is not seen as being deserved. However, in many real-world applications individuals likely believe that they earn more than others because they deserve to do so. As might be imagined, when income is considered to reflect effort rather than luck the results do change. For example, Hoffman *et al*. (1994) report that when the role of proposer in the ultimatum game is earned, rather than being randomly assigned, proposers offer less and respondents are more likely to accept unequal offers. Similar results are found in Cherry *et al*. (2002) when the asset of the dictators in the bargaining game is legitimate. We will return to this point below in Section 4.3 when describing some evidence from the income-distribution literature on the fairness of outcomes. Another critique refers to the size of the stakes, with the suggestion that inequality aversion may be lower when the stakes are high. See on this point the discussion in Eckel and Gintis (2010), who conclude that this fact does not refute the theory but is rather a proof of the rationality of subjects who take the costs of their behaviour into account.

A more general criticism of FS which calls the scientific basis of their method into question is contained in the various contributions of Shaked, and Binmore and Shaked. The details can be found in the January 2010 special issue "*On the Methodology of Experimental Economics*" of the *Journal of Economic Behavior & Organization*. This special issue includes the critique by Binmore and Shaked (2010*a*), the replies by Fehr and Schmidt (2010) and Eckel and Gintis (2010), and the rejoinder by Binmore and Shaked (2010*b*).

A novel test of the desire to change the income distribution, and the provenance of the income in question, appears in Zizzo and Oswald (2001). Rather than taking money from one person and giving it to another, participants in this experiment are allowed (at a cost to themselves) to destroy each other's earnings. This is the 'negative framing' of the destruction described in Abbink *et al*. (2009) above. Participants played in groups of four. Each participant has the same amount of money to start with, and can attempt to increase it by ten rounds of betting on a number (1, 2 or 3) that is randomly chosen by a computer. A maximum amount per round can be wagered. This betting stage creates an unequal distribution of income. In the second stage, players can pay to burn each other's earnings, at a price to themselves of 0.01, 0.02, 0.05 and 0.25 of a money unit per money unit burnt.

While the initial distribution of income is equal, two of the four players in each group are favoured. These players can bet more than the others in each round of the betting stage, and they in addition receive a cash bonus between the betting and burning stages. This is public knowledge.

The results in Zizzo and Oswald show a remarkable amount of destruction. Just under two-thirds of players burnt some money, and the average player had just shy of half of their earnings burnt. The destruction rates here are higher than those in Abbink *et al*. (2009), which may well reflect that the average burning price here is lower. There is little evidence of a price elasticity of burning, except at the top burning-cost rate of 0.25. In the context of the current paper, richer players were burnt more, but especially the two players who had received an unfair advantage were burnt more.

2.2.5 Hypothetical preferences and Neuro evidence

Inequality aversion runs counter to the hypothesis that individuals are status-seeking, as noted by Bolton and Ockenfels (2000, p.172). The concern for relative standing is the focus of another set of contributions in experimental economics (see Alpizar *et al*., 2005, Johansson-Stenman *et al*., 2002, Solnick and Hemenway, 1998, and Yamada and Sato, 2013). The approach here is to allow individuals to make choices over hypothetical states of the world in

order to understand how important absolute and relative outcomes are to them. In income terms, these are couched in terms of own income and average societal income. The greater the importance of relative income, the more the individual will be willing to give up own income to achieve a better relative standing.

For example, in Solnick and Hemenway (1998), individuals are asked to choose between states *A* and *B*, as follows:

A: Your current yearly income is $50,000; others earn $25,000.

B: Your current yearly income is $100,000; others earn $200,000.

It is specified that 'others' refers to the average of other people in the society, and emphasised that '*prices are what they are currently and prices (the purchasing power of money) are the same in States A and B*'.

The key in this hypothetical-choice literature is that respondents choose between one state in which they are better off in absolute terms and another in which they are better-off compared with others. All three papers find evidence of strong positional concerns over income, in that individuals report that they are willing to give up absolute income in order to gain status (choosing *A* over *B* above). The percentage who exhibit 'relative' preferences can be large: half of the respondents said that they preferred to have 50% less real income but higher relative income (i.e. they preferred *A* to *B* above): see Solnick and Hemenway (1998) and Solnick and Hemenway (2005).

Such choice experiments are easy to couch in terms of consumption or other life domains, rather than income, as well. The taste for relative standing in Solnick and Hemenway (1998) is found to be strongest for attractiveness and supervisor's praise, and weakest for vacation time; in Alpizar *et al*. (2005) it is stronger for cars and housing, and weaker for vacations and insurance. A useful extension in Corazzini *et al*. (2012) is to take the approach outside of only rich countries: in their work, respondents in high-income countries are more concerned by relative standing than are those in lower-income countries.

Most of these experiments have been conducted with students, which is the standard practice in experimental economics. Carlsson *et al*. (2007) is the first study that is based on a random sample of the population as a whole. Their results are comparable to those in Alpizar *et al*. (2005), who found that on average about half of the utility obtained from an additional dollar comes from relative concerns. Carlsson *et al*. (2007) report that, on average, 45% of the utility increase from a small income increase arises from enjoying a higher relative income, a

result which is halfway between 100% (corresponding to the hypothesis that only relative income matters) and 0% (where only absolute income matters).

A final set of experimental results comes from the recent NeuroEconomics literature. Fließbach *et al*. (2007) appeals to MRI techniques to measure the brain activity of pairs of individuals who carry out identical evaluation tasks in different scanners. If the individual succeeds in the task (remembering the number of blue dots on a previous screen, which they see for one and a half seconds), they obtain a monetary reward of a certain size, as indicated on their computer screen. The outcome of the other player (their success, and the amount won if the answer was correct) is shown at the same time. Fließbach and colleagues manipulate both the amount the individual wins if correct and the amount the other player wins in order to create a number of contrasting conditions. For example, in their conditions C6, C8 and C11, the individual always win 60 Euros if his answer is correct (all participants are men), but the other player wins, if correct, 120, 60 and 30 Euros respectively. One of each individual subject's many trials was randomly picked for payment after the end of the experiment.

The results show that relative incomes matter. Holding the subject's own earnings constant, the amount earned by the other player is significantly correlated with blood oxygenation level-dependent (BOLD) responses in the ventral striatum, one of the regions of the brain known to be involved in the processing of rewards. Wu *et al*. (2012) also find evidence of social comparisons in brain activity, and suggest that it mostly appears in later cognitive appraisals and re-appraisals, rather than in the initial evaluation stage. Recent follow-up work by Fließbach *et al*. (2012) repeats their 2007 experiment, but this time with both men and women, and distinguishes between advantageous and disadvantageous inequality. Disadvantageous inequality is shown to have a much larger impact on brain activity in the ventral striatum than does advantageous inequality.[10] Dohmen *et al*. (2011) also use the same experiment, and show in a regression analysis that the effects of own and others' income on activation in the ventral striatum are equal and opposite (which was also true in the 2007 experiment). This holds for both men and women, although the estimated effect of both income variables is larger in size for men.

[10] In a completely different setting, Cohn *et al*. (2014) also conclude that disadvantageous inequality matters more for effort decisions in a laboratory experiment than does advantageous inequality. Specifically, in a field experiment, individuals who reported that they were underpaid at an initial base wage increase their performance as the hourly wage rises; there is no such effect for those who report being adequately paid or overpaid. Cohn *et al*. further show that this distinction in the effort response to wages is only found for subjects who display positive reciprocity in a laboratory experiment.

Somewhat similar in intent, although the experiment here consisted of individuals reading written reports on (fictitious) others, who are superior or inferior to the respondent, and the good or bad events that occur to them, is Takahashi *et al*. (2009).

Dawes *et al*. (2012) explicitly consider redistribution and brain activity. They consider individual decisions to pay a cost to change the distribution of income within a group, where this latter distribution was determinedly randomly. Redistribution was correlated with brain activation in an area known to be correlated with social preferences. In addition, this brain activation was shown to be correlated with survey measures of egalitarian preferences that were elicited outside of the scanner. Zaki and Mitchell (2011) show that inequitable decision-making (choosing to favour a smaller reward for oneself rather than a larger reward for the other player in a modified dictator game) is associated with brain activity in a region associated with subjective disutility. Last, Tricomi *et al*. (2010) explicitly address advantageous and disadvantageous inequality by randomly assigning individuals in pairs to be rich (with $50) or poor (no dollars) after both have received an initial allocation of $30. Brain activity in areas known to be related to the valuation of stimuli is then measured via MRI as further transfers to both pairs are carried out. The results show that the 'poor' responded more strongly to transfers to themselves than to the other person, while the 'rich' evaluated transfers to others more strongly than transfers to self. This is argued to show that individuals have social preferences over both advantageous and disadvantageous inequality.[11]

The discussion in the current Section has shown that there is by now a considerable body of evidence consistent with individuals comparing their incomes with each other. Income is, in this sense, a social good. A certain amount of work has suggested something of a loss-aversion with respect to these comparisons, in that doing worse than others is more important in a well-being sense than doing better than others.

Any movement in the distribution of income will therefore affect societal well-being both directly, via changes in individuals' own incomes, and in a comparative manner, via the various gaps between individual incomes. Imagine a rise in inequality caused by an increase in some top incomes. Those who benefit from higher incomes will have higher well-being, both because they are richer and because their gaps to others have risen (although this effect may only be secondary). On the contrary, those whose incomes have not risen and who

[11] A novel contribution in the broad area of physiological reactions to income distribution is Falk *et al*. (2013). This paper first shows in an experimental setting that perceived wage unfairness (as in unmet expectations about the share of a reward to be received) is associated with measured individual heart-rate variability. It is also shown that the answer to a question on unfair pay in the 2009 wave of the SOEP is correlated with self-reported health outcomes, and in particular with cardiovascular health.

compare to the fortunate few who are richer are now relatively worse off, which reduces their well-being. The overall effect is *a priori* ambiguous.

Alternatively, inequality may fall due to a rise in the incomes of those at the bottom of the distribution (via a tick up in the minimum wage, say). Again, the well-being of those who benefit rises, both via greater own income and smaller gaps to the richer others. But the well-being of those who do not benefit falls as their advantageous gaps to the poorer are now smaller in size. If we continue to believe that this latter effect is of second order, then we may expect societal well-being to improve here.

