

Reference Groups and Relative Effects on Well-Being

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REFERENCE GROUPS AND RELATIVE EFFECTS ON WELL-BEING

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Economic growth may not improve society if people compare their achievements to others in relative ways that detract from well-being. But who are these others and what economic dimensions matter? This research applied a *p*-value ranking approach from genetics research to tackle the issue of reference group selection. Data from over 30,000 British and American adults were analyzed in nearly 800 multi-level models. Over 300 measures of reference group socio-economic status and eight measures of well-being were used. The results showed that reference groups based on geography and age, perceptions of those in “society,” and rank wealth were most consistently associated with well-being. Measures less consistently associated with well-being used averages, medians, and proportions in states and local authorities without demographic sub-groups. Future researchers should consider the consistently associated dimensions of reference groups when constructing relative measures.

JEL Codes: J01, R23, D6, D31, I31

Keywords: relative income, reference groups, socio-economic status, social comparisons, well-being, *p*-value ranking

1. INTRODUCTION

This paper examines the relationship between relative socio-economic status and self-reported well-being. While many studies have been conducted on relative concerns in economics, this research contributes by providing new answers to longstanding questions. Do people compare their income to all their neighbors or only neighbors with certain similar characteristics, like age or gender? Do comparison targets affect whether it is the average income of a local area that matters or one’s position in the distribution of income? Answering these kinds of questions can inform discussions about the optimal level and distribution of socio-economic resources for individuals and societies.

Relative concerns are reflected by “reference groups,” defined as the people to whom we compare ourselves or are merely knowledgeable about in some manner, even if comparison processes are not engaged (Hyman 1942, 1968; Paynton, 1966; Runciman 1966). For example, someone might notice their neighbors’ levels of education and either compare their level of education with their neighbors’ or not. They may take note of their neighbors’ levels of education and move on. The concept of a “reference group” is interpreted in diverse ways across

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various literatures without and with comparison processes. Shibutani (1955) for example, wrote about reference groups as “groups whose perspectives are assumed by the actor” (p. 563). Social comparisons are not present in this conceptualization.

It is difficult to predict the types of reference groups that influence well-being. Part of the difficulty is that people can choose to whom they compare, thus effects are not likely to be uniform within groups or individuals (Sedikides and Gregg 2008). Several studies have asked people to whom they compare (for example, see Dornstein 1988; Knight et al. 2009; Clark and Senik 2010). In Clark and Senik (2010), a sample of about 19,000 Europeans in paid were asked how happy they were, with whose income they would be most likely to compare, and how important these comparisons were. Out of the options work colleagues, family members, friends, others and do not compare, most people selected work colleagues or do not compare, and those who reported that it was important to make comparisons with others’ income were less happy.

In this research, over 300 different measures of reference group socio-economic status were created and used to investigate their relationship with various well-being measures. These are more measures of reference group socio-economic status than in any investigation to date. The two datasets selected for the investigation contain rich measures of well-being and socio-economic status: the American Time Use Survey (ATUS) and the English Longitudinal Study of Ageing (ELSA). The analyses of over 300 measures of reference group socio-economic status across eight measures of well-being in ATUS and ELSA produced new results.

First, geographic comparisons about socio-economic status with respect to neighbors alone were not consistently and substantively associated with well-being. This is interesting given that relative hypotheses have been previously dismissed using income within geographical groups alone (Deaton and Stone 2013). Second, people needed to identify with their neighbors in some way—particularly according to age or perceptions of those in “society”—for social comparisons about socio-economic status to matter for well-being. Finally, rank position mattered more than average or median position most consistently and substantively for wealth, although there was evidence for relative effects in all socio-economic domains.

Overall, the results suggest that researchers should use age and consider wealth rather than income (where available) when constructing reference group socio-economic status measures in well-being research. They should also be cautious about using reference groups constructed using geography as the main comparison group unless they incorporate perceptions of geography or other demographic characteristics like age.

In what follows, the literature associated with this research is reviewed. Given the vast amount of literature, it is necessarily a selective review. Section 2 discusses how theories of positional consumption and identity economics relate to the literature on relative socio-economic status and well-being. Section 3 details the conceptual approach to reference groups. Section 4 lays out the data and analytic approach, and Section 5 contains the results. Section 6 contains a discussion and conclusion.

2. PREVIOUS LITERATURE

2.1. *Background to Positional Consumption and Identity Economics*

Economic considerations of relative effects are longstanding. Veblen (1899) and Duesenberry (1949) were early proponents of the idea that individual consumption and utility are dependent on group consumption, i.e. “Keeping up with the Joneses.” Intuitively, an annual pay increase of \$10,000 might seem substantial and contribute positively to someone’s well-being (an absolute effect); however, if those around that person also receive a pay raise of \$20,000—and if this is known—their own pay raise might affect their well-being less, not at all, or even negatively because of social comparisons to others’ pay (a relative effect). This is a significant issue because economic growth may not be associated with better well-being if positional concerns about economic status negatively impact upon well-being (Easterlin 1974; Deaton and Stone 2013; Oishi and Kesebir 2015).

Economic theories about positional concerns center on consumption and, by association, income and wealth, which are sometimes used to proxy consumption (Luttmer 2005). Yet not all economic theories that incorporate positional concerns focus on consumption. Akerlof and Kranton’s (2000, 2010) theory of identity economics draws upon psychological and sociological theories about social norms, which also reflect positional concerns (see also Akerlof 1980). The basic premise is that it is not only people’s preferences and tastes that affect their decisions but also social norms about what is and is not appropriate, and whether these norms affect people depend upon their identities.

The relative income literature is largely founded on theories of positional consumption, which is evidenced by key papers referring to the work of positional theorists but not social norm and identity economics (Easterlin 1974; Luttmer 2005; Clark et al. 2008). It is evident, however, that social norm and identity theories are also applicable to research into the relationships of relative socio-economic status with well-being. As an example, Black but not White groups are negatively affected by relative income in the United States (Davis and Wu 2014). This is general evidence for social norms because the relationship between consumption and utility depends upon the group, but the lens of identity gives nuance to the interpretation because ethnic identity background shapes the direction of the relationship.

