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ORIGINAL RESEARCH

Aversion to Local Wellbeing Inequality is Moderated by Social Engagement and Sense of Community

Pascarn R. Dickinson[1] · **Philip S. Morrison**[1]

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Abstract
Our subjective wellbeing is a mix of our personal and community wellbeing. One indication of their close relationship is the strong negative correlation between our own subjective wellbeing and the degree of subjective wellbeing inequality within our community. This negative relationship reflects our innate and socialized inequality aversion and holds regardless of whether the group is large as in the case of countries or small in the case of local neighbourhoods. While the country case has been well documented in the subjective wellbeing literature, the relationship between the local community distribution of subjective wellbeing and individual subjective wellbeing has received little attention. In this paper we demonstrate the sensitivity of individual life satisfaction to the distribution of life satisfaction within electoral wards in urban New Zealand and explore several possible behavioural drivers. We find that having social support and feeling a sense of community both reduce the negative effects of local subjective wellbeing inequality, while being less socially engaged exaggerates them. Our results highlight the potential that programmes aimed at reducing wellbeing inequalities within local communities might play in raising individual as well as average wellbeing.

Keywords Subjective wellbeing · Life satisfaction · Wellbeing inequality · Local · Community · Social support · Social engagement · Heterogeneity · New Zealand

1 Introduction

Repeated surveys have shown that the more unequally distributed the wellbeing of the group, the lower the individual and average wellbeing of its members (Bolle et al., 2009; Delhey, 2004; Fahey & Smyth, 2004; Goff et al., 2018; Ott, 2005). As social creatures we are sensitive to the wellbeing of others, and the closer they reside geographically, the more sensitive we are to their condition. Further, as we show below, the more that we connect with our community and the more socially engaged we are, the lower the negative impact wellbeing inequality has on our wellbeing.

✉ Pascarn R. Dickinson
pascarn.dickinson@vuw.ac.nz

[1] School of Geography, Environment and Earth Sciences, Victoria University of Wellington, Wellington, New Zealand

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For several decades wellbeing researchers have advocated the use of subjective wellbeing measures as more effective indicators of national progress than purely economic measures such as GDP (Clark et al., 2008; Easterlin, 1974; Helliwell et al., 2013; Stiglitz et al., 2009). At the same time, studies of income inequality within both large and small groups have hypothesised a negative effect of income inequality on the wellbeing of individuals (Wilkinson & Pickett, 2009), but several reviews have been unable to identify a clear relationship between wellbeing and income inequality (Ngamaba et al., 2018; Quick, 2015; Schneider, 2016). Some have even asked if wellbeing inequality is immune to income inequality (Becchetti et al., 2014; Berg & Veenhoven, 2010; Delhey & Kohler, 2011; Gandelman & Porzecanski, 2013; Oishi et al., 2011; Ott, 2005; Ovaska & Takashima, 2010).

Among the reasons for the unclear relationship between income inequality and wellbeing inequality is the difference between income as a measure of life *chances* and wellbeing as a measure of life *results* (Veenhoven, 2005). While income may be a measure of how much people earn, subjective wellbeing is a self-evaluation of the life people are living. There is now a growing recognition that the wellbeing of individuals is affected more strongly by the level of inequality in *wellbeing* rather than inequalities in income, and that lowering wellbeing inequality may be one way of raising average wellbeing (Goff et al., 2018; Kalmijn & Veenhoven, 2014; Quick, 2015; Stevenson & Wolfers, 2008). As Helliwell et al. (2016) have pointed out: "If it is appropriate to use life evaluations as an umbrella measure of the quality of life, to supplement and consolidate the benefits available from income, health, family and friends, and the broader institutional and social context then it is equally important to broaden the measurement of inequalities beyond those for income and wealth" (pp.9–10). What has been less well researched is *why* our wellbeing should be so sensitive to the inequality in wellbeing around us.

In response we test two hypotheses: (1) that wellbeing is negatively associated with wellbeing inequality at the local scale, and (2) that interpersonal support, social engagement, and community connection all moderate the negative effects of local wellbeing inequality. In doing so we apply two models-the ecological and the individual-and use life satisfaction as our measure of wellbeing. The ecological model is based on communities and is used to test the relationship between the *average* life satisfaction and the distribution of life satisfaction within the group. The individual model is used to estimate how strongly *individuals* are affected by the distribution of life satisfaction within their locality, and to test for possible moderating factors.

The contribution of our paper is twofold. Firstly, we show that the negative relationship between subjective wellbeing and its distribution is not confined to countries or to large regions, but also holds at the local city and neighbourhood levels. This contribution is significant because the local scale has possibly the most important bearing on our wellbeing (Hendriks et al., 2016). Our second contribution is to identify several behavioural underpinnings of the wellbeing and wellbeing inequality relationship. We demonstrate that those who feel supported, are socially engaged with their local group, and who feel part of a community are less adversely affected by increasing local inequality in subjective wellbeing. In other words: people display aversion to wellbeing inequality, but its negative impact on our wellbeing is insulated by support from and engagement with those who live close to us.

We begin in section two by reviewing the literature, then cover the models and introduce the New Zealand Quality of Life Survey in section three. In the fourth section we document the negative relationship between wellbeing and wellbeing inequality and apply the moderators in section five. We conclude the paper in section six and make several policy recommendations.

2 Literature Review

Several studies examine subjective wellbeing inequality at the level of the country (Chin-Hon-Foei, 1989; Delhey & Kohler, 2011; Ifcher & Zarghamee, 2016; Veenhoven, 2000, 2005).[1] A smaller subset apply an ecological model at this scale to demonstrate that greater inequality in wellbeing is associated with lower average wellbeing (Bolle et al., 2009; Delhey, 2004; Fahey & Smyth, 2004; Goff et al., 2018; Ott, 2005).[2]

For example, Delhey (2004) documented a negative relationship between the mean and standard deviation of life satisfaction across 28 European countries. Fahey and Smyth (2004) carried out a similar analysis using the mean of a happiness question, and found it too had a close negative relationship with happiness inequality across 33 European countries. Fahey and Smyth (2004) also noted how populations in the rich parts of Europe have high and relatively equal wellbeing while those in the poorer parts of Europe have low and unequal wellbeing. They advocated "an a priori case for expecting stronger linkages between such variance and the socio-economic context" and suggested that "these linkages point to suggestive and potentially important insights about human welfare and how it should be conceptualized and measured in research on social inequality" (Fahey & Smyth, 2004: p. 8).

