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The differing impact of individual social trust across 89 countries
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DOI
10.1080/14616696.2016.1153697
Publication date
2016
Document Version
Final published version
Published in
European Societies
License
CC BY-NC-ND
Link to publication

Citation for published version (APA):
National income inequality and self-rated health: the differing impact of individual social trust across 89 countries

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ABSTRACT
The well-known Income Inequality Hypothesis suggests that income disparities in a country are detrimental for people’s health. Empirical studies testing this hypothesis so far have found mixed results. In this study, we argue that a reason for these mixed findings may be that high national income inequality mostly harms individuals with high levels of social trust. We employ data of the World Value Survey and European Value Survey, using information on 393,761 respondents within 89 countries. Multilevel regression analyses, across countries and within countries across time, confirm findings from earlier studies that there is a negative association between national income inequality and self-rated health. Our results also reveal that national income inequality is especially detrimental for trustful citizens: while the effect of income inequality is nearly absent among people with low social trust it is negative among people with high social trust.

ARTICLE HISTORY Received 9 January 2014; Accepted 15 January 2016

KEYWORDS Self-rated health; income inequality; generalized social trust; multilevel models; World Value Survey; European Value Survey

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During the last decades, there has been debate in social epidemiology, medical sociology, and public health research on whether income inequality is harmful for people’s health. Although numerous studies support the well-known Income Inequality Hypothesis (IIH, Wilkinson and Pickett 2006; Pickett and Wilkinson 2015), which posits that income inequality is harmful for health, various other studies conclude that income inequality is not or hardly associated with poorer health (e.g. Jen et al. 2009; Qi
2012; Pop et al. 2013). As a result, there is lasting controversy on how to explain these opposing findings.

Several scholars have argued that contrasting outcomes regarding the relationship between income inequality and health may be due to variations between studies in factors such as the contextual level at which income inequality was examined (e.g. nations, states, or municipalities), or the use of time lagged effects versus current effects of income inequality on health (Subramanian and Kawachi 2006; Chen and Gotway Crawford 2012; Qi 2012). Additionally, it has been suggested that it may be inappropriate to assume effects of income inequality on health to be equal for all citizens, regardless of their personality, social background, and resources. As Subramanian and Kawachi (2006) have argued, income inequality may be beneficial for the health of some social groups (e.g. those with high incomes), but detrimental to others (e.g. people who experience economic deprivation). Hence, effects of national income inequality on health may be obscured if scholars fail to articulate the specific conditions under which income inequality affects health. This may partly explain the absence of a relationship between income inequality and health in some of the previous studies.

In this study, we argue that next to individual income and race (Subramanian and Kawachi 2006), social trust may act as a condition under which income inequality translates into poor health. Although the pathway between national income inequality and feelings of health that is mediated through social trust has been often investigated (e.g. Kawachi and Kennedy 1999; Aida et al. 2011; Mansyur et al. 2008; Rözer and Volker 2015), the possibility that social trust moderates the relationship between national income inequality and health has not yet been examined. As we argue in this study, high social trust might be a condition under which income inequality is especially harmful. Individuals with high social trust are often more aware of social problems that are associated with national income inequality, while they are at the same time relatively receptive of negative feelings caused by the awareness of these social problems.

In this study, we aim to (a) reassess the relationship between national income inequality and self-rated health by using an exceptionally large cross-national data set and (b) test whether this relationship is conditioned by individual social trust. We argue that the relationship between national income inequality and self-rated health may be absent when studying the population as a whole, but that harmful effects of income inequality on health may be identified when focusing on social groups that are strongly affected by the detrimental consequences of income inequality. To test our
expectations in a multilevel design, we merged all available waves of the World Value Survey (WVS) and European Value Survey (EVS) between 1981 and 2014. This large national comparative data set covers information on 393,761 individuals living in 89 countries.