The relative unemployment and well-being literature is more rooted in social norm and identity theory than positional theories of consumption. Many studies focus on norms (Stutzer and Lalive 2004; Powdthavee 2007; Shields et al. 2009; Clark et al. 2010; Oesch and Lipps 2013; Chadi 2014). There are exceptions. Eggers, Gaddy and Graham (2006, p. 227) introduced their discussion of norms by discussing Duesenberry’s (1949) relative income hypothesis, and Clark (2003) referred to both social norm theory and theories of positional consumption. Despite their similarity, social comparisons and social norms are not equivalent. To illustrate, men being more affected by relative unemployment in Clark (2003) is poorly explained by general comparison and positional consumption approaches that do not predict gender differences. A more specific explanation comes from social norms theory, whereby it is more acceptable for women to be out of the labor force.

Scholars in the smaller relative education literature refer to both positional and identity theories (e.g. Kingdon and Knight 2007; Botha 2014; Nikolaev 2016). Unlike the relative income literature, education is not typically considered a proxy for consumption but rather a good that is consumed. There may be absolute benefits from consuming education, such as higher future earnings, productivity, and experienced meaningfulness while learning (Becker 1994; Anusic et al. 2017). However, well-being may depend on others' education because this sets a social norm for how well-educated people are expected to be. Education also signals status and investment, affecting well-being when educational norms are internalized based on identity (Akerlof and Kranton 2002; del Salinas-Jiménez et al. 2011; Piper 2015).

In summary, although the relative income, unemployment, and education literatures vary in the extent to which they apply positional consumption or social norm and identity theories, they can apply to both. Positional consumption theories provide the general insight that individual consumption and utility are dependent upon others' consumption, while social norm and identity theories explain how and why they are dependent and explicitly expand the consideration of consumption to other domains, including education and unemployment.

2.2. *Further Studies on Reference Group Socio-Economic Status and Well-Being*

What is the empirical evidence on the effects of reference group socio-economic status on well-being? The effects of higher reference group socio-economic status need not always be negative. For example, it could be that others' success signals hope for one's own future or provides shared public goods and resources that positively contribute to well-being (Hirschman and Rothschild 1973; Cheung 2016; Brodeur and Flèche 2019).

2.3. *Relative Income*

Many studies have shown negative effects of relative income (and consumption and wealth) on well-being (for example, see McBride 2001; Blanchflower and Oswald 2004; Luttmer 2005; Layard et al. 2010; Card et al. 2012; Hudson 2013; Clark et al. 2017; Elgar et al. 2021). Most studies used average or median—or predicted average or median—measures of relative income and wealth, which reflect norm but not identity effects. There are exceptions. For example, Card et al. (2012) used lists of real salaries, finding that seeing the list lowered well-being if staff earned less than the median. Powdthavee et al. (2017) used tax data on top income shares, finding a negative association of increasing shares with well-being.

Some studies highlight a positive association of relative income and wealth with well-being, especially in small local geographic areas like US zip codes (e.g. see Graham and Felton 2006; Clark et al. 2009; Firebaugh and Schroeder 2009; Ifcher et al. 2018; Brodeur and Flèche 2019). There is, however, also research that shows no or a negative effect of relative income in local areas (Luttmer 2005; Deaton and Stone 2013; Cheung and Lucas 2016), and evidence of positive effects of reference group socio-economic status on well-being outside of small local areas (e.g. Senik 2008; Davis and Wu 2014). FitzRoy et al. (2011) found relative effects were positive for those under 46 years, though still negative for those over 46, suggesting comparisons may be affected by ageing, period, or cohort effects.

Other studies have documented no association (Diener et al. 1993; Deaton and Stone 2013; Diener et al. 2013; Kifle 2014; Luo et al. 2018). These studies support the notion that economic growth is associated with better well-being because detrimental effects of social comparisons to others' success do not, overall, interfere with the positive effects of economic growth (Sacks et al. 2012). The notion of "overall," however, misses nuances (De Neve et al. 2018). Relative effects may be null on average but negative in regions with high income inequality, perhaps because social cohesion is lower (Cheung and Lucas 2016). Moreover, average or median measures might not capture reference group socio-economic status as well as measures like rank (Boyce et al. 2010; Kifle 2014; Hounkpatin et al. 2015). We need to go beyond population average effects to fully understand the consequences of relative income and economic growth for well-being.

2.4. *Relative Unemployment and Education*

The relative unemployment and education literatures also show conflicting results. Generally, there is a negative association between relative (national) unemployment rates and well-being, and being unemployed tends to hurt individuals less when unemployment rates are high (Clark and Oswald 1994; Di Tella et al. 2001; Wolfers 2003; Alesina et al. 2004). However, Eggers et al. (2006) show that higher local unemployment was associated with better well-being, and Böckerman and Ilmakunnas (2006) detected no association between national unemployment and well-being.

Although there are fewer studies, some research shows a negative association between relative education and well-being, too, including in studies where workers are more educated relative to their colleagues with similar occupations (Piper 2015; Nikolaev 2016). However, other research on relative education has found positive and null associations (Putman 2001; Nikolaev 2016). Although income, employment, and education are separate dimensions of socio-economic status, these dimensions are related, and their literatures share the similar feature that evidence for the directions of the relative effects on well-being is mixed.

2.5. *Explanations for Contrasting Results*

What might explain these contrasting results? One possibility is that null overall effects might be negative in some areas, such as where inequality is higher (Cheung and Lucas 2016). The assessment of relative effects might matter, with relative rank effects being stronger than median or average effects (Boyce et al. 2010; Kifle 2014; Hounkpatin et al. 2015; Macchia et al. 2020). Shared public goods could account for positive effects (Brodeur and Flèche 2019). Another possibility is that effects differ according to reference groups. Many studies use geographic reference groups based on the assumption that people know and identify with their neighbors.