Unfortunately, most of the changes in the distribution of income that we see are this stylised. In order to make any kind of welfare statement, we need to know who compares to whom, how much the different kinds of income gaps matter, and how much relative income matters compared to absolute income. We have little reasonable hope of measuring these magnitudes with any degree of accuracy in existing data.

Even so, we do believe that the comparative reference group exists, and represents one central constituent of attitudes towards inequality in an economy. The other main part of such attitudes comes from the normative view of inequality in the income distribution (as defined in the Introduction). While there is a substantial amount of work devoted to the comparative reference group, it arguably turns out to be rather more difficult to evaluate normative attitudes towards inequality. It is to this question that we turn in Section 3 below. This section we will also review some of the work that has tried to disentangle the various motivations behind individuals' actions.

3. The normative view

In the normative view of the reference group, an individual evaluates the overall degree of income inequality in the reference group, but without making any comparisons to individuals who are richer or poorer than she is. Depending on the attitudes and social norms prevailing within a group the individual can evaluate these income disparities as fair or unfair.

As in Section 2 above, regarding the comparative view of the reference group, there is evidence on the normative view of the reference group from both subjective well-being research and experimental analysis.

3.1 Inequality and well-being: What do people say?

We are interested in this chapter, as the title suggests, in individuals' attitudes towards or opinions about inequality. There are a number of ways in which these can be elicited, including direct questioning, experimental approaches or inference from observed behaviours. In this sub-section, we consider the contribution of 'happiness economics', in which some measure of income inequality is related to the individual's self-reported well-being. In general, an equation similar to the following is estimated:

$$W_{ijt} = \alpha + \beta X_{it} + \gamma Ineq_{jt} + \varepsilon_{it}. \qquad (3)$$

In this approach, we collect survey information on the subjective well-being of an individual *i*, living in some aggregate area *j* (where *j* is often, but not always, a country) at time *t*. This subjective well-being is related to a vector of standard demographic variables (age, sex, education, labour-force and marital statuses, and almost always the individual's or the household's income) through the vector β. Of most interest to us here is the conditional correlation (i.e. controlling for all of the variables in the vector *X*) between well-being and the aggregate measure of inequality in area *j*, $Ineq_{jt}$. The estimated value of the parameter γ shows us whether individuals, *ceteris paribus*, tick up or tick down their self-reported well-being scores in areas with higher or lower levels of income inequality.

The estimation of an equation like (3) allows the 'value of inequality', as it were, to be inferred from the empirical relationship between the observed inequality around the individual and their reported level of subjective well-being. This latter is most often measured by questions about the individual's happiness, life and income satisfaction or some other measure of general psychological functioning. Multivariate regressions allow not only the sign of the conditional correlation between income inequality and subjective well-being to be established (γ above), but also the economic importance of any relationship that is identified (via the comparison of γ to some of the estimated β coefficients on other variables, such as income or unemployment).

This 'happiness' approach to valuing public goods has now appeared a number of times in the subjective well-being literature. Some well-known pieces of work in this respect have considered inflation and unemployment (Di Tella *et al*., 2001), aircraft noise (Van Praag and Baarsma, 2005), and pollution (Luechinger, 2009), although there are by now many other applications.

Cross-section and panel data allow the happiness or satisfaction of tens or even hundreds of thousands of individuals to be measured. It is perhaps easy to get carried away by the sheer number of degrees of freedom here. Except that, as we suggest below, this is largely illusory: while it is theoretically possible for each individual to be confronted with a different income distribution, the most common approach has been to take cross-country data, often repeated cross-section, and include the country-level Gini coefficient (or something else) on the right-hand side of a satisfaction regression. In this case, the effective number of degrees of freedom in the empirical estimation remains for the most part at the two-digit level.[12]

Although there are by now many thousands of empirical contributions across the social sciences which relate individual income to some measure of individual well-being, it remains true that only a small fraction of this existing work has considered any role for income inequality. Even so, it seems that the ease of access to large scale data sets has led to relatively consistent growth of research in this area over time. A necessarily incomplete but hopefully somewhat-representative sample of some of the work that has been carried out in the area of income inequality and subjective well-being appears in Table 1. This table broadly reflects the growth in interest in the subject, but also considerable disparity in the estimated value of γ, as revealed by happiness data.

Perhaps the earliest contribution in Economics is Morawetz *et al*. (1977), which contrasts two different Israeli communities and show that the level of happiness is higher in the community with the more equal income distribution. Although interesting, the result essentially relies on two observations, and does not control for all of the other factors which might differ between the two communities. A contribution which is more in the regression framework is an innovative article by Tomes (1986). This uses data (from the 1977 Quality of Life Survey) on individuals in approximately 200 Federal Electoral Districts in Canada. Matching in census data on income distribution, it is shown that the share of income received by the bottom 40% of the population is negatively correlated (at the ten per cent level) with both satisfaction and happiness for men. The same correlations are insignificant for women. Inequality is thus positively correlated with men's subjective well-being.

Hagerty (2000) is the first of a number of contributions to use US General Social Survey (GSS) data. In his GSS sample from 1989 to 1996, maximum community income and the skew of community income are respectively negatively and positively correlated with

[12] As one of the right-hand side variables in these kinds of regression is aggregated at a higher level than the dependent variable, the standard errors are under-estimated and should be corrected as in Moulton (1990): it is not always clear that this correction is carried out in this literature.

happiness scores. Hagerty also uses aggregate data from eight different countries to show that average happiness is lower in countries with wider income distributions. More recent work using the GSS has however come to a variety of results. While Blanchflower and Oswald (2003) and Oishi *et al*. (2011) both conclude that there is a negative relationship between life satisfaction and income inequality, Alesina *et al*. (2004) and Di Tella and MacCulloch (2008) both find no significant relationships in GSS data. Alesina *et al*. (2004) is of interest here, as they explicitly compare long-run US and European data, from the GSS (1972-97) and Eurobarometer (1975-92) respectively. Over the whole sample, inequality reduces reported subjective well-being amongst Europeans, but not Americans. The authors suggest greater (perceived) social mobility in the USA as one potential explanation of this difference.

Schwarze and Härpfer (2007) calculate inequality in gross household income at the region and year level in 14 waves of German SOEP data. Life satisfaction is found to be negatively correlated with inequality (although a measure of income redistribution is not significant). Other work establishing a negative correlation between inequality and well-being includes Biancotti and D'Alessio (2008), Brodeur and Flèche (2013), Ebert and Welsch (2009), Oshio and Kobayashi (2010), Verme (2011), Van de Werfhorst and Salverda (2012) and Winkelmann and Winkelmann (2010), using data from a wide variety of different countries.

On the opposite side of the court, a number of contributions have instead concluded for a positive correlation. Along the same lines as the finding in Canadian data in Tomes (1986), Ball (2001) also finds that happiness and inequality are positively correlated in raw data from the 1996 World Values Survey (WVS), although the introduction of a number controls renders this positive correlation insignificant. The estimated value of γ in the first eleven waves of the British Household Panel Survey (BHPS) is positive (Clark, 2003), as is that in the first five waves of the WVS (Rozer and Kraaykamp, 2013). Last, in one of the relatively rare contributions entirely outside of the OECD, Knight *et al*. (2009) find that county-level income inequality is positively correlated with happiness in the 2002 Chinese national household survey.

One recent intriguing contribution to this empirical debate comes from Grosfeld and Senik (2010). In contrast to a number of the contributions in Table 1, their identification is purely within and not between country, as they consider data from Poland over its transition period. Using repeated CBOS cross-section data over the 1992-2005 period, they identify a turning point in the estimated relationship between inequality and subjective well-being. This correlation is positive and significant in the first years following transition, but then turns

negative and significant. The break point that best fits this split in the data is 1996. The interpretation that the authors give is in terms of inequality first being regarded as providing opportunities for future higher incomes, which consequently turned into more negative comparative evaluations of disparities as it become clearer that not everyone would be able to benefit from any opportunities that this greater inequality promised.

As well as the sign and significance of the estimated effect, we are also interested in the size. Some of the work cited in Table 1 does contain explicit statements about marginal effects. For example, Tomes (1986) writes that "*an increase of 10% in the share of the poor reduces satisfaction by approximately 0.6 of a point. In order to maintain satisfaction unchanged, own income would have to be increased by $4,200 for every 1% increase in the share of the poor*" (p.435). This latter figure is larger than the annual income of 3860 Canadian Dollars in his dataset (although it should be noted that the confidence intervals around these estimates are quite large). Alesina *et al*. (2004) find that a one percentage-point rise in the Gini is compensated by a rise in annual income of 2950 Dollars in the US (8.7% of annual income) and 474 Dollars in Europe (4.2% of annual income). The effect size in the SOEP in Schwarze and Härpfer (2007) seems more moderate: "*If income inequality would be reduced by a half household income could be reduced by around 10% without changing life satisfaction*" (p.244).

While this kind of compensating differential is attractive in that it is easy to understand, it also obviously depends critically on the size of the estimated income coefficient in a subjective well-being equation. It is easy to believe that the coefficient on own income is actually an underestimate here, for standard endogeneity reasons, leading to trade-offs of income against inequality that are too high.

As an alternative, we consider the well-being effect of a one-point rise in the Gini coefficient, with the effect size being expressed as a percentage of the range of the subjective well-being measure. For example, the 0 to 10 life-satisfaction scale used in the SOEP has a range of 10; the corresponding 1-7 scale in the BHPS has a range of 6. It is not possible to calculate a standardised marginal effect using this metric across all of the work in Table 1. In the first instance, a number of the contributions here use ordered probit or ordered logit estimations, so that there as many marginal effects as one minus the number of subjective well-being categories. Restricting ourselves to linear estimation techniques using the Gini which yield significant estimates cuts the sample down to five: Hagerty (2000), Schwarze and Härpfer (2007), Knight *et al*. (2009), Winkelmann and Winkelmann (2010) and Rozer and

Kraaykamp (2013). These papers use five different datasets, with subjective well-being measured on a variety of scales.