1. Theoretical background and hypotheses

1.1. National income inequality and self-rated health

The IIH generally implies that national income inequality harms an individual’s health (Wilkinson and Pickett 2006). Several theoretical ideas have been formulated on why national inequality would be detrimental for personal health. These ideas in a nutshell are the following. First, it has been theorized that national income inequality has an effect on health mainly by affecting people’s psychosocial quality of life (Kennedy et al. 1996; Kawachi and Subramanian 2014). In more unequal societies, income differences and class distinctions are larger and therefore more visible. This fuels comparisons and status competition across people in society, including the middle and upper class. As a consequence, people may feel rushed and squeezed which obviously lowers psychosocial quality of life. Second, ‘neo-materialist explanations’ argue that policy measures matter (Layte 2012; Torre and Myrskylä 2014). Governments in unequal societies would invest less in public facilities that promote health, such as health care, education, and housing. As a consequence, facilities that promote health may be of a lower quality and less easily accessible. This could result in a lower overall health situation in such society. Third, compositional mechanisms provide an alternative explanation for inequality effects, and therefore should be controlled for in further analyses. Compositional features, however, do not directly link to the impact of national income inequality on health in terms of wider income differences (Kawachi and Kennedy 1997; Pickett and Wilkinson 2015). These compositional arguments mainly evolve around the role of individual income and poverty. Because in unequal societies more people have low incomes when holding wealth constant, people in these countries are also more likely to face-related problems such as poverty, crime, and status deprivation (Subramanian and Kawachi 2004). This may harm all people in society, even when they are not deprived themselves, because people may feel upset when they observe that some people are far better off than others. Additionally, through increased crime and status anxiety, people from the higher social strata also get
confronted with the negative consequences of living in a society where the
distribution of wealth is uneven.

Summarizing these arguments, the ‘IIH’ presumes that the higher the
level of a nation’s income inequality, the lower the level of self-rated
health among the citizens living in that country.

1.2. The differing impact of social trust

Although it is often implicitly assumed that national income inequality
has equal effects on health for all individuals in society, there are
serious reasons to cast doubt on this assumption. For example, Subrama-
nian and Kawachi (2006) found that the relationship between state
income inequality in the USA and poor health was stronger for whites
than for blacks, and weaker for lower income groups than for those
with higher incomes. Thus, it appears that the extent to which high-
inecome inequality translates into poor health may be conditional on indi-
viduals’ social background and resources.

We here propose that individual social trust may act as a condition
under which national income inequality is harmful for feelings of
health. Trust is often referred to as glue that keeps society together, or
in less magical terms, a rational process enabling or supporting
cooperation between individuals (Putnam 2000). Social trust is thought
to represent a wide variety of interrelated aspects (Delhey et al. 2011).
First, as traditionally argued by economics, social trust reflects people’s
experience on how often general others in society can be trusted
(Hardin 1993). Second, as the social capital literature argues, social trust
is among the most important conditions under which social exchange
can take place between people (Coleman 1988). This social exchange is
likely to be reflected in a large number of social contacts and integration
in social networks. Third, social trust is often seen as the link between citi-
zens and institutions, making citizens trust their institutions more, and by
facilitating social exchange making institutions actually function more
effectively (Rothstein and Uslaner 2005). Fourth, social-psychologist
studies indicate that trust might be seen as a personal trait which may
be related to other traits such as an open and pro-social attitude, and opti-
nism (Uslaner 2000).

Rather than as a conditioning factor, social trust has often been studied
as a mediator in the relationship between national income inequality and
health (Kawachi et al. 1997). Indeed, it has been shown that high-income
inequality in a country lowers levels of social trust (e.g. Aida et al. 2011;
Rözer and Volker (2015). The key reason for this relationship is the aversion to the heterogeneity principle (Alesina and La Ferrara 2000). According to this principle, and in line with the homophily principle (e.g. McPherson et al. 2001), people are more likely to trust ‘similar others’, because people feel more familiar and can more easily identify with people like themselves. Inequality, however, increases heterogeneity because it widens differences in income and related lifestyles between people, making others less similar and familiar, which decreases the likelihood to trust them. Research showed that indeed people with lower social trust, or social capital, report lower levels of health (Kim et al. 2008; Huijts and Kraaykamp 2012). Several additional reasons may be mentioned for this relationship. First, having social trust causes people to feel related to and enhance interactions with others, which augments the provision of support, companionship and feelings of belonging, and this may lead to better health (Berkman et al. 2000). Second, through their variety of social contacts, trustful people may better handle stressful situations than people with low trust (Kawachi and Berkman 2001). Third, people with high trust may use the resources of their social contacts to enhance their feelings of health (Cattell 2001). Therefore, in the analyses, we account for the possibility that social trust acts as a mediator between national income inequality and health.