For example, Deaton and Stone (2013) found no evidence that higher average regional incomes were associated with worse well-being. They did not appear to control for absolute income at the person-level, which could conflate absolute and relative effects. However, they argued that if the overall effect on well-being of relative income is negative, then a negative sign will appear for average income

in the reference group (because the negative average relative income effect would essentially absorb the positive effect of absolute income). This does not address the negative effect that absolute socio-economic status could have on well-being at some points of the distribution, nor the positive effect that relative status could have (Jebb et al. 2018; Kudrna and Kushlev, 2022). Nevertheless, in their results, the effect within different geographic regions was always positive except for average income in states for happiness, where the effect was negative. They argued their results did not support the relative income story whereby income generates negative externalities for others and economic growth does not improve well-being. However, neighbor effects and mixed results might depend on whom the neighbors are, such as according to a similar gender or age, or in regions with more equal distributions of resources (e.g. see Cheung and Lucas 2016; Ifcher et al. 2018; Brodeur and Flèche 2019).

A better method than asking people to whom they compare, and the one adopted in this research, is to consider how variations in reference groups affect well-being without asking people. This avoids the issue that comparisons could be partly below conscious awareness and other factors like reporting biases (Tversky and Kahneman 1974; Mussweiler et al. 2004; Chatard et al. 2017). Prior research has conducted such investigations on a more limited scale. In the US, Pérez-Asenjo (2011) looked at rank income and the ratio of individual income divided by reference group income. Out of reference groups based on age, sex, race, educational degree, city/country, work status, marital status, occupation, prestige, religion, political views and geographic region, the groups based on age, sex, race, and religion were most closely associated with well-being. In the UK, Brown et al. (2015) compared reference groups based on geography versus demographic characteristics, differences according to estimation methods, and differences according to the self-reported well-being measures. The results showed that both sign and significance of reference group effects differed according to the approach. For example, with life satisfaction, reference group income based on demographic characteristics was significantly negatively associated with well-being in the pooled and random effects models. However, effects were null in the fixed effects model. For reference group income based on geographic characteristics, effects became positive in the random effects and fixed effects models and were null in other models.

Other researchers have varied fewer reference groups within studies. In general, they showed that their results were robust to differences in reference groups such as age or geography (for example, see Wood et al. 2012; Deaton and Stone 2013; Daly et al. 2015). Exceptions occur for the aforementioned studies on local areas. Callan et al. (2015) investigated the effects of perceptions of one's own money, education, and jobs relative to others in the United States versus those who are "like you" on physical and mental health, finding that the wording "like you" mattered more for well-being than wording about others in the United States. This research builds upon these studies by varying the type of people included in reference groups (e.g. age, gender), the dimensions of socio-economic status (e.g. income, unemployment), and the way the information is reduced for measurement (e.g. average, proportion), as discussed further in the next section.

3. CONCEPTUAL APPROACH

3.1. *The Concept of Reference Groups*

Conceptually, there is much information that one could consider about a group, and this research is focused upon the acquisition of socio-economic information about reference groups. How people acquire information about others' socio-economic status matters. Different perceptual processes are evoked when someone is told that someone else's socio-economic status is, for example, high or low, than when they make their own judgment about whether it is high or low. It is also difficult to avoid judging information about others' socio-economic attainment in some manner and to avoid using one's own socio-economic status in the judgment. The following discussion from Kahneman and Miller (1986) about norm judgments illustrates both of these points:

In category-centered comparisons, the object of judgment is compared to the norm for a specified category. In stimulus-centered comparisons, the elements of the norm tend to be recruited directly by the stimulus itself. "Jane owns a small dog" is an example of a category-centered judgment. To make and to interpret such judgments, a norm of size for a particular category must be invoked ... Stimulus-centered judgments are more elusive ... (p. 150).

Kahneman and Miller go on to note that category-centered judgments are not wholly different to stimulus judgments; rather, they are on a continuum with each other. In reality, people acquire information about the socio-economic attainment of others in a host of different ways—from news articles that discuss the distribution of income, to noticing someone's accent and inferring their social class (Argyle 1994; Bjornsdottir and Rule 2017; BBC 2021).

When people compare their own to others' socio-economic status, there must be some reference group used to make the comparison. In the language of Kahneman and Miller, there must be some "norm," interpreted here as being the socio-economic status of some reference group of people. Which groups of people comprise the reference groups that matter for well-being? It is not only how to define the people within a reference group that is a challenge. There is also the issue of how information about reference groups is reduced for measurement, and again, the approaches are very different between studies. Should one take an average of a particular characteristic within a reference group, such as average income or education? An average would be one way to get at a norm. What consideration should be given to the equality of the socio-economic distribution, rankings according to pay or wealth, or distance from measures of central tendency, such as distance from average income or education?

3.2. *Scopes, Summaries, and Standpoints*

To address these challenges, this research classified approaches to describing aspects of the reference group under three broad categories of aspects—scope,

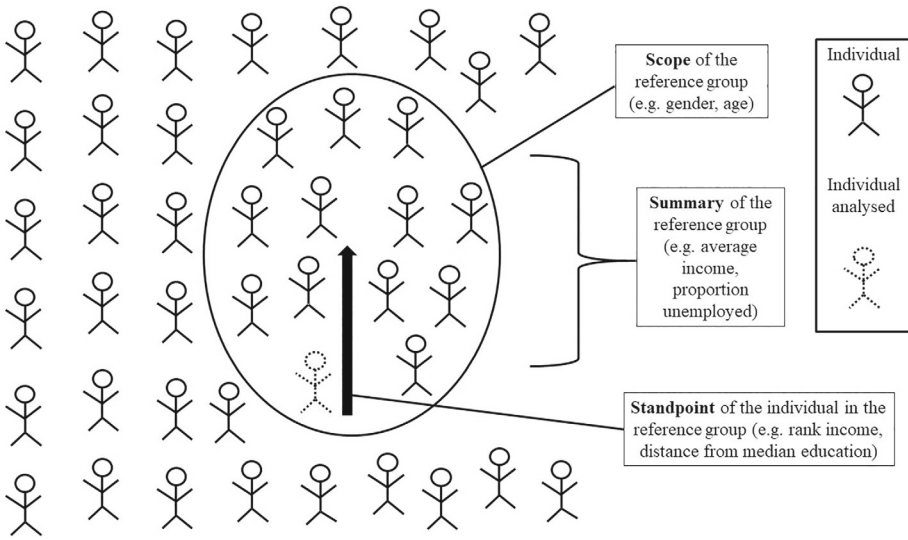


Figure 1. Stylized depiction of the scope, summary, and standpoint aspects of reference groups