Expressed as a percentage of the scale range, a ten percentage point change in the Gini coefficient mostly produces a movement in well-being of between 2% and 8% of the scale range (the exception being Schwarze and Härpfer, 2007, where the figure is smaller). In the SOEP, the standard deviation of life satisfaction is about 18% of scale range (1.79 for a scale of 0-10), with an analogous figure for the BHPS of 21% (1.29 for a 1-7 scale). A broad conclusion is that this very large movement in the Gini has an effect of between 0.1 to 0.4 of a standard deviation in life satisfaction. By way of comparison, the effect of unemployment on life satisfaction in the SOEP and the BHPS is somewhere around 6% to 10% of the scale range, or 0.3 to 0.5 of a life-satisfaction standard deviation.[13]

Some of the work on inequality and happiness here has explored the role of mediating variables or sub-group regressions to establish the subjective-groups for which the correlation with inequality is the largest in order to shed some light on the circumstances under which inequality affects subjective well-being. In the perhaps absence of a clear central tendency, it is arguably useful for policy purposes to know where and when inequality might be harmful in subjective well-being terms.

One of the best-known findings in this respect comes from Alesina *et al*. (2004): in Europe, inequality hurts the poor and left-wingers more (in the sense of having a greater negative effect on their well-being scores) than it does richer and right-wingers. This finding has recently been corroborated on more recent (2009-2010) Eurobarometer data by Vandendriessche (2012). Along the same lines, in Grosfeld and Senik (2010) the initial positive correlation between well-being and inequality was found only for right-wingers.

Other work has considered the mediating role of individual income. Oishi *et al*. (2011) find that the effect of inequality on happiness is negative and significant only for those in the

[13] It is arguably misleading to compare the size of the coefficient on inequality to that on individual unemployment. If half of the population are in the labour force, then a rise of one per cent in the unemployment rate corresponds to one more person out of 200 in the population being unemployed rather than employed. Assuming that unemployment only affects the individuals who are unemployed (so that there are no spillovers) a one percentage point rise in the Gini index is roughly equal to a ten percentage point rise in the unemployment rate. For example, consider that subjective well-being is on a 1-10 scale, and the estimated coefficient on the Gini is -5: this ensures that a ten percentage point rise in the Gini will lead to a fall in predicted well-being of 0.5, which is five per cent of the scale range (the mid-point of the figures mentioned in the text). If individual unemployment leads to an effect on individual well-being of 8 per cent of the scale range (which is again the mid-point figure), then its estimated coefficient will be -0.8. A one per cent rise in the Gini reduces well-being by 0.05 (= 0.01 x 5). A one per cent rise in the unemployment rate will lead to a change in average well-being in the society by -0.8/200 = -0.004. In this calculation, assuming no spillovers from the unemployed onto the non-unemployed, a rise in unemployment of over ten percentage points (12½ points, exactly) produces the same effect on societal well-being as a one percentage point rise in the Gini.

bottom two quintiles of the income distribution. Schwarze and Härpfer (2007) find that only those in the first income tercile are negatively affected by post-government income inequality. In Clark (2003), the correlation between regional income inequality and individual well-being is more positive for individuals whose own income has been more mobile over time.

Oshio and Kobayashi (2010) carry out a number of tests of mediating variables and conclude that the correlation between happiness and inequality is more negative for women, the younger, those who have unstable positions on the labour market, and those who are politically in the centre (rather than being Progressive or Conservative).

Some work has considered a mediating role for individual values, rather than observed demographic characteristics. In Biancotti and D'Alessio (2008), inequality has a more negative effect for individuals who report more inclusive and moderate values. Rozer and Kraaykamp (2013) find that the effect of Gini on well-being is more negative (actually less positive) for Europeans, those with more egalitarian norms (from a question on the relative preference for incomes being made more equal as opposed to needing larger income differences for incentive reasons), and those with greater levels of social and institutional trust. Last, as might be expected if the income distribution reveals information about the individual's own potential future position, in Ferrer-i-Carbonell and Ramos (2014) the effect of inequality is greater for those with higher (self-reported) measures of risk aversion in 1997-2007 SOEP data. The marginal effect of the Lander-Year Gini coefficient on life satisfaction is twice as negative for those with the highest risk-aversion score (on a zero to ten scale) as compared to the effect for those who report the modal score of five.

One important individual value in the terms of this current chapter, and one to which we shall return below, is the perceived fairness of the market system (i.e. the system that transforms individual inputs into individual outputs). In Oishi *et al*. (2011), the effect of inequality on happiness is moderated by the individual's perceived fairness of others, and whether the individual believes that others can be trusted. Along the same lines, Bjørnskov *et al*. (2013) find that the perceived fairness of the income-generation process affects the association between income inequality and subjective well-being.

This burgeoning work on inequality and happiness has then revealed a number of intriguing findings. But perhaps one of the most striking aspects of Table 1 is the sheer variety of empirical correlations which have been uncovered. Is there any way of making sense of the variety of different estimated results here, or does sample variability rule the day (with as many positives as negatives as zeros)?

A first point, apparent from the fourth column of Table 1, is that there is no empirical agreement on the most appropriate measure of inequality. While the majority of work refers to the Gini coefficient (a point to which we shall return in Section 4 below), it is also true that no consensus has been reached regarding the geographic level at which this coefficient should be evaluated.

Most of the empirical analysis has been carried out using data which contains only coarse-grained information on the distribution of income (*i.e.* at a very aggregated level, such as the country). Some work on British, Japanese, German and Russian data has appealed to measures of inequality at the regional level (respectively: Clark 2003, Oshio and Kobayashi, 2010, Schwarze and Härpfer, 2007, and Senik, 2004). One of the few contributions to use large-scale data with more local-level inequality measures is Brodeur and Flèche (2013), who appeal to county-level information in the American BRFSS. Another is Winkelmann and Winkelmann (2010), who match in measures of inequality at all of the (in increasing order of size) municipality, region and canton levels in the 2002 wave of the Swiss Household Panel. The research in Knight *et al*. (2009) combines more local-level measures of the distribution of income with data from a non-OECD country (China), finding a positive effect of the county-level Gini on respondents' happiness (see also Jiang *et al*., 2012).

One of the reasons why the degree of aggregation matters is that the Gini often moves only little over time, a point made by Graham and Felton (2006), who note that the Gini coefficient in Chile in the 2000s is not substantially different from that which pertained in the 1960s, despite the considerable social and economic changes that have taken place over the intervening period. Econometrically, it is then difficult to introduce both the Gini and country dummies into a regression, leading to the possibility that the Gini may be proxying for some other fixed country characteristic that is correlated with subjective well-being.

In general, this lack of variation in the measure of inequality does not help us to assuage the doubt that it is strongly correlated with some other variable that is important for happiness. For example, income inequality at the regional or country level could reflect industrial structure or the unemployment rate, both of which may well have independent effects on subjective well-being. Given a sufficient number of observations, it should be possible to tease out the independent contributions of inequality and other variables. But at the aggregate level it is anything but sure that sufficient observations are available. In general, the list of potentially-important aggregate-level variables is often perilously close to the number of degrees of freedom in the analysis. In Di Tella and MacCulloch (2008), for example, income inequality attracts a negative but insignificant coefficient in their analysis of

Eurobarometer and GSS data. They note that this occurs "*in part because there is some degree of co-linearity between the included variables. For example, if we do not include unemployment benefits, a variable that is highly correlated with inequality, we find that the coefficient on inequality becomes negative and significant*" (p.36). Verme (2011) concurs that the lack of variability in survey measures of the Gini coefficient make it particularly susceptible to multicollinearity with other aggregate-level variables (a problem he tackles via a number of robustness tests in which the other aggregate explanatory variables are dropped in turn).

An additional drawback to the empirical analysis of the relationship between individual well-being and aggregate income inequality is that it does not adequately distinguish between the comparative and normative aspects of the reference group. Even though some of the empirical analyses in Table 1 (although far from all) do introduce some measure of the mean of the income distribution into the analysis, they are unable almost by construction to calculate measures of relative deprivation and relative satisfaction from the survey data used. As such, any partial correlation between aggregate income inequality and individual subjective well-being very likely mixes together aspects of the comparative and normative reference groups, which perhaps explains the variety of estimated coefficients in Table 1.

Given the perhaps natural limits on the analysis of the relationship between aggregate inequality and individual subjective well-being, any evidence from this type of analysis will probably have to remain suggestive. This is arguably not the case for experimental work, where the reference group and the degree of inequality can be exactly manipulated, and it is to this that we now turn. Experimental work is of course not free of problems, in that what people say in a controlled setting may well differ from what the way in which they would actually behave in reality, and their perceptions of inequality will likely be influenced by many factors. For a thorough discussion of these aspects and problems with experiments regarding social preferences, see Levitt and List (2007).

3.2 Experimental economics

The experimental economics contributions to inequality aversion from the more aggregate perspective have appealed to two different approaches: 1) inequality and risk aversion with a parametric social welfare function; and 2) general social welfare functions. In the first of these, two types of experiments have been run. The first is similar to that adopted

in the experiments on status or relative income discussed above in Section 2.2, that is the choice between alternative societies with different income distributions behind the veil of ignorance. The second type is based on the leaky-bucket experiment, which we introduce below.

Johansson-Stenman *et al*. (2002) carry out hypothetical-choice experiments. An individual's relative risk aversion is interpreted as the social inequality aversion from a utilitarian social welfare function's perspective. Inequality aversion is evaluated via individuals' choices between two types of society, from behind a veil of ignorance. Individuals are asked to choose the society that would be the best in terms of the well-being of their imaginary grandchild (in order for choices to be abstracted from the respondent's own circumstances and environment). The income distributions in the two societies, A and B, are uniform, and the respondent is told that their grandchild has an equal probability of receiving any income level within the range.

For example, Society A has a uniform income range of 10,000 to 50,000 Swedish kroner, whereas Society B has a uniform income range of 19,400 to 38,800 Swedish kroner. The student subjects in the experiment are told that prices are the same in the two societies, that there is no welfare state, and that there are no growth effects of the different income distributions.