In this study, we however argue that rather than merely being a mediator, social trust primarily constitutes a condition under which national income inequality is detrimental for health. First of all, having high trust might enhance the negative effects of income inequality on health. According to the IIH, unequal societies are more affected by societal problems such as ill health, bad public services, drug use, violence, imprisonment, teenage births, obesity, and downward mobility (Wilkinson and Pickett 2010). High-trusting people will be more often confronted with these problems because by their open and pro-social personality they are most likely to come into contact with people from other social strata. In addition, high-trusting people might be more receptive for the negative consequences of income inequality because they are most concerned with problems in their wider environment, and because they will try most actively to establish an understanding of why people can run into problems inadvertently (Lewis and Weigert 1985; Rözer and Kraaykamp 2012). On the one hand, these attitudes result, for example, in that people with high trust donate more to charity, are more active in voluntary work, more often offer social support, and are relatively tolerant towards ethnic minorities and people living on welfare (Rothstein and Uslaner 2005; Nannestad
One the other hand, confrontations with, and being receptive for, negative consequences of income inequality may make people with high trust in generalized others feel powerless and stressful, and as a consequence may lower their subjective feelings of health.

Second, income inequality may suppress the generally positive effect of social trust on people’s health. One of the reasons why high-trusting individuals are relatively healthy is because their open attitudes help them to maintain large supportive networks that extent their immediate social circle of family members (Delhey and Newton 2003). However, it takes two to become friends, and building social networks might be relatively difficult in unequal societies, because there are fewer high-trusting people with whom one can become friends. Besides, even when high-trusting people have large social networks in unequal countries, these social networks are less likely to be composed of high-trusting contacts because in unequal societies there are fewer high-trusting people with whom one can become friends (e.g. Kawachi et al. 1997).

Our reasoning that social trust constitutes a condition under which (national) income inequality is detrimental for health is supported in social-psychological experiments. These experiments have shown that people in general have lower levels of well-being when they observe or (have to) choose unequal outcomes, especially when they hold pro-social attitudes, which is often the case for people with high social trust (Van Lange et al. 1997). These pro-social attitudes also might be supported by the personal networks and environments of people with high trust, which are characterized by many social ties across social classes (Kelley and Stahelski 1970; Van Lange et al. 1997).

Hence, our general hypothesis reads: the negative effect of national income inequality on self-rated health is stronger for individuals with high social trust than for individuals with low social trust.

In Figure 1, our expectations are graphically displayed. Having high trust in general others in society may mediate the effect between national income inequality and health, but also constitutes a condition under which people are more receptive for the negative side effects of a nation’s income inequality.

2. Data, measurements and method

2.1. The WVS and EVS

To test our hypotheses, we combined two of the largest national comparative data sets in the world: the World Values Survey (WVS) and the
European Values Study (EVS) (WVS 1981–2008, 2014). We employed all surveys held between 1981 and 2014. All surveys where gathered per country by national academies of science, university-based institutions or professional survey organizations. In most cases, stratified multi-stage random sampling was used, with a two-stage design. First, a random selection of sampling locations (municipalities) was made. Second, a random selection of individuals was drawn up. Almost all surveys within countries covered at least 1000 respondents. Not all participating countries reported response rates, but in most participating countries response rates vary around 60%. All surveys were conducted through face-to-face interviews. Random sampling assured that the surveys are representative within a country.

From these surveys, we used information of 393,761 individuals living in 89 different countries. The question on self-rated health had to be available to include a country (in a specific year) in our sample, and therefore we had to drop the entire second wave of the EVS. Countries (in a specific year) were also excluded when it was found impossible to gather information on national income inequality, or GDP. Therefore, most recent years (from 2014) were excluded. We only included countries (in a specific year) and respondents without missing values on the main independent variables. We restricted our sample to people aged 18 years and older to maintain comparability between the various surveys. Despite a slight oversampling of Western countries, all large regions of the world are represented in our data.

2.2. Measurements

Self-rated health is used as a dependent variable because it captures feelings of health and includes physical as well as mental aspects of health. To measure self-rated health, respondents were asked to evaluate their health using five answering categories. These were rescaled, ranging from ‘very
bad’ (0) to ‘very good’ (4). By using this rather general measure of respondents’ physical and mental health, we follow a prominent tradition in social epidemiological research. Self-rated health proved to be a valid and reliable indicator of health in earlier studies (DeSalvo et al. 2006; Jylhä 2009). Nonetheless, the usefulness of self-rated health in cross-national research has been questioned, because it is only moderately correlated with objective measures of health across countries, such as mortality rates and life-expectancy (Dorling and Barford 2009). To check for this relation, we aggregated our data and compared self-rated health outcomes across countries with infant mortality rates and life-expectancy figures (World Bank). Associations (aggregated) of self-rated health with mortality rates \( r = -0.368 \), and self-rated health with life-expectancy \( r = 0.107 \) indeed indicate that subjective and objective health measures are interrelated, but only moderately. To our opinion, this illustrates that employing self-rated health measures in a multilevel design for cross-country comparisons may reveal interesting outcomes. Using a dichotomized version of our dependent variable (i.e. (very) good health vs. less than good health) did not lead to different results. For descriptive statistics of our data see Table 1.