summary, and standpoint—varying them within samples in analyses to investigate whether and how they affect the relationship between relative socio-economic status and well-being. The scope, summary and standpoint aspects of reference groups are shown visually in Figure 1. In brief, scopes are the group definition: the boundary conditions of the reference group that are used to distinguish one group from another, such as age, gender, or geography.¹ A summary is the reference value: the metric used to present aggregate information about the heterogeneous individuals contained within the scope of the group, such as average or median. A standpoint is the relative value: where an individual is positioned within the group with respect to the aspect of relativity investigated, such as rank or distance from the average.

Much of prior research summarized information about a reference group using an average summary measure—e.g. average income or average education (e.g. on income, see McBride 2001; Blanchflower and Oswald 2004; Ferrer-i-Carbonell 2005; Luttmer 2005; Deaton and Stone 2013; Luo et al. 2018; on education, see Putman 2001; Nikolaev 2016). Sometimes median income was used (Cheung and Lucas 2016). Another key summary measure was the rate

¹In the apparent first usage of the term “reference group,” Hyman (1942) used different scopes, such as friends, colleagues, and acquaintances, as “frames of reference” (p. 15). In a study analyzing data that asked people to whom they compare themselves, Clark and Senik (2010) referred to the “direction” of income comparisons (p. 576). In studies that compared difference scopes, Pérez-Asenjo (2011) used the phrase “defining reference group characteristic” (p. 1421), and Callan et al. (2015) used “comparison targets” (p. 1415). All of this heterogeneous language is intended to be encompassed by the use of the word “scope;” however, scope does not inherently require a social comparison in the way that direction of income comparisons or comparison targets do. It is, therefore, most closely aligned with the term “frames of reference.”

(proportion) of unemployment (e.g. Wolfers 2003).² To facilitate comparability with prior literature, this research uses average measures of income and wealth, median education, and proportion unemployed. It also includes summary measures of those with higher incomes, wealth, and education because social comparison theory highlights that people also make strategic upward and downward comparisons to people dissimilar from themselves (D'Ambrosio and Frick 2007; Sedikides and Gregg 2008).

Standpoints consider where an individual is positioned within the group with respect to the aspect of relativity investigated—whether it is height, intelligence, respect, socio-economic status, or something else (Anderson et al. 2012; Carrieri and De Paola 2012; Nikolaev and McGee 2016). Rank measures are standpoint measures, as are distance from average measures or those that ask people where they see themselves relative to others in some scope (e.g. Adler *et al.*, 2000). Studies about standpoint measures draw on literature beyond social comparisons, including range-frequency and evolutionary theories for rank status (Parducci 1963, 1965; Gilbert et al. 1995; Gilbert 2001; Flinn et al. 2005; Boyce et al. 2010). This research varies how information about the standpoint of an individual within a group was conveyed using three common methods from prior literature. The first is rank of income, wealth, and education; the next was the distance from average income, average wealth, and median education; and the final was one's perception of their socio-economic standing.

3.3. *Analytic Approach and Predictions*

This research took an exploratory approach given the difficulties of predicting the types of people within reference groups (scopes) that may impact upon well-being. Exploratory research is not uncommon outside the social sciences. In the biological sciences, p-value ranking is used to identify the most important genes from hundreds or thousands of genes (Zaykin and Zhivotovsky 2005; Sham and Purcell 2014). In this research, p-value ranking is applied to identify the most important reference groups from hundreds of possibly important reference groups. While no prediction is made about which groups may impact well-being, it is still predicted that different scopes could explain the mixed positive and negative results found across the literature on reference group socio-economic status and well-being.

Although this research is largely exploratory, some further predictions can be made. Based on previous research on rank socio-economic status and the importance of identity, it is expected that measures incorporating individual standpoints in the distribution of resources will be most closely associated with well-being (Boyce et al. 2010). It is also expected that reference group socio-economic status will be more closely associated with how people think about their lives (life evaluations) than with how they feel (experience and positive or negative affect), given past research on income (e.g. Diener et al. 2013). Overall, this research used over

²Summary measures could, in theory, also include income polarization and inequality, though these are not usually discussed as part of the relative economic standing literature (Esteban and Ray 1994; Rodríguez 2015; Cheung and Lucas 2016; Powdthavee et al. 2017; Macchia et al. 2020).

300 different measures of reference group socio-economic status, which is more than any investigation to date.

4. METHOD

4.1. *Data*

The data came from 21,590 adults aged 15+ years in waves 2012 and 2013 of the ATUS and 10,103 adults aged 50+ years who participated in waves two through six (2004–2013) of the ELSA. These are publicly available datasets (see <https://www.bls.gov/tus/> and <https://www.elsa-project.ac.uk/>). ATUS was selected because of detailed diary-based measures of well-being and ELSA for rich information on socio-economic status. The National Centre for Social Research granted special permission to access lower-level geographic (local authority) information in ELSA. The March supplement to the Current Population Survey (CPS, a survey that is linked to ATUS but conducted between two and 5 months prior) provided state-level group information. The World Inequality Database (wid.world) supplied information on top income shares.

4.2. *Measures*

The research used a range of well-being measures covering life evaluation, positive and negative affect, and meaning from the ATUS and ELSA (see Table 1). Well-being is a complex construct and the effects of relative socio-economic status on well-being may differ depending on how well-being is assessed. In ELSA, positive and negative affect were combined due to little variation across waves, and two measures of life evaluation were used to assess the robustness of the results to item wording. All well-being measures were standardized to have a mean of zero and a standard deviation of one.

4.3. *Absolute Socio-Economic Status*

In ATUS and ELSA the absolute socio-economic status measures were income, earnings, wealth, education, and unemployment (although ATUS did not contain wealth). Table 2 below shows the brief details of these items, and more details are in a Supplementary Online Appendix (see Table S1).