An individual who is risk neutral will prefer Society A, in which expected income is higher. Someone who is indifferent between the two societies will have a relative risk-aversion parameter, η, that can be calculated by assuming a CRRA utility function[14] (see their equation (5)). In the example given above, indifference between societies A and B implies a value of η of 0.5; equally, an individual who prefers A (B) over B (A) will have a value of η of $<$ ($>$) 0.5. There are eight different conditions in their experiment. Society A always remains as described above, while there are eight society B's, ordered such that indifference between A and B implies increasing risk aversion (see their Table 1). The higher is the value of η, the more income society is willing to give up in order to bring about a more egalitarian distribution of income, corresponding to a more concave social-welfare function.

The median value of inequality aversion in these experiments is in the interval between two and three. The respondents were fairly evenly-distributed between the categories, with 43% of the respondents having inequality aversion of between one and five. Furthermore, a considerable number of respondents (17%) exhibited zero or negative inequality aversion. In

[14] Such that $U = y^{1-\eta}/(1-\eta)$ if $\eta \neq 1$, and $U = \ln(y)$ if $\eta = 1$.

addition, 19% of respondents exhibited extreme aversion compatible with the Rawlsian maxi-min strategy, which is the case of maximum aversion in the experiment. In a similar experimental setting, Carlsson *et al*. (2005) confirm a median value of relative risk aversion of between two and three, and find a larger fraction of respondents (63%) with a value of relative risk aversion between one and five. In their experiment, 8% of respondents were found to be risk-lovers.[15]

Some work in this area has tried to distinguish further between two types of inequality aversion: the first is the individual's level of risk aversion, as explained above, while the second is the individual willingness to pay to live in a more equal society. The estimation of individual inequality aversion only via risk aversion disregards any preferences that individuals may have regarding inequality *per se*.

To separate out these two attitudes, two types of experiments are carried out, one for each type of aversion. To this end, Carlsson *et al*. (2005) extend the analysis of Johansson-Stenman *et al*. (2002). The first experiment concerns the traditional imaginary grandchild, as described above, where the respondents do not know the position of their grandchildren, but only the income distribution and hence also the probability distribution in each society. In the second experiment, subjects choose between pairs of hypothetical societies with different income distributions, where the grandchild's income is known and is set equal to the mean income in the society. In other words, "*In the first experiment individuals choose between hypothetical lotteries, where the outcomes determine their grandchildren's incomes in a given society. This experiment allows for the estimation of the individual's risk aversion in a setting where the level of social inequality is fixed. In the second experiment individuals choose between hypothetical societies with different income distributions, where the grandchildren's incomes are known and are always equal to the mean income in each society. This experiment enables us to estimate parameters of individual inequality aversion in a risk-free setting*" (Carlsson *et al*., 2005, p.376).

In the second experiment, with a value of inequality aversion of zero the individual is indifferent to income inequality; with a value of one, a 1% increase in own income yields as much utility as does a 1% fall in inequality. The median value of inequality aversion is found to be in the interval between 0.09 and 0.22, and most responses reflect positive inequality aversion. Only 7% of respondents appear to be inequality-lovers, in the sense that they are

[15] It is notable that the values of the degree of inequality-aversion found in this experimental literature are far higher than those used in practice for the measurement of inequality: The US Census Bureau uses a value of less than 1 (see http://www.census.gov/prod/2000pubs/p60-204.pdf), whereas the key inequality measures reported on the Luxemburg Income Study website as their "key figures" only use values of 0.5 and 1.

willing to sacrifice their own income in order to make society more unequal, while 6% are found to be extremely inequality-averse. Kroll and Davidovitz (2003) also find that subjects prefer more equal income distributions. However, when they had to give up part of their reward in order to shift to a more equal distribution, they chose not to do so.

Amiel *et al*. (1999) belongs to the second type of experiment in method 1), in which social inequality aversion is estimated via the *leaky-bucket* experiment. A sample of students were asked to indicate the amount of 'lost money' that they were willing to accept for a transfer of money from a richer to a poorer individual, where this loss came about for example due to administrative costs. The median value of inequality aversion was estimated to be between 0.1 and 0.22, which is much lower than the existing estimates from the alternative approach, such as in Johansson-Stenman *et al*. (2002). However, the circumstances of the two experiments are very different, making a clear comparison of the results rather difficult.

That these large differences in the value of inequality aversion result from the different measurement techniques is confirmed by Pirttilä *et al*. (2008). The authors estimate inequality aversion using a questionnaire approach in a representative survey of Finns. The advantage of this questionnaire is that the same individual was asked questions based on two different measurement techniques: the leaky bucket and the preferred wage distribution under the veil of ignorance. The median value of the inequality aversion parameter from the leaky-bucket questions lay below 0.5. However, the results from the preferred distribution question gave a much higher value for inequality aversion, with the parameter being over 3. There are thus a considerable number of respondents who are willing to sacrifice the mean wage in order to bring about a more equal distribution of wages, but who at the same time are not willing to carry out costly transfers from richer to poorer.

Pirttilä *et al*. propose a number of explanations for this rather radical difference in the results. One possibility is that people simply have different attitudes towards the implied efficiency–equity trade off in different situations. The leaky-bucket question is specifically focussed on redistribution, whereas the change in the wage distribution is a bargaining result. The two questions may also be measuring the same phenomenon but at a different scale. In addition, the leakage, that is the efficiency loss, is explicitly visible in the leaky bucket question, whereas the respondent would have to calculate it in the wage-distribution question. Respondents may have had efficiency concerns in mind in the leaky-bucket question, and their preferences over efficiency could explain part of their unwillingness to support the transfer.

Pirttilä *et al*. also confirm the results in Beckman *et al*. (2004): the actual position of the respondent in the income distribution affects the answer given in the leaky bucket experiment. As expected, support for this transfer is higher amongst the individuals who would benefit from it.

In the income-distribution literature the indices that are deemed appropriate to measure inequality are those which conform to the Lorenz dominance criterion. These indices fulfil four basic axioms: scale invariance, symmetry, the population principle and the Pigou-Dalton transfer principle. For a recent survey of these properties and the dominance criteria see, amongst others, the excellent chapter in Chakravarty (2009). The first three properties are commonly assumed in the majority of indices of well-being; only the transfer principle, as we mentioned in the introduction, is at the heart of inequality measurement.

Attitudes towards inequality have been interpreted by some authors as being revealed by the reaction of (some relatively informed part of) the general public to these four basic properties. This is the contribution of the authors in group 2), where some general social welfare function is assumed but without any *a priori* functional form. The main question that is addressed in this part of the literature is what inequality seems to represent for the general public, and in particular whether these four basic axioms are reflected in individuals' views. The seminal book is this area is Amiel and Cowell (1999). Given that the defining concept for inequality measurement is the Pigou-Dalton transfer principle, we below discuss only those experimental results which cover this aspect of inequality.

In Amiel and Cowell (1992), the transfer principle is presented to respondents both as a numerical problem and verbally. In the former, the are asked to say which of two distributions of income are more unequal: A=(l, 4, 7, 10, 13) vs. B=(l, 5, 6, 10, 13).

Verbally, they are asked to say what happens to inequality in the following scenario: "*Suppose we transfer income from a person who has more income to a person who has less, without changing anyone else's income. After the transfer the person who formerly has more still has more*".

Nearly two-thirds of the student sample in Amiel and Cowell (1992) do not think that inequality is lower in A than in B above, while 40% do not agree that inequality will fall following the verbal scenario. The difference in these figures likely comes from individuals thinking of some kind of Robin Hood redistribution in the verbal case, whereas the actual numerical problem involves redistribution from the fairly poor to the even poorer. Amiel *et al*. (2012) examine many 'flavours' or interpretations of the transfer problem. Only 21.6% of the

sample are found to be in line with the researcher's standard view. A critique of the way in which some of these kinds of questions are asked is provided by Jancewicz (2012).[16]

Similarly to Kroll and Davidovitz (2003) and Carlsson *et al*. (2005), Amiel and Cowell (2002), Gaertner and Namazie (2003) and Cowell and Cruces (2004), using method 2), examine the degree to which the principle of transfers is followed by people who evaluate inequality and risk. About 60% of respondents in the latter contribution viewed an equalising transfer as inequality/risk reducing, and consistency in the risk version of the questionnaire was higher than consistency with the principle of transfers in the inequality version. This finding is confirmed by Gaertner and Namazie and Amiel and Cowell (2002), where the proportions of acceptance in the sample are 23% in the risk questionnaire and 17% for inequality.

Overall, individuals do have normative preferences over the distribution of income. It is however hard to argue that these are isolated in happiness regressions, as the latter are not able to separate out the comparative and normative components of attitudes to inequality. The experimental literature has been more successful in this respect, but even there the variety of different methods have produced quite a large range for the estimated value of inequality-aversion. Part of the problem here seems to be that the different methods make salient different preferences (such as risk aversion or preferences over efficiency). Another is that there are almost an infinite number of ways in which we can change the inequality of the income distribution, and preferences over taking money from the rich to give to the poor, and taking money from the middle or lower-middle class to give the poor may reasonably differ, even if the final impact on the Gini coefficient is the same.

4. Outstanding issues

This section discusses a number of issues which extend the existing literature on income gaps and income inequality described above.

4.1 Inequality and other outcome variables

The discussion to date has considered individuals' relationship to others' incomes purely in the sense of 'do they like it or not', whether that be revealed by survey information

[16] For example, the lack of a "*Don't Know*" response category, and there being no natural unit of account given for the figures in the numerical problem.

on subjective well-being or behaviour in experiments. At the risk of opening a Pandora's Box of other possible dependent variables, this is far from being the only outcome of interest. A number of other possible outcomes have been investigated across the social sciences: the following is a brief sample of some recent areas of research in this respect.

de Vries *et al*. (2011) test the hypothesis that income inequality may produce individuals who are more competitive and less friendly towards others. These latter attitudes are captured by the Big Five personality factor of Agreeableness, which now appears in a number of surveys.[17] The regression analysis in de Vries *et al*. (2011) is based on almost 700 000 observations between 2001 and 2009 from an American web-based survey aimed at measuring personality. Agreeableness scores are significantly negatively correlated with State-level income inequality (as measured by the Gini coefficient on pre-tax household income matched in from the 2000 Census). This individual-level personality finding can be argued to be consistent with the considerable amount of existing evidence on aggregate inequality and measures of violent behaviour: see Daly *et al*. (2001) for evidence on Canadian provincial-level murder rates, and Macours (2011) for the role of district-level income inequality (over a period of income growth) in fuelling civil conflict (as measured by mass abductions by Maoist rebels) in Nepal.