Bolle et al. (2009) went further and tested the link between the standard deviation and average level of happiness within 71 countries, concluding that greater equality in happiness was one of the main drivers of higher average levels of happiness across countries. In a similar study, Ott (2005) used data on 78 countries from the World Values Survey to demonstrate a consistent negative relationship between life satisfaction and life satisfaction inequality. More recently, Goff et al. (2018) drew on the European Social Survey, the World Values Survey, and the Gallup World Poll to demonstrate once again that life satisfaction is negatively related to life satisfaction inequality.

Compared to the country scale, relatively few studies have examined the presence of wellbeing inequality at the sub-national level, although there are some exceptions (Becchetti et al., 2014; Dutta & Foster, 2013; Okulicz-Kozaryn, 2011; Stevenson & Wolfers, 2008). Even fewer examine the relationship between wellbeing and wellbeing inequality at the sub-national level. Most notably, Goff et al. (2018) analyse the Gallup-Healthways Well-Being Index across the states of the USA. After controlling for age, sex, marital status, and education, they found a strong negative relationship between individual life satisfaction and the inequality of life satisfaction *within* the states. Goff et al. (2018) also point towards one possible explanation of this negative relationship by demonstrating that it is stronger among those who claim to care more about inequality.

While the analysis of Goff et al. (2018) is sub-national, many US states are still larger than small nations. Using smaller sub-national units Helliwell et al. (2019) were also able to demonstrate the negative relationship between the mean wellbeing of Canadian counties and their level of wellbeing inequality. Ziogas et al. (2020) use the same cross-sectional data to demonstrate the high correlation between wellbeing and wellbeing inequality, noting at the same time the slightly wider standard deviation of life satisfaction in urban counties.

[1] For background papers on long-term trends in the international inequality of wellbeing using a variety of measures see (Bourguignon & Morrisson, 2002; Decancq et al., 2009).

[2] Similarly, Hopkins (2008) points out that models of inequity aversion in common use in experimental economics also imply a negative relationship between inequality and happiness.

The negative relationship between wellbeing and wellbeing inequality within the group therefore has widespread empirical support at various scales, ranging from large groups such as countries down to smaller groups such as counties. At the same time, none appear to have tested this relationship at a scale as local as the neighbourhood. In addition, with a minor exception, none have examined the possible behavioural drivers of the negative relationship.[3] We seek to address this gap and look beyond the wellbeing inequality literature for possible explanatory mechanisms.

As a social species, we are sensitive to the wellbeing of other people. This statement likely has strong appeal for many of us, resonating with the idea that our survival has depended heavily on our ability to recognise and respond to the wellbeing needs of others, especially in our immediate group. Some have sought to explain our inequality aversion through a biological or evolutionary perspective, pointing towards our innate egalitarian preferences (Bartal et al., 2011; Dawes et al., 2007; Dawes et al., 2012; Fehr et al., 2008; Johnson et al., 2009; Loewenstein et al., 1989; Tricomi et al., 2010). Bartal et al. (2011) for example show that rats exhibit prosocial behaviours in response to the distress of others, indicating that empathy-motivated prosocial behaviour may have biological roots.

Others such as Aknin et al. (2019) have examined the impact of prosocial behaviours on wellbeing more specifically. They show that engaging in prosocial behaviour generally promotes wellbeing, and they identify the conditions under which these wellbeing benefits are most likely to emerge. People are more likely to derive happiness from helping others when they feel free to choose whether or how to help, when they feel connected to the people they are helping, and when they can see how their help is making a difference. As such, social connection and prosocial behaviour may offer substantial wellbeing benefits for both those being helped and those providing help (Aknin et al., 2019). We therefore propose that people will be less negatively impacted by wellbeing inequality if they feel more in touch with their community, more socially connected, and more supported by others.

To summarise, the wider evolutionary and social science literature suggests that there is a strong case for expecting an inverse relationship between people's subjective wellbeing and the degree of wellbeing inequality in their country, region and local community. Several studies have already offered empirical support for this thesis at various scales, though none appear to have tested the connection at the level of the neighbourhood or to have tested possible behavioural drivers of the relationship. The following section discusses our measurements and models before introducing our data.

3 Measurement, Models, and Data

Issues of measurement are central to studies of subjective wellbeing. Wellbeing is the experience of health, happiness, and prosperity. It includes having good mental health, high life satisfaction, and a sense of meaning or purpose. A variety of measures of subjective wellbeing have been proposed (see Morrison, 2020). By far the most used measure, particularly by wellbeing economists, is life satisfaction (Diener et al., 1985) and we follow that

[3] By identifying sub-national regions within Japan, Oshio and Kobayashi (2010) come close to the model we apply at the sub-national level, although their measure of inequality is income rather than subjective wellbeing. Important in foreshadowing our own results they recognise the way key individual attributes *modify* the association of regional income inequality with subjective assessments of happiness. In particular they find that widening inequality most directly reduces the wellbeing of those in an unstable status and who face the greatest uncertainty about future employment and income (Oshio & Kobayashi, 2010).

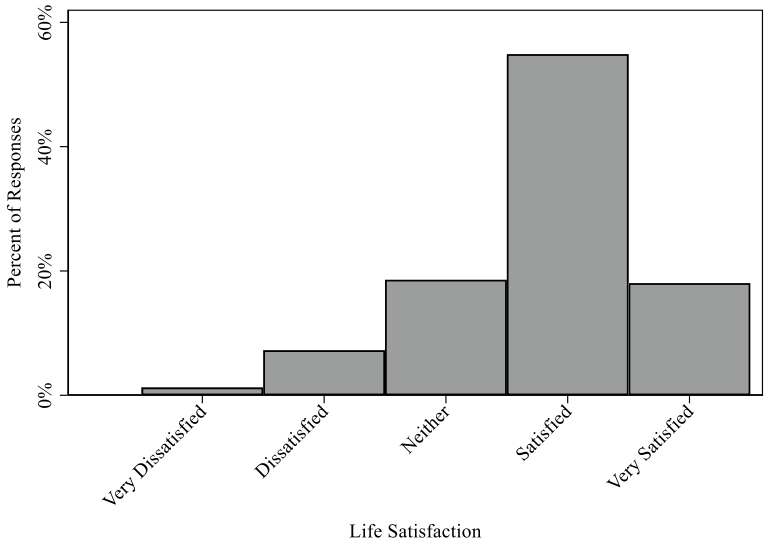

Fig. 1 The distribution of the life satisfaction responses in the New Zealand Quality of Life Survey 2014
Source: New Zealand Quality of Life Survey, 2014, $N = 5277$

practice here. Our measure is a 5-point self-report measure of life satisfaction taken from the 2014 New Zealand Quality of Life Survey. The question asks:

> *Q33: "Taking everything into account, how satisfied or dissatisfied are you with your life in general these days?" Very dissatisfied (1), Dissatisfied (2), Neither satisfied nor dissatisfied (3), Satisfied (4), Very Satisfied (5).* (Quality of Life Team, 2014: p.143).