4.4. *Relative Socio-Economic Status*

The scopes were state (in ATUS) and local authority or government office region (in ELSA), as well as age (± 5 years), gender, marital status, race, parent, occupation, income, education, and unemployment groups in states and government office regions (GORs). Additional scopes available in ELSA were wealth, religion, and political groups in GORs. The groups used to create the relative variables are in Tables S1 and S2 and they were different for each relative variable. As an example, there were 100 groups for the gender group in state in ATUS: 50 states \times 2 reported genders = 100 groups. As another example, there were 11 wealth groups and nine GORs for a total of 99 groups. Note that local authority was not

TABLE 1
WELL-BEING MEASURES AND WORDING IN AMERICAN TIME USE SURVEY (ATUS) AND ENGLISH
LONGITUDINAL STUDY OF AGEING (ELSA)

Well-being measure	Item wording
ATUS	
Life evaluation—Cantril ladder	Please imagine a ladder with steps numbered from zero at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. If the top step is 10 and the bottom step is 0, on which step of the ladder do you feel you personally stand at the present time?
Experienced positive affect	“Use a scale from 0 to 6, where a 0 means you did not experience this feeling at all and a 6 means the feeling was very strong ... How [EMOTION] did you feel during this time?” The emotions were tired, happy, stressed, and sad. For pain the exact item was “From 0 to 6, where a 0 means you did not feel any pain at all and a 6 means you were in severe pain, how much pain did you feel during this time if any?” Positive affect = happy; negative affect measure created by taking average of tired, stressed, sad and pain
Experienced negative affect	
Experienced meaning	From 0 to 6, how meaningful did you consider what you were doing? 0 means it was not meaningful at all to you and a 6 means it was very meaningful to you
ELSA	
Life evaluation—satisfaction (1)	I am satisfied with my life (strongly agree, agree, slightly agree, neither agree nor disagree, slightly disagree, disagree, strongly disagree)
Life evaluation—satisfaction (2)	I feel satisfied with the way my life has turned out (often, sometimes, not often, never)
Evaluation of life meaning	I feel that my life has meaning (often, sometimes, not often, and never)
Experienced positive/negative affect	Now think about the past week and the feelings you have experienced. Please tell me if each of the following was true for you much of the time during the past week. You felt depressed? You were happy? You felt sad? You felt lonely? (yes/no)—average taken

combined with other scope characteristics such as age or gender due to insufficient sample sizes at local authority levels to do so.

Summary measures were proportion, average, and median. Standpoint measures were rank and distance from the average or median. In ELSA, four additional perceived standpoint measures asked participants where they saw themselves relative to society, friends, colleagues, and those nearby (see Table S3). Note that a higher rank was numerically a higher number (first place was not the highest rank). The distance measures are positive values when above the median or average

TABLE 2
DESCRIPTION OF ABSOLUTE SOCIO-ECONOMIC VARIABLES

Dataset Variable	ATUS Description	ELSA
Income	Annual family income. Less than \$25 K, \$25 K to less than \$50 K, \$50 K to less than \$75 K, \$75 K to less than \$100 K, \$100 K+. Last 12 months—money from jobs, net income from business, farm or rent, pensions, dividends, interest, social security payments and any other money income	Annual benefit unit-level real income (logged). Net equalized real income at the benefit unit level, including all employment and self-employment income, private and state pension income, state benefit income, asset income, and any additional income sources
	Annual individual earnings (logged). Earning including overtime pay	Net real earnings from last job at the individual level (logged)
Wealth	No measure available	Net non-pension real wealth at the benefit unit level (logged), including savings, investments, physical wealth, gross housing and subtracting financial debt; logged
Education	Highest level of school completed/degree attained. 12th grade (no diploma) or less to MSc/PhD+	Highest qualification. NVQ1/CSE to NVQ4/NVQ5/Degree
Unemployment ^a	Employment status (unemployed, other), old (from prior CPS survey). Any work for pay or profit in last week	Employment status (unemployed, other)
	Employment status (unemployed, other), current (from ATUS survey). Any work for pay or profit in last week	

Abbreviations: ATUS, American Time Use Survey; CPS, current population survey; ELSA, English Longitudinal Study of Ageing.

^aNote that ATUS contained two variables indicating whether the respondent was unemployed. The first variable was older because it came from the earlier CPS interview, which asked about labor force status in the last week. The second variable was newer and from the ATUS interview, conducted two to 5 months after the CPS interview, which updated the CPS information. Thus, there was a trade-off between maintaining comparability with income and education using the CPS measure and reducing measurement error using the ATUS measure. Both measures were used.

and negative when below, meaning they were expected to be positively associated with well-being (while the summary measures were expected to be negatively correlated).

All relative measures were standardized to have a mean of zero and a standard deviation of one. As shown in Tables S4 and S5, different scopes, summaries, and standpoints were combined to create 107 measures in ATUS and 200 measures in ELSA.

4.5. Controls

The control variables from ATUS and ELSA were age, age squared, gender, marital status, health status, social relations, religious affiliation, housing and quality of environmental conditions, children, caring responsibilities (in ELSA), household size, ethnicity, typicality of days' feelings (in ATUS), population density (in ATUS), urban area (in ELSA) day of week of interview (in ATUS), and political affiliation (in ELSA). Table S2 describes these further. The absolute socio-economic measures (see above) were also controls. Housing costs and the index of multiple deprivation were included in an attempt to control for public goods and provide a cleaner test of relative effects.