Loughnan *et al*. (2011) analyse self-enhancement, which is the propensity to see yourself as being better than the average. They consider the relationship between self-enhancement and income inequality, with the argument that the gain from being better than others will be larger in more unequal societies. They administer a self-enhancement questionnaire to (mainly student) samples across 15 countries. In these questionnaires, respondents are asked about 20 different desirable characteristics. For each characteristic, they say whether they have more, the same, or less of it than the average student (or average person, in the non-student samples). They first show that respondents on average think they have more of the characteristic than the average in 14 out of 15 countries (the exception is Japan). They further demonstrate that self-enhancement is greater in countries with a higher Gini coefficient. This relationship is resistant to the introduction of a range of individual-level psychological variables.

In DeBruine *et al*. (2011), data from almost 5000 women aged 16-40 across 30 developed countries shows that women's preferences for facial masculinity are negatively correlated with a composite measure of country health: the value of masculinity as a proxy for

[17] As measured by the answers to questions on being interested in people, taking time out for others, and not being interested in other people's problems (this latter being reverse-coded).

developmental health is greater in countries where health is on average worse. Brooks *et al*. (2011) build on this work by noting that facial masculinity may also matter via the spread of the benefits which it confers. In the same way that a greater dollar return to higher rank in a golf tournament seems to lead to greater effort by players (Ehrenberg and Bognanno, 1990), any signal predicting competitive success is more valuable when rewards are more spread out. They hence match in data on the national Gini coefficient (from the United Nations Statistics Division) to DeBruine *et al*.'s original preference data. Their subsequent empirical analysis suggests that national income inequality is a better predictor of female preferences for facial masculinity than is national health.

Van de Werfhorst and Salverda (2012), in their introduction to a special issue of *Research in Social Stratification and Mobility,* suggest that income inequality at the national level is associated with a number of observable and attitudinal outcome variables. A number of the papers contained in this special issue go on to examine in detail the negative relationships between income inequality, on the one hand, and all of solidarity towards others, expressed support for democracy, and actual political participation.

Rothstein and Uslaner (2005) simultaneously estimate a measure of generalised trust and income inequality (the Gini coefficient). They conclude that inequality does indeed significantly diminish trust, while the estimated coefficient on trust in the income inequality equation is negative but insignificant. These findings have recently been critically re-evaluated by Steijn and Lancee (2011), who specifically underline the potential importance of non-Western countries with particularly high levels of income inequality, and a confounding role of national wealth. Their regressions on Western country data (from the International Social Survey Programme, ISSP, and European Social Survey, ESS) show that the bivariate correlation between income inequality and trust is negative and significant, but that this relationship becomes insignificant in multivariate analysis once wealth is controlled for.

We are not necessarily arguing here that these additional potential attitudinal[18] correlates of income inequality are to be considered separately and in isolation. Rather we think that they indeed represent some of the channels via which income inequality leads through to overall well-being outcomes (and to those regarding individual health, on which there is a substantial literature that we have not covered here: see Chapter 18).

[18] Moving beyond the individual level, we can also consider the attitudes expressed by other societal actors. Burgoon (2013) analyses party position-taking in almost fifty years of annual data across 22 different countries. Net income inequality is positively and significantly associated with anti-globalization position-taking.

4.2 Other measures of different aspects of the distribution of income

All of our discussion of attitudes towards the distribution of income has been in terms of gaps to others in the reference group, in Section 2, and a normalised sum of all the gaps in society, as the Gini coefficient in Section 3. We have presumed that these are indeed the salient measures of others' income. But we do not know that for sure.[19]

Consider two log-normal distributions of income, where one is a horizontal displacement of the other, as in Figure 1. Which is the most unequal? If we are not in the income distribution then our (normative) evaluation of the dispersion in these two curves depends on which distribution measure we choose. Some measures of various aspects of the distribution of income are identical across the two: this is the case for the absolute Gini coefficient, the variance, the interquartile range and the percentage of the population in relative poverty (as defined as income below 60% of the median, say). Other measures are not the same in distributions 1 and 2: the percentage in absolute poverty, the relative Gini coefficient and the D9/D1 or D5/D1 ratios.

If the individual making the evaluation is in the income distribution, then their evaluation will also depend on their own income position: this is the comparative evaluation. At an income of Y_i, an individual will feel more deprived in distribution 2 than in distribution 1: their relative deprivation will be higher (more people above them) and their satisfaction will be lower (fewer people beneath them).

We have considered the relationship between objective measures of inequality, such as the Gini, and subjective well-being. But do people actually know what the value of the regional or national Gini coefficient is? Individuals' perceptions of the degree of inequality around them may not be well reflected in the Gini coefficient, and equally they may believe the distribution of income to be different from what is actually measured in statistics.

Macunovich (2011) is an intriguing contribution using the fourth (2005) wave of the WVS. She analyses not only the Gini coefficient, but also two measures of crowding at the bottom of the distribution: the ratio of the number of people who say that they are in the lowest income decile in the country to the number who say that they are in the highest, and the same ratio with respect to self-reported social class. While the Gini coefficient continues to exhibit a positive correlation with both happiness and life satisfaction, the estimated

[19] A question which we do not address here is whether it is the pre-tax or post-tax income distribution that is correlated with subjective well-being. One reading is that it is the distribution of pre-tax income which determines both well-being and preferences for redistribution, and this latter influences the actual tax system which in turn determines the post-tax distribution of income. At the practical level, not all empirical papers make clear whether their income measures are net or gross.

coefficients on these two ratios are negative and often significant. This might be thought of as consistent with some of those at the bottom providing a negative signal (as in D'Ambrosio and Frick, 2012), or more generally with some negative externalities in society associated with poverty.

O'Connell (2004) uses information on (the log of) the income received by the top quintile in a country to that received by the bottom quintile. This is shown to be negatively associated with life satisfaction in an aggregate-level analysis of 15 EU countries in Eurobarometer data over the 1995-1998 period.

Some of the work appearing in Table 1 uses a variety of measures of income distributions. Both Tomes (1986) and Brodeur and Flèche (2013) consider the bottom end of the distribution, with the former including the share of income earned by the bottom 40%, and the latter the county-level percentage in poverty according to three separate definitions.

In general, however, very few contributions here have tested different measures against each other in a beauty contest to see which one is the most salient correlate of subjective well-being. Ebert and Welsch (2009) is relatively unusual in this literature in that they do consider a wide class of inequality indices comprising the Atkinson and Gini family as special subclasses (see Ebert, 1988), and evaluate their effects on individual reported life satisfaction in 20 years of Eurobarometer data. As the self-reported income data in the Eurobarometer is not sufficiently good to allow detailed measures to be computed from within the dataset, these latter are matched in from the Luxembourg Income Study (LIS), which somewhat reduc[20]es the number of countries which can be used in the empirical analysis.

Ebert and Welsch start by considering the Gini, Atkinson 0.5 and Atkinson 1.0 indices. All three of these are shown to be significantly correlated with life satisfaction in ordered probit regressions. They then consider generalizations of these indices. Their analysis of life satisfaction leads them to conclude that both rank and level inequality aversion matter, and that the overall degree of inequality aversion is larger than that implied by the standard measures applied in empirical analysis.[21]

A last point with respect to the question of '*which measure of others' income*' is that existing work has very much concentrated on cardinal measures of comparisons, as picked up by income gaps and Gini coefficients. While there is likely some role for such comparisons, it

[20] Although not in the context of subjective well-being, Jancewicz (2014) provides an extremely interesting analysis of the criteria that individuals use in order to sort different income distributions into groups that have similar perceived levels of inequality.

[21] It would also be of great interest to evaluate the relationship between income polarization and individuals' reports of subjective well-being. We are not aware of any contributions in this respect.

also seems probable that individuals are rank-sensitive. Some previous work has considered the role of income rank in determining well-being. In Brown *et al*. (2008), income rank is shown to outperform average reference group income in three satisfaction equations (influence over the job, achievement, and supervisor's respect): see also Clark *et al*. (2009*a*) for economic satisfaction and Boyce *et al*. (2010) for life satisfaction. In the field experiment in Card *et al*. (2012), information on the individual's revealed rank in the income distribution was more important in determining their satisfaction than was the relative wage level. Clark *et al*. (2010) appeal to both survey and experimental evidence on the role of relative income in determining the level of effort that workers supply. In both types of data, the individual's rank in the income distribution is a more powerful determinant of their effort decision (as measured by the log-likelihood) than is the relation of the individual's own income to mean income in the reference group. Mujcic and Frijters (2013) come to the same conclusion in the analysis of hypothetical choice data from a sample of just over 1000 Australian students. Finally, Clark and Senik (2014) appeal to Chinese panel data from Guizhou province, in which all households in the village are interviewed. This complete data allows household rank in the village income distribution to be determined. Being at the top (top decile) or bottom (lowest 25%) of the income distribution seems to matter disproportionately for satisfaction with income.

It may also be the case that not all ranks are of equal importance, so that the correlation between income rank and subjective well-being is non-linear. The experimental and survey results in Kuziemko *et al*. (2014) underline the importance of the aversion to being last in the distribution. Experimental subjects accept gambles which may move them out of last place that they reject if anywhere else in the distribution. Equally, subjects randomly placed in second-to-last place in modified-dictator games are the most likely to give money to the person one rank above them instead of the person one rank below. One implication is that the relatively poor may oppose redistribution if it is especially targeted at those who are just beneath them in the income distribution. Survey data does indeed show that respondents who earn just above the minimum wage are those who are the most likely to oppose any rise in the minimum wage.