The scale demonstrates good external validity by holding strong negative correlations with other clinical measures of distress and has demonstrated good convergent validity with other scales measuring perceived wellbeing. When examined over several weeks, test–retest reliability was 0.82, and Cronbach's coefficient alpha was 0.87 (Quality of Life Team, 2014). The distribution of responses to the life satisfaction question (Fig. 1) exhibit the negative skew typical of wellbeing distributions in developed economies.

Based on a Likert scale, life satisfaction scores are ordinal but are commonly analysed by OLS regression as if they were continuous measures. The primary rationale is that the common alternatives (the ordinal probit or logit models) predict wellbeing distributions that are extremely close to those generated by the regression model (Ferrer-i-Carbonell & Frijters, 2004; Kristoffersen, 2010). Since the OLS parameters are more easily interpreted most researchers simply use the OLS estimator, including many leaders in the field (Helliwell & Putnam, 2004; Krueger & Schkade, 2008; Layard, 2005; Oswald & Wu, 2010). We adopt the same practice here.

When it comes to measuring wellbeing inequality an issue arises as a result of the bounding of the life satisfaction scale. Wellbeing inequality is typically measured by the standard deviation which uses the mean as its measure of central tendency. As a result, any compression of the distribution against the upper bound of the wellbeing scale will automatically generate a negative relationship between the standard deviation of wellbeing and the mean (Quick, 2015).

Several commentators have viewed this arithmetic dependence of the standard deviation on the mean as obstructing the inference of a behavioural relationship between the two. Summing up this debate, Bolle et al. (2009) conclude that, "…theoretically, the standard deviation is dependent on the value of the mean happiness rating, but … in most practical situations this type of dependency is fairly weak." (pp.718–9). Others have tested this 'mechanical' relationship and have reached similar conclusions (Goff et al., 2018). Earlier, Kalmijn and Veenhoven (2005) had compared the standard deviation and three other measures of wellbeing inequality and concluded that standard deviation is the most appropriate. In short, most researchers in the wellbeing field are quite comfortable relating mean wellbeing to its standard deviation as a test of the wellbeing impact of wellbeing inequality (Kalmijn et al., 2011; Ott, 2005; Veenhoven, 2005; Veenhoven & Kalmijn, 2005).[4]

Notwithstanding the prevailing practice, we find the case for the use of the standard deviation as a measure of wellbeing inequality questionable on statistical grounds. The source of the problem is the assumption of cardinality in a wellbeing distribution that underlies the standard deviation. Therefore, as a robustness check we employ a measure of dispersion based on the median (discussed further below). The results reported in Sect.4 confirm the expected negative relationship between wellbeing and the distribution of wellbeing, and reduce the likelihood that the negative relationship between mean wellbeing and its spread is purely 'mechanical' in nature, clearing the way for the detection of its behavioural drivers.

3.1 Models

We begin our empirical analysis with the *ecological* model which expresses the average wellbeing of the group, $\overline{w}_g$, as a function of the distribution of wellbeing *within* the group, $W^{\sigma}{}_g$, where σ is the statistic used to describe the distribution.

$$\overline{w}_g = a_o + \beta W_g^{\sigma} + \varepsilon_g \tag{1}$$

We complement this first model with the *individual* model in order to test the effect of people's personal characteristics on the relationship between individual wellbeing and the distribution of wellbeing within the group as detailed in Eq. 2.[5] As such our individual model addresses the wellbeing of the ith individual within the gth group, W_{ig}[6]:

$$W_{ig} = a_o + \beta W_{ig}^{\sigma} + \lambda X_{ig} + \zeta M_{ig} + \delta(W^{\sigma}M)_{ig} + \varepsilon_{ig} \tag{2}$$

where W is the measure of subjective wellbeing, W^{σ} is the chosen measure of wellbeing inequality within the group, X is a vector of personal attributes, M is a moderator and $W^{\sigma}M$ is the interaction between the level of wellbeing inequality and the moderator.

[4] This is not to say that standard deviation is the only measure of wellbeing inequality used. Becchetti et al. (2014) and Stevenson and Wolfers (2008) both apply the Gini coefficient and variance to measure happiness inequality.

[5] Although we use the term 'effect', we recognise that since our analyses is conducted on cross-sectional datasets we are only dealing with statistical associations and we cannot infer causation.

[6] Oshio and Kobayashi (2010) write their income inequality version of this model as a multilevel model (level 1 being the individual and level 2 the region) with covariates attached to both. They collected information about household income to calculate the income inequality measures and the mean income for 47 prefectures (Oshio & Kobayashi, 2010). We deferred advancing the multi-level model in this case due to space constraints. For a related application to New Zealand Quality of Life Survey see the second author's study of urban pride (Morrison, 2016).

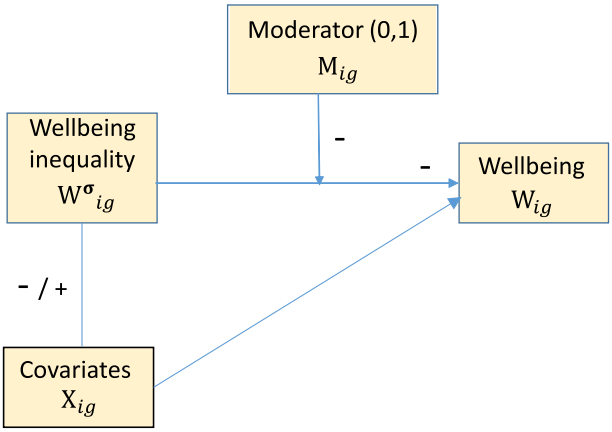

Fig. 2 Testing the moderating effect of connectedness with others on the negative relationship between wellbeing and wellbeing inequality

This second model allows us to control for attributes of the individual, X_{ig}, which otherwise affect the level of wellbeing (the intercept). We used the interaction term (W^{σ}.M) to test whether certain characteristics of the individual (such as their level of social engagement) moderate the rate at which subjective wellbeing falls as inequality within the group rises (the slope). Our general thesis going into this test is that the individual's connectedness (M) with others in the group will reduce the negative impact of local wellbeing inequality on their own wellbeing (see Fig. 2 and the expected signs).