4.6. Statistical Analyses

The core analyses were pre-registered multi-level linear mixed effects models fitted to the data using Stata 16 (osf.io/v8cj5). Models explained variance in well-being from relative socio-economic status and the controls. In ATUS the three activity-level experienced well-being measures were averaged within individuals. Models explained variance from individual-level well-being data (life evaluation, experienced positive affect, experienced negative affect, experienced meaning) nested within states:

$$(1) \quad SWB_{ij} = \beta_0 + \beta \text{Relative socio} - \text{economic status}_j \\ + \beta \text{Controls}_{ij} + \beta \text{Controls}_j + u_j + e_{ij}$$

where SWB_{ij} is the observed subjective well-being score for an individual i in state j , β_0 is the overall average across individuals, $\beta \text{Relative socio} - \text{economic status}_j$ the state-level relative coefficient, $\beta \text{Controls}_{ij}$ represents the coefficients for the fixed individual-level controls (age, age squared, gender, marital status, health status, social relationships, religious affiliation, housing, children, household size, typicality of days' feelings, day of week and year of interview), $\beta \text{Controls}_j$ represents the coefficients for fixed state-level controls (population density, median housing cost), u_j the random effect of states, and e_{ij} the individual-level residual error term.

In ELSA, multi-level mixed models explained variance in the four measures of well-being (life evaluation 1, life evaluation 2, life meaning, experienced affect). The models accounted for repeated measures of well-being with random effects for observations at each wave w , nested within individuals i , local authorities j , and GORs k . For local authority-level relative coefficients, the model was:

$$(2) \quad SWB_{wijk} = \beta_0 + \beta \text{Relative socio} - \text{economic status}_{w,j} + \beta \text{Controls}_{wijk} \\ + \beta \text{Control}_{ijk} + \beta \text{Controls}_j + \beta \text{Wave}_w + v_k + u_j + t_{ijk} + t \text{Wave}_{ijk} + e_{wijk}$$

where SWB_{wijk} is the observed well-being score for an individual at each wave, β_0 the average score across all waves, $\beta \text{Relative socio} - \text{economic status}_{w,j}$ the time-varying local authority-level relative coefficient; $\beta \text{Controls}_{wijk}$ the time-varying demographic controls (age, age squared, marital status, health status, social relations, religious affiliation, housing, children, caring responsibilities, ethnicity, household

size, income, earnings, wealth, education, and unemployment), $\beta\text{Control}_{ijk}$ the fixed individual-level control (gender), $\beta\text{Controls}_{jk}$ the fixed local authority-level controls (index of multiple deprivation and urban/rural status), βWave_w the time trend, v_k the random effect of GORs, u_{jk} the random effect of local authorities, t_{ijk} the random effect of individuals, $t\text{Wave}_{ijk}$ a random effect for wave for the i th individual (random slope), and e_{wijk} the wave-level residual error term.

For government office region-level relative coefficients, the corresponding model was:

$$(3) \quad \begin{aligned} SWB_{wijk} = & \beta_0 + \beta\text{Relative socio – economic status}_{wk} + \beta\text{Controls}_{wijk} \\ & + \beta\text{Control}_{ijk} + \beta\text{Controls}_j + \beta\text{Wave}_w + v_k + u_j + t_{ijk} + t\text{Wave}_{ijk} + e_{wijk} \end{aligned}$$

where $\beta\text{Relative socio – economic status}_{wk}$ was the time-varying government office region-level relative coefficient.

The corresponding model with relative coefficients for perceptions of relative standing was:

$$(4) \quad \begin{aligned} SWB_{wijk} = & \beta_0 + \beta\text{Perceived relative socio – economic status}_{wijk} \\ & + \beta\text{Controls}_{wijk} + \beta\text{Control}_{ijk} + \beta\text{Controls}_{jk} + \beta\text{Wave}_w \\ & + v_k + u_{jk} + t_{ijk} + t\text{Wave}_{ijk} + e_{wijk} \end{aligned}$$

where $\beta\text{Perceived relative socio – economic status}_{wijk}$ was the time-varying perceived relative socio-economic coefficient for individuals.

To prepare for the core analyses, the research conducted OLS linear regression models to assess the presence of potentially high collinearity among the predictors at different levels. A cautious approach was taken to collinearity by using a Variance Inflation Factor (VIF) cutoff of 10 (O'Brien 2007). There were 53 reference group socio-economic status variables in the ATUS with a $VIF \geq 10$ that were excluded from analyses (see Table S7), and there were 60 reference group socio-economic status variables in the ELSA with a $VIF \geq 10$ (see Table S8).

The research used adjusted tests of statistical significance for multiple comparisons of reference group socio-economic status within datasets using the Bonferroni procedure. The Bonferroni correction is considered conservative because it assumes that the tests are completely independent of each other (Altman et al. 2013). In this research, dependence could be interpreted as the tests being related because they are on the same sample, across the same dimensions of well-being, and across similar aspects of socio-economic status. Thus, applying the Bonferroni adjustment could lead to a high rate of false negatives, and a failure to detect substantively important effects. As discussed in Altman et al. (2013), there is not agreement about what to do in such situations. To balance being over- and under-conservative, the results are divided by the number of tests conducted within each dataset. However, all full p-values are reported for each measure of reference group socio-economic status so that readers can draw their own conclusions.

After excluding the 53 reference group socio-economic status variables in ATUS, 54 remained (there were a total of 107 reference group socio-economic

status variables in ATUS—see Table S4). The critical p -value was of 0.05 was divided by 216 (54×4 measures of well-being), which provided a critical value of $p = 0.000023$ for the ATUS analyses. After excluding these 60 reference group socio-economic status variables in ELSA, 140 remained (there were a total of 200 reference group socio-economic status variables in ELSA—see Table S5). The critical p -value was of 0.05 was divided by 560 (140×4 measures of well-being), which provided a critical value of 0.000089 for the ELSA analyses.

With many observations ($N = 21,590$ in ATUS and $N = 10,103$ in ELSA), there is the possibility of detecting a statistically significant effect that is not practically or substantively significant, even after adjusting for multiple comparisons. An effect could also be dismissed as not statistically significant even if it has practical significance. All the well-being and relative variables are standardized, which means that the coefficients can be interpreted in terms of standard deviation changes. This enables a comparison between different measures of well-being that are on different scales, as well as a comparison between different measures of reference group socio-economic status on different scales. Thus, the results can be interpreted in terms of relative importance.