These kinds of rank comparisons are of great interest. They do imply a role for inequality in the determination of individual well-being in that, given own income, a mean-preserving spread of income in the reference group implies lower individual rank. However, at the societal level this will not matter. By construction, rank is zero-sum: my loss must be offset by others' gains. Unless we have heterogeneity in the taste for rank (as in Frank, 1985),

the degree of inequality will here not affect the way in which income comparisons affect overall well-being.

4.3 Fairness and preferences for redistribution

The measures of income distribution used in the above literature have been objective: they measure what others in the society actually earn. This is of course not necessarily what individuals *believe* that others earn, and it may well be this latter, and its relation to what it is believed that others *should* earn, that is the most important for determining individual attitudes towards inequality.

Almost no-one in our societies thinks that everyone should receive the same income. Incomes differ often for very good reasons, such as number of hours of work for example. In general, we can think of the causes of income distribution as being partitioned into factors for which the individual is responsible and those for which she is not (see Fleurbaey, 1995). These are respectively referred to as effort and circumstances in the literature on the equality of opportunity (see chapter 5 of this volume for a survey in great detail).[22] Almås *et al*. (2011) propose the measurement of a 'responsibility-sensitive' fair income distribution. This is applied to 1986-2005 Norwegian data. They show that, although the Gini index fell over this period, unfair income inequality actually rose. Further, the pre-tax unfair income Gini rose less than the post-tax unfair income Gini, so that the tax system has become less pro-fair.

An alternative approach to fairness, which does not require the explicit distinction of responsibility and non-responsibility factors, is to explicitly ask individuals about how much they think that others should earn. For example, the cross-country ISSP surveys have asked direct questions a number of times about perceived and fair distributions of incomes. Each year the ISSP survey administers a number of core questions, as well as rotating modules on specific topics. These modules in 1987, 1992, 1999 and 2009 were on Social Inequality. Individuals were asked directly how much they thought that individuals in certain job types earned. For example, in the 1987 wave, variable v26 refers to the answer to the following question:

"*We would like to know what you think people in these jobs actually earn. Please write in how much you think they usually earn each year, before taxes. (Many people are not*

[22] We might expect inequality to be less acceptable when it occurs by chance, rather than from individual effort. In this context, it is noticeable that there is no particular push to redistribute from lottery winners. This may reflect that they on average already pay a tax by spending more on the lottery than they receive. In the UK National Lottery, for example, less than half of the money spent on tickets is won in prizes.

exactly sure about this, but your best guess will be close enough. This may be difficult, but it is important, so please try.). First, about how much do you think a bricklayer earns?". Variable v27 refers to the answer to the same question, but now with respect to a Doctor in general practice. The following nine questions then cover the income of a bank clerk, an owner of a small shop, the chairman of a large national company, a skilled worker in a factory, a farm worker, a secretary, a city bus driver, an unskilled factory worker, and a cabinet minister in a national government.

Last, individuals are asked a series of eleven questions covering the same occupations, but this time are asked to indicate what they think that these individuals *should* earn each year before taxes, regardless of what they do actually receive.

The same types of questions are repeated across the different Social Inequality modules, although by 2009 the questions only covered the five occupations of a Doctor in general practice, the chairman of a large national company, a shop assistant, an unskilled factory worker, and a cabinet minister in a national government.

Similar kinds of questions have appeared in a number of other surveys, including the 2005 wave of the SOEP. It is also possible to ask these questions about actual and just rewards with respect to the individual herself, or regarding a hypothetical third person with a given set of demographic characteristics (see Jasso, 2007).

One application of the answers to these questions is to consider the responses that are given for occupations at the top and bottom end of the income distribution: for example, in the above ISSP questions, the incomes of the chairman of a large national company and an unskilled factory worker. The ratio of these two gives an indication of the income inequality that the respondent perceives. Along the same lines, a fairness index can be calculated as the ratio of the incomes that the individual believes that these two occupations should earn. The comparison of these two ratios gives an indication of how much of the gap in earnings that the individual perceives is considered to be fair.

An empirical application of this kind of approach can be found in Schneider (2012), who uses German data from the 2006 wave of International Social Justice Project to consider the relationship between subjective well-being and income inequality. Instead of calculating a Gini coefficient from within the dataset, or matching it in at some level from an external data source, she calculates a direct measure of the individual's perception of the fairness of the income distribution.

Using the responses to the questions about the perceived incomes (PI) and just incomes (JI) of a managing director (MD) and an unskilled worker, she calculates a measure of the overall legitimacy of income inequality as follows:

$$Legitimate\ Inequality = ln[(PI_{MD}/PI_{unskilled})/(JI_{MD}/JI_{unskilled})].$$

Someone who believes that the current income distribution is just has a value of legitimate inequality of zero. Those who believe that the income gaps should be wider will have a negative value, while those who perceive some inequality of reward will have a positive value. This measure of legitimate inequality varies at the individual level, therefore providing far more potential explanatory power than the aggregate-level measures of income inequality which have been discussed so far.[23]

In her 2006 data, Schneider reports an average value of the first term in the square brackets, $PI_{MD}/PI_{unskilled}$ of around 644, with the average value of $JI_{MD}/JI_{unskilled}$ being slightly over 300. This yields a value of legitimate inequality of around 0.75. The individual level of the perception of inequality is shown to be negatively correlated with life satisfaction. This correlation is stronger for the higher than for the lower income groups.

Osberg and Smeeding (2006) appeal to these questions in the 1999 ISSP survey. However, instead of looking at the gaps with respect to the top and bottom occupations in the list, they consider the entire set of responses regarding perceived and just incomes. By assuming that there are equal numbers of individuals in each of the nine occupations, they can calculate Gini coefficients, both with respect to the income that the individual actually believes is earned, and a 'just' Gini coefficient for the income that she believes should pertain. They then calculate the ratio of these two Gini coefficients: a value of less than one implies that the individual believes that there should be less inequality than that which she believes exists.[24]

Most people are in favour of some levelling of incomes, while very few believe that all incomes should be the same. The average value of the ratio of the Gini coefficients is less

[23] Legitimate inequality does differ across individuals, which is good. However, it is also potentially endogenous, with unhappy people thinking that people at the top of the income distribution earn more (or should earn less), for example.

[24] Blanchflower and Freeman (1997) are along the same lines. They use the 1987 and 1992 ISSP surveys and consider the standard deviation of the log response given across the different occupations. They do this both for the perceived and fair distributions (which they call the perceived and appropriate differentials). Their main result is that ex-Communist countries both perceive and consider appropriate tighter income distributions compared to Western countries, but that this gap fell sharply over the transition process (here between 1987 and 1992).

than one in all of the 27 countries which appear in the 1999 ISSP. The average figure across all countries is 0.75. In some countries, such as the US and Japan, this figure is around 0.8; in others such as Spain and Sweden it is under 0.7. As well as cross-country differences in this measure of the desire to redistribute, there are systematic differences by individual characteristics as well. In particular, Osberg and Smeeding underline the importance of age, education and family income in this respect.

A more direct approach to perceived income inequality, and its relation to subjective well-being, is taken by Smyth and Qian (2008), who use Chinese data from a 2002 survey of 31 cities. In this data, individuals are asked directly about their perceptions of inequality of the income distribution, on a one to five ordered scale. These perceptions are shown to be correlated with individual happiness scores.[25] The sign of this correlation depends on the individual's own position in the income distribution. In particular, perceived inequality is negatively correlated with happiness for individuals who are in the bottom quintile of the income distribution, whereas this correlation is positive for those who are in the top quintile.

The importance of inputs and income inequality has also appeared in the experimental literature: it matters where income comes from. Abeler *et al*. (2010) find, in a gift-exchange game, that equal wages lead to systematically lower levels of effort being furnished by workers than when the firm can decide to pay workers differently. Their explanation is that workers do not want their wage-effort ratio to be lower than that of their co-workers, and consequently work less hard. Clark *et al*. (2010) also find that the wages offered to other experimental participants in a gift-exchange game are negatively correlated with the effort furnished by the worker. Krawczyk (2010) finds in experimental work that the equality of opportunity moderates the desire to redistribute.

Perhaps the most direct evidence of attitudes towards inequality comes from asking individuals whether they want to see less of it, by redistributing from the richer to the poorer. There is a considerable literature on the desire to redistribute: see Förster and Tóth (2014). One of the first contributions is Persson and Tabellini (1994), who both propose a theoretical model and present some empirical results with respect to the median-voter theorem. The individuals here are purely concerned with their own self-interest, and have no social preferences as such. The median here refers to the distribution of some variable, for example

[25] This correlation is arguably large in size. Happiness in their survey is on a 1-5 scale, as is the individual's perception of inequality. The overall partial correlation between happiness and fairness in their Table 2 is -0.09. As such, the effect of moving from the bottom to the top of the perceived income inequality scale has an effect of 0.36, which is 9% of the scale range. We cannot directly compare this figure to the correlation between subjective well-being and the Gini coefficient in Section 3.1, as we cannot map the seriousness of inequality to a particular Gini figure.

income or skills (as measured by education). The individual's voting preferences will then depend on their own position in that distribution.

A second well-known contribution is Piketty (1995), who develops a theoretical model to explain why, in the long run, Left-wing dynasties in the lower class are more supportive of redistributive policies, while Right-wing dynasties in the upper-middle classes are less so. As in Persson and Tabellini (1994), individual income is here related to political opinion: those with higher incomes are more right-wing and less favorable to redistributive policies, while those with lower incomes are more likely to vote for left-wing parties and to be in favor of redistribution.[26]

It is not only the individual's situation today that counts, but also where she thinks that she might end up tomorrow. The 'prospect of upward mobility' (POUM) literature explicitly appeals to individuals' future prospects of social mobility. As such, own current income is not a sufficient statistic to know the individual's current preferences over redistribution. The currently poor may oppose redistribution if they expect their own income to improve in the future (Benabou and Ok, 1996, provide theoretical and empirical evidence that the POUM hypothesis works to limit the extent of redistribution in democracies). There is an obvious parallel between the POUM hypothesis and what we referred to as the signal effect of others' incomes in Section 2.1.