Most of the cited wellbeing studies estimate Eq. 2 using OLS, which results in fixed effect parameters α, β, λ, and δ. In such a model the random or allowed-to-vary element is captured by ε. The implicit assumption in such applications is that there is constant variability (homogeneity) and no autocorrelation which allows the variance of the error term $\sigma^2{}_{\varepsilon}$, to be represented by a single parameter which is normally distributed about a mean of 0. However, there are two properties of *residential* groups which invalidate such an assumption. The first is that people are free to select their residential location and the second is that proximity increases interaction leading to a range of context effects.

In the first case individuals are not randomly assigned to residential areas; rather they consciously select their location based on decisions made in other spheres of their life: their employment and family requirements, socio-economic constraints, cultural pre-dispositions and personality (Bleidorn et al., 2016; Jokela et al., 2015; Rentfrow et al., 2008). This residential sorting process means that the personal characteristics of neighbours are more highly correlated than with non-neighbours. It also means that people consciously select places based on who is already living there.

The second property of residential groups is the way proximity reinforces the effect of group selection. By virtue of their location as neighbours, members of the same spatial group are more likely to interact with each other which results in their conscious or unconscious convergence on common views and attitudes to ensure peace and harmony. The presence of consumption externalities also means they are more likely to copy each other's spending patterns (Winkelmann & Winkelmann, 2010). This convergence is particularly likely when they share both common facilities and local acquaintances, friends, or relatives.

The presence of both selection and proximity effects requires that we adjust for the joint membership of the residential group, otherwise we violate the assumption of the regression model that the error terms ε_{ig} are independently and identically distributed (i.i.d). Without adjustment, estimates of the OLS model will still be unbiased in the presence of autocorrelation but the standard errors may be quite wrong, leading to incorrect inferences. We therefore apply a modified correlation matrix to allow for 'clustered errors'.

In summary, we estimate two models. The ecological model is employed to test for the negative relationship between group wellbeing and the inequality of group wellbeing. The individual model is used to test the effect of social engagement moderators on individual sensitivity to wellbeing inequality within the group.

3.2 The New Zealand Quality of Life Survey

Our study draws on a survey of 5295 people in Aotearoa New Zealand (New Zealand). New Zealand is a country 268,021 km^2 in size, with a population of approximately 5 million people, 87% of whom live in urban areas. The six cities analysed below are all within the country's top 10 by population and collectively house nearly 60% of the total population.

The New Zealand Quality of Life Survey is conducted as part of the Quality of Life Project, a collaboration between New Zealand's city and district councils. The survey is a stratified probabilistic sample of the areas covered by the participating councils weighted according to people's age, location, ethnicity, and ward within the city. The 2014 survey was a partnership between the City Councils of Auckland, Wellington, Porirua, The Hutt, Christchurch and Dunedin. While more recent Quality of Life Surveys have been conducted (2016, 2018 and 2020), we draw on the 2014 survey because it was the last to use the life satisfaction question.

The geographic unit we use is the electoral ward, the smallest spatial unit recognised in the survey. Ward boundaries are reviewed in the year before each three-yearly election and therefore the size and configuration of the wards can change slightly over time. While electoral wards are larger than most people might view as their immediate community, most New Zealanders are quite familiar with their ward and will likely feel a sense of identity that comes from sharing a common representative in government. An inspection of the ward maps for each city shows they follow the major geographic barriers such as hills, rivers, and inlets which physically define sections of the cities.[7]

The dependent variables, covariates and moderators for the analysis are listed in Table 1. The covariates include city of residence, sex, age group, an ethnicity indicator, employment status, education, and personal income. The three moderators are binary measures of personal support, social isolation (or loneliness) and a sense of community. We also use the personal support variable as a substitute for partnership status given that such a variable was not available in the survey.

Table 1 lists the variables in the left-hand column, along with numbers assigned to each response category (in brackets) for each variable. These same numbers correspond to the numbers at the top of the table. For example, in the case of the first variable, the column labelled '5' refers to 'Very Satisfied'. In the City of Residence variable '5' refers to 'Christchurch', and so on.

[7] Electoral wards were used for all the cities except Auckland, which uses community and local boards (which tend to be similar in size to wards). For the sake of simplicity, we will also refer to these as wards. After excluding outliers and wards with only 30 or fewer responses, a total 44 out of 47 wards were analysed in 2014.

Table 1 Dependent variables, covariates, and moderators, Quality of Life Survey, 2014

Variable	Number of Respondents and Percentage of Total Responses										
	1	2	3	4	5	6	7	8	9	10	Total
Life satisfaction: Very dissatisfied (1), Dissatisfied (2), Neither satisfied nor dissatisfied (3), Satisfied (4), Very satisfied (5)	66	382	981	2896	952						5277
	1.3%	7.2%	18.6%	54.9%	18.0%						100%
City of Residence: Auckland (1), Porirua (2), Hutt City (3), Wellington (4), Christchurch (5), Dunedin (6)	2,441	611	569	647	488	539					5295
	46.1%	11.5%	10.7%	12.2%	9.2%	10.2%					100%
Sex: Male (1), Female (2)	2426	2856									5282
	45.9%	54.1%									100%
Age Group: Under 20 (1), 20–29 (2), 30–39 (3), 40–49 (4), 50–59 (5), 60 + (6)	218	909	940	1230	838	1160					5295
	4.1%	17.2%	17.8%	23.2%	15.8%	21.9%					100%
New Zealand European: Yes (1), No (2)	3694	1593									5287
	69.9%	30.1%									100%
Employment Status: Full Time [30 h +] (1), Part Time [Under 30 h] (2), Unemployed and looking for work (3), Unemployed and not looking for work (4)	2779	915	326	957							4977
	55.8%	18.4%	6.6%	19.2%							100%
Education: No Formal Qualification (1), High School Qualification (2), Non-university Diploma/Certificate (3), Bachelors Degree (4), Postgraduate Degree (5), Other (6)	503	1644	1019	1099	888	63					5216
	9.6%	31.5%	19.5%	21.1%	17.0%	1.2%					100%
Personal Income: Loss/Zero (1), Less than $10,000 (2), $10,001–$20,000 (3), $20,001–$30,000 (4), $30,001–$40,000 (5), $40,001–$50,000 (6), $50,001–$60,000 (7), $60,001–$70,000 (8), $70,001–$100,000 (9), More than $100,000 (10)	329	372	531	420	405	457	455	361	555	537	4422
	7.4%	8.4%	12.0%	9.5%	9.2%	10.3%	10.3%	8.2%	12.6%	12.1%	100%
Support: Yes (1), No (2)	4900	161									5061
	96.8%	3.2%									100%
Isolated Binary: Never/Rarely (1), Sometimes/Most Times/Always (2)	3625	1663									5288
	68.55%	31.55%									100%
Feel a Sense of Community Binary: Agree (1), Does Not Agree (2)	2695	2290									4985
	54.06%	45.94%									100%