5. RESULTS

5.1. ATUS

Figure 2 shows the ATUS reference group socio-economic status variables with a $p < 0.000023$. The full ATUS results are in the Supplementary Online Appendix (Tables S9–S12). The first result that stands out is that the only scope significantly associated with well-being was age group in state. Scopes based on geography (state) alone were not associated with well-being, nor were scopes based on gender, marital, race, parent, occupation, income, education, or unemployment groups in states. The results for the scope age groups in states showed that higher unemployment was associated with worse well-being, as was higher average income and percentage with top incomes and in states. This means that only the summary (not standpoint) measures of reference group socio-economic status were significantly associated with well-being in the ATUS. Out of the five significant effects in ATUS, four were associated with life evaluations on the Cantril ladder (80 percent), and one was significantly associated with experienced meaning (20 percent).

5.2. ELSA

Figure 3 below shows the ELSA reference group socio-economic status variables with a $p < 0.000089$. The full ELSA results are in the Supplementary Online Appendix (Tables S13–S16). One result that stands out is, like ATUS, reference groups based on geography alone (local authority) were not associated with well-being for any of the summary measures. Another key result is that, again, age scopes were consistently associated with well-being. There were 7/17 (41 percent) age scopes significantly associated with well-being, similar to 10/17 for religion (59 percent), 7/13 for wealth (54 percent), 8/17 (47 percent) for parent, 7/17 for political (41 percent), 8/17 (47 percent) for race, 5/13 for education (38 percent),

Key		Summary							Standpoint				
		Top 1% income shares	Average income	% income 100K+	Average earnings	% earnings 100K+	Median education	% degree+	% unemployed (old)	% unemployed (new)	Rank earnings	Distance from average earnings	Rank education
	Not a measure												
	Excluded (VIF≥10)												
	Not significant												
	Cantril ladder (CL)												
	CL & Experienced meaning												
Scope	State												
	Age group in state												
	Gender group in state												
	Marital group in state												
	Race group in state												
	Parent group in state												
	Occupation group in state												
	Income group in state												
	Education group in state												
	Unemployment group in state												

Figure 2. The reference group socio-economic status measures significantly ($p < 0.00023$) associated with well-being in American Time Use Survey (ATUS).

Notes: The “old” and “new” measures of relative unemployment, which reflect whether the unemployment variable was from the older CPS interview or the newer ATUS interview. “Not a measure” means that no data were available to construct the measure and it was not created.

6/17 (35 percent) for marital status, and 6/17 for occupation (35 percent), but more than 1/9 for income (11 percent), and 3/8 for unemployment (38 percent).

The perceived standpoint measures (bottom right of Figure 3) stand out because they were significantly associated with all measures of well-being. The MacArthur ladder (perception of money, education, and jobs in the scope society) was particularly consistently and strongly associated with well-being (see S13—S16). Rank wealth was also noteworthy because it was associated with well-being in every scope.

Out of the 140 measures of reference group socio-economic status in ELSA, around half were summary (72, 51.4 percent) and half were standpoint measures (68; 48.6 percent; see Table S5). Out of the 82 measures of reference group socio-economic status significantly associated with well-being, again half were summary measures (41; 50 percent), and half were standpoint measures (41; 50 percent).

Looking across the well-being measures, out of the 82 reference group socio-economic status variables significantly associated with well-being, all (100 percent) were associated with evaluations (life evaluation and/or life meaning). There were only three (3.6 percent) measures associated with experienced affect last week in ELSA and these were all perceived standpoint measures: MacArthur Ladder (perception of money, education, and job relative to “society”) well off friends, and well off nearby. The results were not robust to different wordings of

Key		Summary										Standpoint										
	Not a measure																					
	Excluded (VIF≥10)																					
	Not significant																					
	LS1																					
	LS2																					
	LS1 & LS2																					
	LS1, LS2 & LM																					
	LS1, LS2, LM, & EA																					
+	effect is positive																					
-	effect is negative																					
		Average income	% income £46K+	Average earnings	% earnings £46K+	Average wealth	% wealth £450K+	Median education	%NVQ4/NVQ5/Degree+	% Unemployed	Rank income	Distance from average income	Rank earnings	Distance from average earnings	Rank wealth	Distance from average wealth	Rank education	Distance from median education	Perception of money, education, job	Perception of financial situation		
Scope	Local authority										+	+	+		+							
	Age in GOR	-	-	-	-	-	-	-	-	-		+			+							
	Gender in GOR	-	-	-	-	-	-	-	-	-		+	+		+							
	Marital in GOR	-	-	-	-	-	-	-	-	-		+	+		+							
	Race in GOR	-	-	-	-	-	-	-	-	-		+	+		+							
	Parent in GOR	-	-	-	-	-	-	-	-	-		+	+		+							
	Occupation in GOR	-	-	-	-	-	-	-	-	-		+	+		+							
	Income in GOR	-	-	-	-	-	-	-	-	-		+	+		+							
	Wealth in GOR	+	+					+	+			+							-	-		
	Education in GOR	-	-	-	-	-	-	-	-	-		+	+		+							
	Unemployment in GOR	-	-	-	-	-	-	-	-	-						+						
	Religion in GOR	-	-	-	-	-	-	-	-	-		+	+		+							
	Political in GOR	-	-	-	-	-	-	-	-	-		+	+		+							
	Society																				+	
	Friends																					+
	Colleagues																					+
	Nearby																					+

Figure 3. The reference group socio-economic status measures significantly ($p < 0.000089$) associated with well-being in English Longitudinal Study of Ageing (ELSA).

Notes: GOR = Government Office Region, VIF = Variance Inflation Factor, LS1 = life satisfaction (1) that asks about agreement with overall life satisfaction, LS2 = life satisfaction (2) that asks about frequency of satisfaction with the way life has turned out, LM = life meaning, EA = experienced affect last week. “Not a measure” means that no data were available to construct the measure and it was not created.

the life evaluation measure, with 20 (24.3 percent) measures being associated with life evaluation (1) but not life evaluation (2), and 14 (17.1 percent) measures being associated with life evaluation (2) but not life evaluation (1).