A number of pieces of empirical work have correspondingly underlined the importance of both current and future income. Along these lines, Ravallion and Lokshin (2000), using Russian microdata, were the first to show that self-assessed expected own social mobility, or the belief of being on a rising income trajectory, leads to lower demand for redistribution. Alesina and La Ferrara (2005) show that preferences for redistribution are sensitive to the objectively-measured future gains and losses that would result from it (again, this is consistent with pure self-interest). They also stress the importance of mobility as an objective measure of the future expected gains and losses resulting from redistribution. In particular, there is a negative relationship between upward mobility (defined as the individual's own job prestige being higher than that of their father) and preferences for redistribution.[27] In particular, a subjective measure of whether the respondent says that he and his family 'have a good chance of improving their standard of living' is very strongly negatively correlated with support for

[26] There is also a lively literature which emphasizes not necessarily whether I myself will benefit from redistribution, but also whether "people like me" are likely to do so. A recent survey of ethnic diversity and preferences for redistribution is provided by Stichnoth and Van der Straeten (2013).

[27] The survey in Alesina and Giuliano (2010) emphasises the role of the past in general, both the individual's own past and the country's history.

redistribution. Cojocaru (2014*b*) analyses data from the second wave of the LiTS survey (the data are from 2010), and shows that preferences for redistribution are indeed linked to future upward mobility. The demand for redistribution is lower amongst those who are poor today but expect to be rich[28] in four years' time than for those who expect to be poor at both points in time. In line with the original POUM hypothesis, this finding only holds for those with lower levels of risk aversion (from a question on whether the individual would sell their car to buy insurance against a catastrophic drought).

Guillaud (2013) uses 2006 ISSP data covering 33 countries to show that income and occupation are both important predictors of redistributive preferences. Equally, downward social mobility (having a lower position on the social scale now relative to ten years ago) increases the demand for redistribution, while upward social mobility reduces it. There is some evidence that the downward mobility coefficient is larger in size than that on upward mobility, as if individuals were loss-averse with respect to status.

Clark and D'Angelo (2013) analyse 18 waves of BHPS data. They show that higher social status is associated with less favourable attitudes to redistribution and the public sector, as is commonly-found. However, they also find that upward mobility (relative to one's parents) is associated with more Left-wing attitudes, which are shown to be translated into actual reported voting behaviour.

As noted in Section 3.1 above, Alesina *et al*. (2004) show that the effect of inequality on happiness is larger in value in Europe than in the USA. The explanation proposed in Alesina *et al*. is in terms of greater perceived social mobility in the USA than in Europe.

Measures of the demand for redistribution have also been shown to be correlated with the individual's view of the fairness of the income distribution (Corneo and Gruner, 2002, and Luttens and Valfort, 2012). The former test the importance of fairness in determining preferences for redistribution via the answer to the ISSP question "*How important is hard work for getting ahead in life?*", with responses "essential", "very important", "fairly important", "not very important", and "not important at all". They show that there is a self-interested component, in that those who state that they would personally benefit from lower inequality are indeed in favour of redistribution, while those with higher incomes are against distribution. The estimated coefficient on their fairness variable, 'hard work is key' (defined

[28] Poor and rich (now and future) are derived from the individual's response to a question about which decile of the income distribution they are at now and expect to be in four years' time. The poor (rich) are those who give an answer which is under (over) the average answer for the population.

as providing one of the first three responses above), is shown to be negative and significant in a preferences for redistribution regression.

Luttens and Valfort (2012) appeal to data from the WVS and the ESS. They show that both own income and the individual's perception of fairness determine redistribution preferences. It is of interest to note that individuals in the US seem to more sensitive to fairness considerations in determining redistribution than are European respondents.

Tóth and Keller (2011) consider data from the 2009 Poverty and Social Exclusion module of the Eurobarometer. They calculate a Redistributive Preferences Index (RPI) using Principal Component Analysis of five questions on redistribution. The values of this index are then correlated with both individual and country-level variables. The latter include estimates of the distribution of income matched in from LIS data. They show that the RPI is higher for those with lower material status, those who expect the situation to deteriorate over the next 12 months, and who do not think that the poor are lazy. They also consider a number of percentile distribution measures (P95/P5, P95/P50 and P50/P5), as well as the Gini coefficient. All of the three percentile ratio measures attract positive significant estimated coefficients, so that the desire to redistribute rises with inequality. Inequality at the top and bottom of the distribution seems to play an equal role here. Yamamura (2012) also shows that the prefecture-level Gini coefficient is positively associated with redistributive preferences in seven years of Japanese GSS data, although with a significant effect only for the richer.

One perhaps salient point here is that the questions used to establish preferences for redistribution are very different from one survey to another, which hampers the comparability of the existing results. Attitudes to income inequality are measured as follows in the BHPS: "*People have different views about the way governments work. The government should place an upper limit on the amount of money that any one person can make*". Answers to this question are on a 1-5 scale, where 1 represents complete disagreement and 5 complete agreement. This is not a question about redistribution in general, but about pulling the top of the distribution down. In the ISSP, respondents are asked "*On the whole, do you think it should or should not be the government's responsibility to reduce income differences between the rich and the poor?*", with answers on a 1-4 scale. The relevant question in the WVS asks individuals to indicate, on a 1-10 scale, which of the two extremes they most agree with: "*people should take more responsibility to provide for themselves*" versus "*the government should take more responsibility to ensure that everyone is provided for*". As Luttens and Valfort (2012) note, this does mix up concerns for the income distribution with perceptions of government efficiency. Last, the question in the ESS is similar to that in the WVS, asking

individuals to choose between "*government should decrease taxes a lot and spend much less on social benefits and services*" and "*government should increase taxes a lot and spend much more on social benefits and services*".

As well as individuals' stated preferences for redistribution, a recent paper has provided intriguing evidence that the actual observed progressivity of the tax system is positively correlated with average national well-being. Oishi *et al*. (2012) use data from 54 countries in the 2007 Gallup World Poll. Respondents here report three different kinds of well-being measures: Cantril's ladder of the worst to best possible life, and positive and negative daily experiences. The country averages of these scores were correlated with the progressivity of the national tax system from Worldwide-Tax.com (calculated as the highest minus the lowest marginal tax rates, or the difference in the tax rates of those earning 67% and 167% of the country mean income). Tax progression is positively correlated with subjective well-being (see their Figure 1). This is not a simple revenue effect, as both the overall tax rate and government spending are significant in the well-being regressions.

4.4 Only self-interest?

The view of others in the comparative view of the reference group is arguably rather a depressing one. Other people are a negative externality in that $Y_i > Y_j$ brings relative satisfaction and $Y_i < Y_j$ relative deprivation for individual *i*. However certain others may be relevant for the individual, but not viewed in this comparative way. Rather, as intimated in the Introduction, there may well be a sentiment of extended sympathy towards some groups. In a parallel to the comparative reference group, the individuals towards whom behaves altruistically will be chosen by the individual, and may well exclude certain groups in society.

This leads us to the discussion of altruistic behaviour, whereby transferring one's own money to others not only increases the recipient's well-being but also that of the donor. While it is commonplace that generous people record higher well-being scores, showing causality from the former to the latter is more difficult.[29] Luckily there are a number of pieces of research which have suggested such a causal link.

One way of establishing causality is to use experiments. There has been something of a cottage industry in using randomised allocations or natural experiments to look at the relationship between own income and subjective well-being. Dunn *et al*. (2008) build on the observed positive correlation between pro-social spending and subjective well-being by

[29] The experimental approach in Konow and Earley (2008) shows that those with (previously-elicited) happiness scores are subsequently more generous in Dictator Games.

considering a randomised experiment in which some individuals are forced to be generous. In particular, experimental participants first report their happiness. They are then given an envelope with either $5 or $20 to spend that day. Half are told to spend the money on themselves, and the other half on someone else. Happiness recorded later that same evening shows a significant subjective well-being margin in favour of those who spent on others. Importantly, when surveyed regarding what they thought would make them happy, a separate sample of respondents thought that spending on themselves would make them happier than spending on others: as such, individuals are not necessarily aware of the happiness benefits of altruism *ex ante*.

Aknin *et al*. (2013) make the same point more broadly. They first report a positive correlation between prosocial spending and happiness in 136 countries from the Gallup World Poll. They also appeal to experimental analysis. In Canada and Uganda, individuals asked to recall a past instance of prosocial spending reported higher happiness scores than did those who were asked to recall a past instance of personal spending; equally, in India individuals asked to recall a past instance of prosocial spending reported higher happiness scores than did those who were not asked to recall past spending. Last, along the same lines as Dunn *et al*. (2008), participants in Canada and South Africa who were randomly assigned to buy items for charity reported greater positive affect than those who were assigned to purchase the same items for personal use.

Boehm and Lyubomirsky (2009) show that individuals in a treatment group who were told to perform three extra acts of kindness a day experienced a sustained rise in happiness compared to a control group.

It is a small step from monetary donations to others to volunteering in general, and Carpenter and Myers (2010) show that the two are indeed correlated. Meier and Stutzer (2008) analyse survey data around the time of German reunification, which led to a sharp reduction in volunteering opportunities in East Germany. Meier and Stutzer show that the drop in subjective well-being was larger for those who had previously volunteered than for those who had not: a natural conclusion is then that volunteering caused well-being.

A vibrant research area of interest in this respect covers charitable giving. Individuals may give to charity either because they care about the recipients of their largesse, or because they derive some process utility from the act of giving that is independent of the use to which their gift is put (which is what Andreoni, 1989, calls 'impure altruism').[30] Konow (2010)

[30] Alternatively, charitable giving may be seen as a good that endows status on the benefactor, as in Frank (2004).

appeals to a series of carefully-designed experiments to show that giving to others cannot be only explained by the 'warm glow' of the process utility, and that the student subjects are systematically more generous toward charities than toward fellow students. This latter holds even when the charities are not known to the subjects, avoiding any role for familiarity. Konow suggests an over-arching role for context-dependent norms in the determination of giving to others, which he identifies as equity and need in his experiments. Useful relevant symposia on charitable donations can be found in the June 2011 special issue of the *Journal of Public Economics* on Charitable Giving and Fundraising, and the forthcoming OUP book edited by Fack and Landais.