Source New Zealand Quality of Life Survey, 2014

Table 2 Details of the wellbeing inequality measures created

Wellbeing inequality measure	Variable type	Mean	Standard deviation	Min	Max	Total
Standard deviation life satisfaction (i.e. Life satisfaction inequality)	Standard	0.846	0.076	0.691	0.991	5182
	Centered	−0.0006	0.076	−0.155	0.145	5182
Allison-foster ordinal inequality measure (i.e. life satisfaction Inequality)	Standard	1.095	0.148	0.761	1.480	5182
	Centered	−0.121	0.148	−0.454	0.264	5182

Source New Zealand quality of life survey, 2014

Table 1 indicates that most of our New Zealand sample are satisfied with their lives, that nearly half live in Auckland, that there are a majority of females, that most respondents are over the age of 50, and that the majority identify as New Zealand European. Most of the sample is employed fulltime, and the sample covers a diverse range of qualifications and incomes. Turning to our moderators, the vast majority of people have someone they can reach out to for support in a time of need, most are rarely or never socially isolated, and most agree that they feel a sense of community.

The two different measures of wellbeing inequality are detailed in Table 2. The first is the standard deviation measure and the second is the alternative median-based measure created by Allison and Foster (2004). The Allison-Foster wellbeing inequality measure has been advocated as superior because it correctly treats life satisfaction as ordinal (Grimes et al., 2020; Jenkins, 2019).

We use the centered standard deviation of life satisfaction (as detailed in Table 2)[8] to examine both the ecological and individual relationship between wellbeing and wellbeing inequality. The 5182 individuals we analyse in our individual model were distributed over the 44 wards implying an average of 118 per ward. The following section provides our analysis of the relationship between wellbeing and wellbeing inequality at the ward scale.

4 Analysis—Wellbeing and Wellbeing Inequality

We begin with the ecological model.[9] Figure 3 presents a scatter of mean life satisfaction of each of the 44 wards against their corresponding standard deviation life satisfaction, and fits the regression line based on Eq. 1.[10] In this application every one standard deviation increase of a ward's life satisfaction is associated with a decrease of -0.724 in the ward's mean life satisfaction ($a = 4.419$, $b = -0.724$, $SE = 0.241$ $p < 0.01$, $R^2 = 0.177$). On average, an individual moving from the most equal ward in New Zealand (with a standard deviation of 0.7) to the most unequal ward (with a standard deviation of 1.0) would experience

[8] Normally the mean of the variable centered on the mean would be very close to zero, however the Allison-Foster measure is based on the median which accounts for the negative figure.

[9] Both the ecological and individual relationships were also conducted using the New Zealand General Social Survey, the World Values Survey, and Te Kupenga (a survey of Māori wellbeing). In each case, the results were broadly comparable with those presented here. See Dickinson (2018) for a discussion of the General Social Survey and Te Kupenga results.

[10] Applying the survey sampling weights makes little difference to the results.

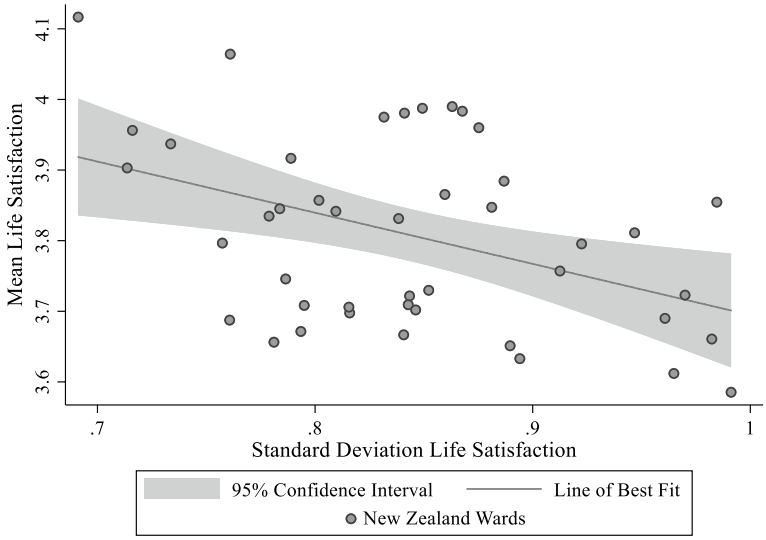

Fig. 3 The negative relationship between the average life satisfaction and the standard deviation of life satisfaction of New Zealand wards in 2014 *Source*: New Zealand Quality of Life Survey, 2014

a −0.217 drop in their life satisfaction due to the higher wellbeing inequality in their new ward.[11]

The presence of the negative relationship at the ward level confirms the expected relationship empirically but it does not explain it. To propose a plausible behavioural explanation, we must turn to further evidence from the individual model (Eq. 2).

4.1 The Individual Model

Equation 2 expresses an individual's wellbeing as a linear function of the dispersion of wellbeing in their group in the presence of demographic and socio-economic covariates. Before exploring the moderations, we examine the relationship between life satisfaction and life satisfaction inequality. Each new variable is introduced successively in a new model. A city control is introduced first, followed by ascribed demographic controls (sex, age group, and ethnicity), and several achieved controls (employment status, education, income, and support in times of need). The full regression results are in Table S1 of Online Resource 1.[12]

The coefficients from the final model in Table S1 (model 9) are plotted in Fig. 4. The vertical line represents 0 on the x axis and denotes the base ('B:') of covariates where applicable. Confidence intervals that cross the vertical line are not significantly different

[11] While the regressions in this section use a centred version of the life satisfaction variable the non-centred version of the regression is used in each of the figures for ease of interpretation.