5.3. Magnitude

The results could be translated into the effects of other well-being determinants to characterize their magnitude. For example, in ATUS, the effects of relative unemployment could be compared to the relationship between being unemployed (at the individual level) and life evaluation on the Cantril ladder. In ATUS, being unemployed was associated with 0.40 lower standardized ladder scores. In comparison, one standard deviation increase in the proportion of people unemployed in age groups in states ($sd = 2.7$ percent) was associated with 0.07 worse standardized ladder scores, 17.5 percent of the effect of being unemployed.

6. DISCUSSION

This research investigated the relationships between relative income, wealth, education, and unemployment with well-being. It used a p-value ranking approach from the biological sciences. The results showed that reference groups based on the scope age were consistently associated with well-being, as were perceptions of those in “society” and rank wealth. Those less consistently associated with well-being used average, median, and proportion measures in states and local authorities without combining geography with demographic characteristics. Relative standing within geographic income groups was also not consistently associated with well-being. Well-being researchers looking at relative effects should consider using measures of relative standing that divide geography by age, and include perceptual measures of relative standing and rank of wealth, where data are available.

One of the predictions was that different scopes might be differently associated with positive and negative effects of reference group socio-economic status on well-being, explaining mixed results in prior literature. Although people generally had lower well-being when those in their reference groups had higher socio-economic status, people in the older England sample reported their lives were going better when others in their wealth groups achieved more. This finding could be due to shared resources, knowledge, or local assets within wealthy social groups, despite the attempt to control for public goods. In the United States, people reported better well-being when more people in their areas were employed (holding own income and employment status constant), consistent with previous literature on unemployment (Clark 2003). Thus, higher socio-economic status in a reference group is not always associated with worse well-being—even in wider, rather than narrower and more local, geographic areas (e.g. Ifcher et al. 2018; Brodeur and Flèche 2019).

The prediction that reference group socio-economic status measures incorporating individual standpoints in the distribution of resources, such as rank or distance from the average, would be more closely associated with well-being than summary measures, such as proportion or average, was not well supported. None of the relative measures significantly related to well-being in ATUS were standpoint measures, and only half were in ELSA. Rank wealth was, however, closely associated with well-being in ELSA, and the perceived standpoint measures were closely related to all well-being measures.

The prediction that life evaluations would be more closely associated with reference group socio-economic status than experienced well-being was supported. This is consistent with previous research on how income is related to well-being (e.g. Knabe et al, 2010; Diener et al. 2013). It also supports the idea that social comparisons are evaluative, requiring a judgment about how oneself is doing compared to others. However, experienced meaning in ATUS was associated with the average income in age groups in states, illustrating that experiences of well-being, and not only life evaluations, are related to reference group socio-economic status.

6.1. *Limitations*

This research did not isolate a causal effect of relative socio-economic status on well-being. Other research has better isolated causal effects by utilizing exogenous

shocks that reveal how much money other people around them possess (Card et al. 2012; Ifcher et al. 2020). Although people likely do not have much of a direct influence on the socio-economic status attained by their reference groups (unless they work in a human resources capacity or share resources), they can select to whom they make social comparisons. It could be that people choose to compare to others of a similar age, for example, and this makes them feel worse—and that this effect would not occur if people did not choose to compare to others of a similar age. In this example, however, people are comparing to others that make them feel worse, rather than better, as discussed in self-enhancement theory (Sedikides and Gregg 2008).

The results were not robust to alternative wordings of the life evaluation items in ELSA. Thus, results from single-item measures of life evaluation may lack validity, and instances when a relative measure is only associated with one measure of life evaluation may not be rigorously supported. Investigations using life evaluation alone should further justify its theoretical basis and empirical rigor, as has been done in other disciplines and for other well-being approaches, including the capability approach, and across public health, philosophy, and psychology (Sen, 1987; Tennant et al. 2007; Angner 2010). The results were robust to alternative unemployment measures in ATUS, “old” (from the CPS, between two and 5 months prior) and “new” (from the ATUS). It is not possible to conclude if participants are failing to adapt to unemployment over time because the duration of unemployment was not included in the analyses (Luhmann et al. 2012).

The approach of conducting many significance tests and adjusting for multiple comparisons could be critiqued. One critique could be considered “conservative” by concluding little to no effect of reference group socio-economic status on well-being. According to this perspective, it might be argued that the Bonferonni correction was insufficient protection from Type 1 errors, and a more stringent criterion should have been applied. A more generous interpretation would conclude that there was a strong and significant effect of reference group socio-economic status on well-being. This would be based on the perspective that because the different reference group socio-economic status and well-being measures are correlated, the correction for multiple comparisons was not required. A more moderate approach is that there was some effect of reference group socio-economic status on well-being because there was an overall pattern of mixed results.

In general, a stronger case for the importance of relative effects can be made from the data from England, which could be due to country or sampling differences, especially the older age of the England sample, or the use of larger regions in England (Government Office Regions versus states). Many of the p-values for the largest and most precise relative effects were quite small, which could be because random effects for geography absorbed some of the variation in the relative status variables. However, the analysis was intended to capture social comparison effects rather than those of local level public goods, thus it was important to absorb this variation.

Many relative variables were excluded due to high collinearity between absolute and relative socio-economic status. One interpretation of the collinear results is that the relative variable did not add much more information to the absolute variable, and thus there was little evidence of relative effects. Small sample sizes within

groups for some relative variables, and varying numbers of groups for each relative variable could have affected collinearity, as well as the precision and significance of the results.

6.2. Conclusion

This research conducted an extensive investigation of relative socio-economic status and subjective well-being. It used two datasets from the US and UK, over 300 measures of relative status, and four measures of well-being. The results showed that reference groups based on age in geographic regions, perceptions of those in “society,” and rank wealth were most consistently associated with well-being. On the other hand, those less consistently associated were based on average, median, and proportion measures in states and local authorities without demographic sub-groups, and those within geographic income groups. Future researchers should consider the consistently associated dimensions when constructing measures of reference groups. The p-value ranking approach could be applied to determine if similar results hold in other datasets, further elucidating the reference groups that are relevant for well-being.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article at the publisher’s web site:

Data S1: Data and Code.

Appendix S1: Supplementary Information.