As noted by Clotfelter (2014), charitable giving is a more important phenomenon in the US than in other G7 countries. However, it does remain unclear whether such giving is always redistributional, in the sense of being aimed at the less well-off. A first point is that some charitable donations, especially among the richer, go to the Arts or Education. Perhaps even more saliently, charitable donations in the US are regressive in terms of the percentage of income donated (see http://philanthropy.com/article/Interactive-How-America-Gives/133709/).

Section 2.1 described a number of pieces of research in the vein of the comparative reference group, whereby higher incomes amongst relevant others were associated with lower levels of subjective well-being. This correlation is not always found to be negative however. A variety of contributions have found that satisfaction and the income of close neighbours are actually positively correlated. This is the case in survey data in Canada (Barrington-Leigh and Helliwell, 2008), China (Kingdon and Knight, 2007) and Denmark (Clark *et al*., 2009*a*). While the non-experimental protocol here makes interpretation more difficult (there are any number of reasons why people might be happier with richer neighbours, including tunnel effects or the provision of local public goods), these findings are consistent with empathy with respect to close neighbours.

Kranton *et al*. (2013) also underline that individuals can be altruistic towards some individuals, but comparative with respect to others. Individuals in their experiment make a series of choices regarding income allocations between two subjects. These subjects can be the individual, a member of her own group, or a member of another group. These groups are determined either by political persuasion, or as 'minimal groups' depending on a preference over two nearly identical lines of poetry, landscape images, and abstract paintings. The authors find considerable heterogeneity in social preferences, and show that individuals are

less generous (or even downright destructive, as in Zizzo and Oswald, 2001), towards individuals outsider their group, even when groups are essentially randomly-formed.

The theoretical implications of altruism in terms of redistribution are analysed in Hochman and Rogers (1969). In this case, some redistribution can make everyone better off. Hochman and Rogers considers transfers only from richer to poorer, and which do not change the income ranking. Transfers are costless: there is no leaky bucket. One of the central aims of their analysis is to establish how the amount transferred depends on the income gap between the rich and the poor. They distinguish two salient cases, which depend on the 'transfer elasticity'. When this elasticity is zero, the same fixed sum is always transferred; when it equals one then the amount transferred is proportional to the income gap between the rich and the poor. A calibration suggests that actual US income tax rates are more consistent with the elasticity being one than zero.

5. Conclusion

As so often in Economics, asking about the relationship between income inequality and individual attitudes looked to be a pretty simple question, but turned out to be remarkably more delicate to answer.

The broad question addressed here is why individuals should care about the distribution of income in a society. The first useful distinction is whether they figure in the society in question or not. In the former case, income inequality will have implications for both their own income and their income relative to others: this is the comparative view of the income distribution. In the latter case, individuals can evaluate a distribution of income dispassionately, as it were, as this distribution will have no implications for either their own absolute income or their relative income: this is the normative view of the income distribution.

As a broad conclusion, there is now a variety of types of evidence which are consistent with individuals caring about their income position relative to others. To that extent, individuals do indeed have social preferences. It is worth underlining the unanimity that individuals dislike earning less than others. The 'comparative' response to earning more than others remains open to debate. There may well be something of an asymmetry here, with the well-being advantage of earning more than others being smaller in absolute value than the well-being loss of earning less than others (a type of comparative loss aversion). However, the more extreme version of this aversion, with individuals actually disliking earning more than

others remains open to debate. In general, the well-being effect of a rise in inequality under the comparative lens is ambiguous: some people will become richer than those in their reference group, others will become poorer.

In contrast to these comparative findings, the happiness literature on the normative view of the income distribution has provided a wide scattershot of findings. One obvious difficulty in any approach based on survey subjective well-being data is effectively controlling for relative income when estimating the correlation between happiness and the income distribution. Very few analyses do so, and therefore provide some kind of compound correlation which includes both comparative and normative elements. The experimental approach here has a notable advantage in being able to distinguish the two.

Our reading of the many empirical analyses is that others' income most certainly does affect individual well-being: certainly in a comparative sense and very likely normatively too. At the same time, there are many qualifications to any broad-brush conclusion. First, the source of the income under consideration is key, with a consistent finding that individuals are less accepting of income gaps between individuals that are seen to be undeserved. Second, individuals can have separate views of different income distributions: it is quite possible to be altruistic with respect to one group, but comparative with respect to another. In this sense, it is not clear that there is only one 'attitude' to inequality. Nor is it clear that such attitudes are fixed over time. For example, preferences for redistribution depend (in a self-interested way) on the individual's perceived position in the income distribution, and on the degree of empathy towards others. Research in Psychology has suggested that younger cohorts are more likely to rate themselves as above average (Konrath *et al*., 2011), and are less empathic (Twenge *et al*., 2012). What may have been unacceptable in the past in terms of the distribution of income may become anodyne in the future.

Research in this area has appealed to contributions from a variety of fields of research, both within Economics and across the Social Sciences. It is striking how little these various fields communicate with each other. Any attempt to integrate at least some of the revealed preference, experiment and happiness approaches would surely be welcome.

Individuals do have attitudes towards income inequality, whether these be stated, revealed, or measured physiologically or neurologically. To this extent at least, man is a social animal. There is unlikely to be agreement any time soon about the 'right' degree of inequality. This will be tied up with the societal extent of jealousy, altruism, fairness and values. That many of these concepts are of such interest across the Social Sciences bodes well for Volume 3 of this Handbook.

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Table 1. Income Inequality and Individual Subjective Well-being.

Authors	Country	Data	Inequality Measure	SWB Measure	Inequality and SWB?
Morawetz *et al*. (1977)	Israel	Two different communities	Gini at community level	Happiness	Negative
Tomes (1986)	Canada	1977 Quality of Life Survey	Census data on share of income received by the bottom 40% in 200 Federal Electoral Districts	Satisfaction and Happiness	Positive correlation for men
Hagerty (2000)	USA	GSS (1989-1996)	Maximum and skew of community income	Happiness	Negative
Hagerty (2000)	Cross-Country	8 countries	Gini	Happiness	Negative
Ball (2001)	Cross-Country	1996 World Values Survey	Gini by country	Life satisfaction	Positive in raw data, Positive and insignificant with controls
Blanchflower and Oswald (2003)	USA	20 years of GSS	D5/D1 by State and year	Life satisfaction	Negative (but only significant for women, young, and the less educated).
Clark (2003)	UK	BHPS Waves 1-11	Gini by region and year	Life satisfaction	Positive, especially for those who are more income mobile
Helliwell (2003)	Cross-Country	WVS Waves 1-3	Gini by country and year	Life satisfaction	No relation
Senik (2004)	Russia	5 years of RLMS	Gini by region and year	Life satisfaction	No relation
Alesina *et al*. (2004)	USA	GSS (1972-97)	Gini by year	Life satisfaction	No relation
Alesina *et al*. (2004)	Cross-Country	Eurobarometer (1975-92)	Gini by country and year	Life satisfaction	Negative
Graham and Felton (2006)	Cross-Country	Latinobarómetro	Gini by country and year	Happiness	No relation
Schwarze and Härpfer (2007)	Germany	SOEP	Gini by region and year	Life satisfaction	Negative
Biancotti and D'Alessio (2008)	Cross-Country	European Social Survey	Interquartile range by country	Happiness	Negative for those with more inclusive and moderate values
Bjornskov *et al*. (2008)	Cross-Country	WVS Wave 3	Gini by country	Life satisfaction	No relation
Di Tella and MacCulloch (2008)	Cross-Country	Eurobarometer and GSS (1975-1997)	Gini by country and year	Life satisfaction	No relation, but depends on other variables included in the regression
Ebert and Welsch (2009)	Cross-Country	Eurobarometer (1978-97)	Gini, Atkinson and hybrid measures by country and year	Life satisfaction	Negative
Knight *et al*. (2009)	China	2002 national household survey	Gini by county	Happiness	Positive
Berg, M., Veenhoven, R. (2010)	Cross-Country	World Database of Happiness (2000-2006)	Gini by country and year	Happiness	Slightly positive

Grosfeld and Senik (2010)	Poland	CBOS repeated cross-sections (1992-2005)	Gini by cross-section	Country satisfaction	Positive and then Negative as transition takes place (break in 1996). Positive effect only for right-wingers
Oshio and Kobayashi (2010)	Japan	Japanese General Social Survey (JGSS: 2000, 2003 and 2006)	Gini by prefecture and year	Happiness	Negative
Winkelmann and Winkelmann (2010)	Switzerland	Swiss Household Panel 2002	Gini by municipality/canton/region	Financial satisfaction	Negative
Oishi *et al*. (2011)	USA	GSS (1972-2008)	Gini by year	Happiness	Negative. Effect significant only for those in the bottom two quintiles of the income distribution. Effect is moderated by the perceived fairness of others, and whether the individual believes that others can be trusted
Verme (2011)	Cross-Country	WVS Waves 1-4	Gini by country and year	Life satisfaction	Negative
Van de Werfhorst and Salverda (2012)	Cross-Country	ESS Round 4	Gini by country	Happiness	Negative
Bjornskov *et al*. (2013)	Cross-Country	WVS Waves 2-5	Gini by country and year	Life satisfaction	Effect more Positive the more the individual perceives society to be fair
Brodeur and Fleche (2013)	USA	BRFSS (2005-2010)	County-level percentage in poverty	Life satisfaction	Negative for all three of percentage of people of all ages in poverty, the percentage of related children age 5 to 17 in families in poverty and the percentage of people under age 18 in poverty in the county. Conditional on own income and neighborhood median income
Rozer and Kraaykamp (2013)	Cross-Country	WVS Waves 1-5	Gini by country and year	Average of Life satisfaction and Happiness	Positive
Cojocaru (2014*a*)	Cross-Country	LiTS Wave 1	Gini by Census Enumeration Area Level	Life satisfaction	No relation

Figure 1. Two log-normal income distributions, with the same variance.