[12] Note the drop in sample size from 5,164 in model 1 to 4,121 in model 8 of Table S1. This drop is mainly due to respondents opting not to answer the personal income question. To test if this decrease impacted the results, models 1 through 7 were run using only the 4,121 respondents from model 8. The results were consistent in sign and significance with those presented here, indicating minimal impact of the list wise deletion on the estimates.

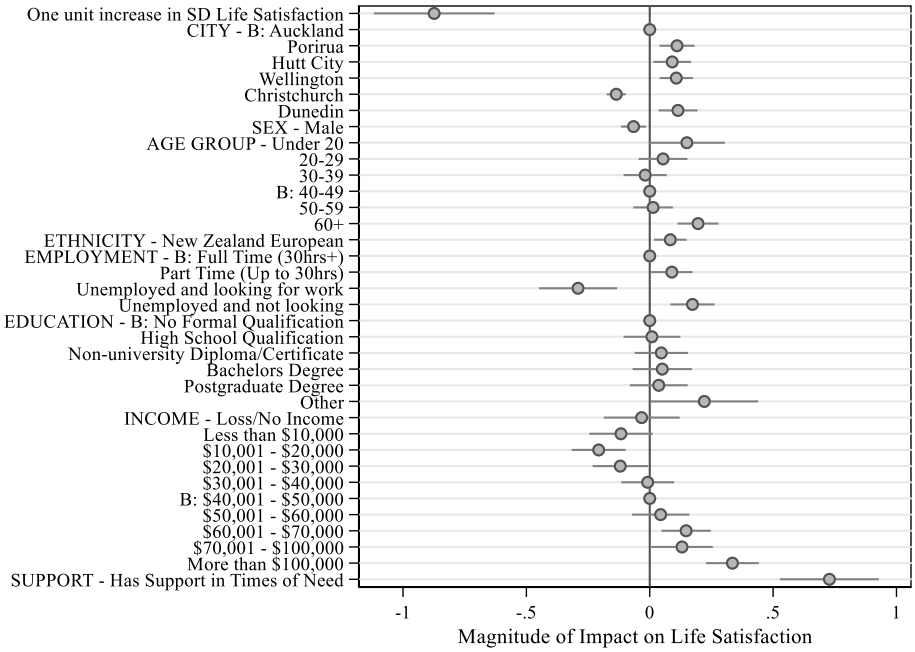

Fig. 4 Coefficient plot of individual wellbeing regressed on ward wellbeing inequality in the presence of eight covariates in 2014 *Source*: New Zealand Quality of Life Survey, 2014; $N=3{,}953$. *Note*: For the underlying estimates, see Table S1 of Online Resource 1

from 0 (at $p<0.05$) and are unlikely to have an independent positive or negative effect on wellbeing. Variables to the left of the vertical line have a negative impact on life satisfaction, whereas variables to the right have a positive impact on life satisfaction.[13]

Figure 4 shows that an increase of one standard deviation in life satisfaction in the residential ward is associated with a -0.874 reduction in the resident's wellbeing ($a=2.929$, $b=-0.874$, $SE=0.121$, $p<0.001$, $R^2=0.093$). To put this perspective, such a change in wellbeing is substantially greater than the difference between being employed full time and being unemployed but looking for work ($b=-0.291$, $p<0.001$). This is a particularly striking equivalence given that unemployment typically has one of the largest negative impacts on an individual's wellbeing (Dolan et al., 2008; Helliwell, 2003; Winkelmann, 2009). The analysis in Fig. 4 replicates most of the other common findings in the wellbeing literature, including the U-shaped relationship between age and wellbeing and the positive (cross-sectional) relationship with income.

Robustness checks are reported in Table S2 in Online Resource 1. The results of the ordered probit regression confirms our interpretation of the OLS regression run in model 9 of Table S1. The sign and significance of the results in Table S2 are also consistent with those discussed above and presented in Table S1 and Fig. 4. As a further check, Table S3 presents the results of the OLS regression in Table S1 using the Allison-Foster median-based measure of wellbeing inequality (in place of the standard deviation of life satisfaction). The results are again consistent with the broader findings

[13] For more information on these coefficient plots and how they are formed see Jann (2014).

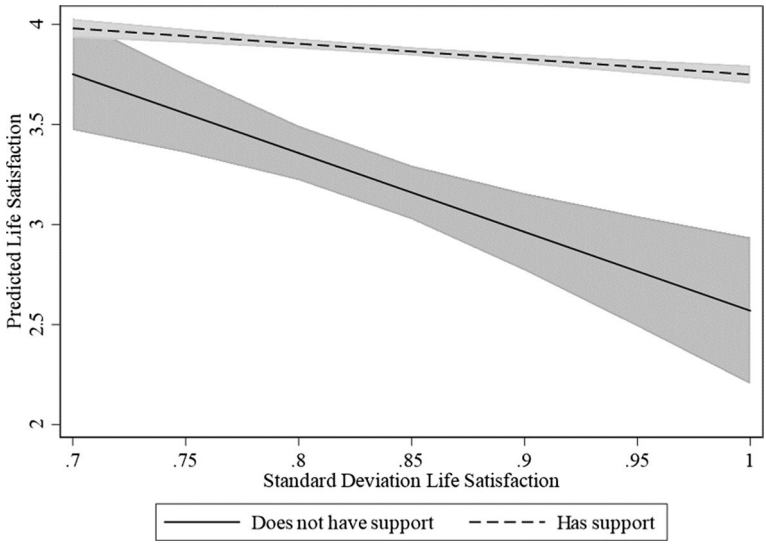

Fig. 5 The moderating effect of personal support on the negative relationship between life satisfaction and life satisfaction inequality within New Zealand wards (2014) with controls and 95% confidence intervals *Source*: The Quality of Life Survey, 2014; $N = 3{,}953$

discussed above, lending confidence that our results are not due to the mechanical relationship between the mean and standard deviation of life satisfaction resulting from a bounded scale.

Our analysis so far takes us to the point reached in most other studies of the relationship between wellbeing and wellbeing inequality, albeit showing the negative relationship between the two also holds at the local neighbourhood scale in addition to the national scale. However, while our analysis and robustness checks offer initial evidence of inequality aversion and support for hypothesis 1, they leave associated behavioural drivers unexplored. Therefore, we now turn to the extent to which social support, social isolation, and feeling a sense of community moderate our individual sensitivity to local wellbeing inequality.

5 Analysis—Moderators of Inequality Aversion

The first of the three moderators we use to test hypothesis 2 examines social support in times of need. The specific question asked in the New Zealand Quality of Life survey was "*If you were faced with a serious illness or injury, or needed emotional support during a difficult time, is there anyone you could turn to for help?*". The response to this question was a simple binary: '*Yes*' (coded as '1') or '*No*' (coded as '0').

Applying Eq. 2, our plot of the predicted margins in Fig. 5 shows that having support positively moderates the negative relationship between life satisfaction and life satisfaction inequality within the ward. The full regression results are in Table S4 of Online Resource 1. Those individuals with no support return an average drop in wellbeing of -3.169 when the spread of wellbeing within the ward increases by one full standard deviation ($a = 3.655$, $b = -3.169$, $SE = 1.016$, $p < 0.01$, $R^2 = 0.095$). In contrast, the life satisfaction of those with

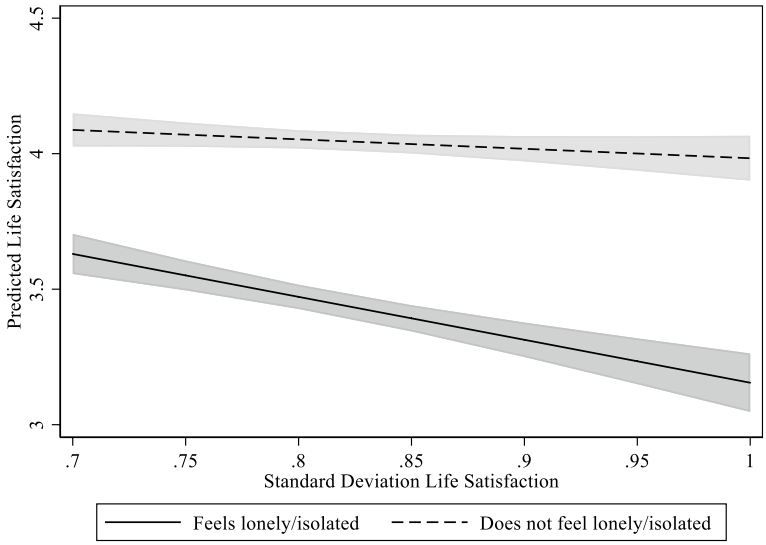

Fig. 6 The moderating effect of social isolation on the negative relationship between life satisfaction and life satisfaction inequality within New Zealand wards (2014) with controls and 95% confidence intervals *Source*: The Quality of Life Survey, 2014; $N = 3{,}949$

support only drops by -0.771 ($a = 3.655$, $b = -0.771$, $SE = 0.134$, $p < 0.001$, $R^2 = 0.095$). In other words, those without strong support networks around them feel the adverse impacts of higher wellbeing inequality much more strongly than those who do feel supported.

The second moderating variable we consider is social isolation. The question in the survey asks, "*Over the past 12 months how often, if ever, have you felt lonely or isolated?*", with respondents having the options of "*Never*", "*Rarely*", "*Sometimes*", "*Most of the time*" and "*Always*". A binary variable was created in which '1' represents those who feel lonely or isolated at least sometimes (i.e. 'sometimes', 'most of the time', and 'always' combined) and '0' represents those who only 'rarely' or 'never' feel lonely or isolated.

Figure 6 plots the predicted margins for those who are and are not socially isolated (see Table S5 of Online Resource 1 for the full regression results). There is strong support for our second hypothesis here as well. Those who are socially isolated display much lower wellbeing in the presence of wellbeing inequality than their more socially connected counterparts. Those who do feel socially isolated score their life satisfaction -1.236 lower for every one-unit increase in standard deviation life satisfaction ($a = 3.353$, $b = -1.236$, $SE = 0.397$, $p < 0.01$, $R^2 = 0.206$). Those who only rarely or never feel socially isolated exhibit a drop in life satisfaction of only -0.348 per one-unit increase in standard deviation life satisfaction, a decline which is not statistically significant even at the $p < 0.1$ level ($a = 3.353$, $b = -0.348$, $SE = 0.212$, $p = 0.107$, $R^2 = 0.206$). The results suggest that people who are well connected socially exhibit little sensitivity to the level of wellbeing inequality in their ward, while those who are more socially isolated feel its adverse impact quite keenly. This may be because those who are socially connected are likely to spend most of their time with others like them who, by extension, are more likely to have high wellbeing. In contrast, those who are socially isolated may be more likely to empathise with those who are struggling.

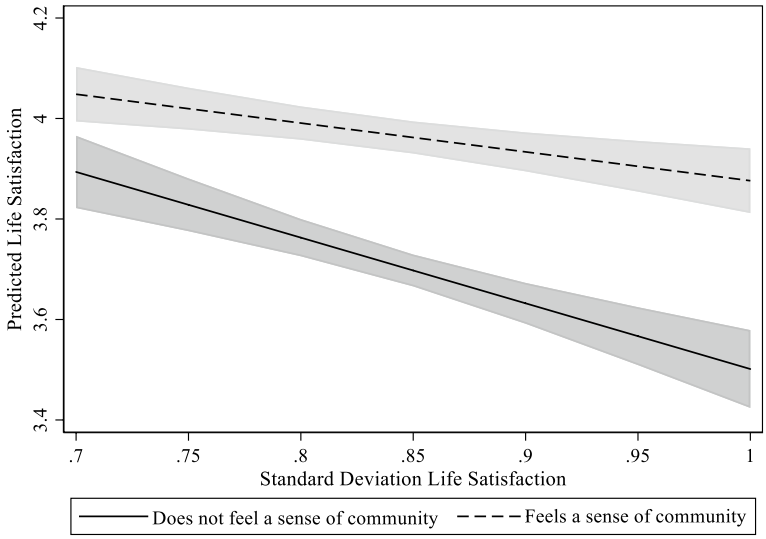

Fig. 7 The moderating effect of feeling a sense of community on the negative relationship between life satisfaction and life satisfaction inequality within New Zealand wards (2014) with controls and 95% confidence intervals *Source*: The Quality of Life Survey, 2014; $N = 3770$

A closely related but distinct moderator is the degree to which residents feel a sense of community. In the Quality of Life survey respondents were asked "*How much do you agree or disagree with the following statements?*", one of which was "*I feel a sense of community with others in my neighbourhood*". The variable uses a 5-point Likert scale ranging from *"Strongly disagree"* (1) to *"Strongly agree*" (5). We collapsed this variable into a binary in which '0' represents those who did not feel a sense of community (i.e. 'Strongly disagree' to 'Neither agree nor disagree') while '1' represents those who agree that they feel a sense of community.

We follow the same method of analysis in Fig. 7 as for our previous two moderations (see Table S6 in Online Resource 1). The results show that feeling a sense of community raises wellbeing and protects residents from the negative wellbeing effect of local wellbeing inequality. Those who *do* feel a sense of community with others in their neighbourhood still experience a decrease in life satisfaction of -0.574 with a one-unit increase in standard deviation life satisfaction ($a = 3.043$, $b = -0.574$, $SE = 0.166$, $p < 0.01$, $R^2 = 0.120$). Those who *do not* feel a sense of community experienced a more marked reduction in life satisfaction of an additional -0.734 for every one-unit increase in standard deviation life satisfaction ($a = 3.043$, $b = -0.734$, $SE = 0.283$, $p < 0.05$, $R^2 = 0.120$).

In summary, estimates from our individual model demonstrate that having support in times of need, being socially connected, and feeling a sense of community all serve to protect individual wellbeing against the negative impact of local inequalities in wellbeing. In the presence of wide variations in local wellbeing, those who are more engaged with those around them do not suffer as much as those who are less well connected.

6 Conclusions

The literature on inequality and wellbeing to date has been thought provoking but inconclusive. One of the reasons is that both inequality and wellbeing can be measured in different ways. When inequality is measured in terms of *income*, the relationship between subjective wellbeing and inequality is inconsistent across a wide literature. When inequality is measured in terms of *subjective wellbeing* itself however, the negative association with individual wellbeing is much stronger. In other words, people's wellbeing appears more consistently sensitive to the distribution of subjective wellbeing than it is to income inequality.

Our study has extended the literature in three ways. Firstly, we have shown that the negative relationship between subjective wellbeing and the inequality of subjective wellbeing is not confined to large spatial units such as countries and counties, but that it also holds at the more local level of the urban neighbourhood (as measured by electoral wards in New Zealand). Secondly, we have pointed out the lack of attention given to the behavioural drivers of this negative relationship and have suggested that the response to wellbeing inequality has roots in the way people relate to each other within their communities. We tested this proposition by introducing three moderators in a model of subjective wellbeing, each demonstrating the way social connection protected against high levels of wellbeing inequality.

Thirdly, we have more formally recognised the ordinal properties of the life satisfaction measure. In addition to applying the standard model using the mean and standard deviation we also applied several robustness checks. These show that the relationship identified is not simply a function of the arithmetic relationship between the mean and the standard deviation of subjective wellbeing. This in turn demonstrates that theoretically motivated, substantive explanations of the relationship have a more important role to play.

Policy Implications

Our primary finding for policy is that the *distribution* of local wellbeing within spatial groups matters empirically and has a behavioural rationale. As such, the relationship deserves greater attention from practitioners, alongside initiatives that target individuals directly. Research at the international level has primarily recommended country-level changes to address wellbeing inequality (Ott, 2005, 2011; Ovaska & Takashima, 2010). For example, Ott (2011) argues that improving the quality of national governance will reduce wellbeing inequality. However, the presence of wellbeing inequality at the regional, city, and within city level suggests there may also be drivers at the local level (Morrison, 2019). This clearly motivates a need to focus on reducing wellbeing inequalities at more local sub-national scales *as well as* at larger scales.

The socio-economic context of local relationships is undoubtedly important. However, our moderation analysis suggests that there may be additional benefits of investing in people's social engagement and social awareness alongside steps to reduce wellbeing inequality itself. In addition to the benefits of interventions in individual cases we can also expect community engagement to have a role in reducing the negative effects of wellbeing inequality present within local communities (O'Mara-Eves et al., 2013). Reducing wellbeing inequality should be a goal, but some degree of variation will always exist. As such, there is justification for further policy aiming to promote a sense of community as well as stronger social connections and social support. Doing so within local communities will help to protect individuals from the adverse impacts of any wellbeing inequality present.

Limitations and Opportunities for Further Research

Our findings notwithstanding, there are several limitations to the current research and therefore further research opportunities. Firstly, while we have used the most common measure of subjective wellbeing – life satisfaction – this is still only a single hedonic indicator. There would be real value in testing other single and multiple measures of wellbeing (for example eudaimonic wellbeing), in order to extend subjective wellbeing to encompass self-development and achievement.

Secondly, there is a strong case for re-specifying the above regression models as multi-level models. This would allow explicit testing of the influence of level 2 effects emanating from socio-economic and social cohesion differences across the wards. In addition, it would allow for testing of the degree to which these differences have influence on people's sensitivity to local wellbeing inequality when compared to social support and sense of community as experienced by the individual. Also, if the ward-based model was nested within cities, the multi-level model could be extended to three levels and used to test standard of living and social cohesion differences at the city level as well.

Thirdly, a parallel literature addresses spatial spill-overs in the transmission of wellbeing between neighbouring groups (Tumen & Zeydanli, 2015; Ziogas et al., 2020). It is quite likely that both the level and the distribution of wellbeing beyond an individual's immediate spatial group will also have an impact on their wellbeing. There is therefore scope for integrating the GIS-based work on spatial autocorrelation (as applied to the interactive geography of groups) with studies such as ours which focus on the interaction of individuals *within* the group.

A fourth advance would be the testing of the same hypotheses using longitudinal data to verify the causality of the relationships that cannot be inferred from the cross-sectional evidence. Longitudinal data would allow tests of changes to conditions of individuals (such as moving from unemployment to employment) on the way they respond to the level of wellbeing inequality within the group. In addition, longitudinal data would allow for testing the wellbeing impact of changes in wellbeing inequality over time.

Finally, a broad challenge emerging from our research is the potential value of placing the above arguments more formally within the wider literature on welfare economics which, among other things, would allow issues of *relativity* to be addressed (e.g. as discussed in Bjørnskov et al., (2013)).

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Author contribution Both authors worked equally on the paper. PM conceived of the project and served as Graduate Supervisor and PD tested the propositions in his Master of Science dissertation which was awarded first class honours.

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Declarations

Conflict of interest The authors declare that they have no conflict of interests.

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