A person’s social trust is measured by the standard question: ‘Do you think most people can be trusted (1), or that you cannot be careful enough in dealing with people (0)?’. This question is widely used, and research indicates that respondents mostly use people in their country as a benchmark in answering this question.

Next, we discuss the national-level measurements. Gini-coefficients, based on household disposable income, are used to measure national income inequality. We employed the Standardized World Income Inequality Database, which is a reliable and comparable data source on income inequality. In cases that no information on income inequality was available for a certain country-survey year combination, we used information on up to two years before or after the survey in order to include as many countries as possible in the analyses.

We used several controls. Perceived (relative) income was measured as the self-rated income position of a respondent in a country. Answering categories were rescaled, and 0 indicates that a respondent indicated to belong to the lowest income category, and 9 to belong to the highest income category. A person’s educational level was measured on a scale ranging from ‘no completed formal education’ (0) to ‘university/college graduate’ (7). Unfortunately, this measure showed a relatively large number of missing values. We imputed missing values using information
in EVS and WVS about the age at which people finished day-time education and other relevant factors. This seems adequate because of the high correlation between the two educational measures \( (r = .740) \). A respondent’s work status is indicated by eight dummy variables: full-time employed, part-time employed, self-employed, unemployed, retired, being a housekeeper, being a student, and otherwise. Marital status is recoded into five categories: married/cohabiting, divorced, separated, widowed, and single. Gender was coded 0 for women and 1 for men, and age ranges from 18 to 99 years. Additionally, we constructed a quadratic term for age, since the negative effect of age on health generally becomes slightly weaker among the oldest age groups. At the national level, we control for national wealth. This was measured with GDP per capita in purchasing power parities from the Penn’s World Trade Tables. GDP was transformed using the natural logarithm to ensure that the relationship is linear, and to account for the presence of countries with extremely high GDP scores. In addition, we control with a dummy variable whether countries have or had a communistic state ideology because the inclusion of (former) communist countries may bias results. Their generally exceptionally low levels of health and social trust may have largely other reasons, such as an oppressive regime, loss of state

### Table 1. Descriptive statistics.

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
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<td>4</td>
<td>2.77</td>
<td>0.91</td>
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<tr>
<td><strong>Individual characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Education</td>
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<td>7</td>
<td>3.59</td>
<td>2.25</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>0.37</td>
<td>0.48</td>
</tr>
<tr>
<td>Part time</td>
<td>0</td>
<td>1</td>
<td>0.07</td>
<td>0.26</td>
</tr>
<tr>
<td>Self-employed</td>
<td>0</td>
<td>1</td>
<td>0.10</td>
<td>0.29</td>
</tr>
<tr>
<td>Retired</td>
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<td>1</td>
<td>0.15</td>
<td>0.35</td>
</tr>
<tr>
<td>Housewife</td>
<td>0</td>
<td>1</td>
<td>0.14</td>
<td>0.35</td>
</tr>
<tr>
<td>Student</td>
<td>0</td>
<td>1</td>
<td>0.06</td>
<td>0.25</td>
</tr>
<tr>
<td>Unemployed</td>
<td>0</td>
<td>1</td>
<td>0.09</td>
<td>0.28</td>
</tr>
<tr>
<td>Other activity</td>
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<td>1</td>
<td>0.02</td>
<td>0.14</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
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</tr>
<tr>
<td>Married/cohabiting</td>
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<td>1</td>
<td>0.63</td>
<td>0.48</td>
</tr>
<tr>
<td>Separated</td>
<td>0</td>
<td>1</td>
<td>0.06</td>
<td>0.23</td>
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<tr>
<td>Widowed</td>
<td>0</td>
<td>1</td>
<td>0.07</td>
<td>0.26</td>
</tr>
<tr>
<td>Single</td>
<td>0</td>
<td>1</td>
<td>0.24</td>
<td>0.43</td>
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<tr>
<td>Age</td>
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<td>99</td>
<td>42.23</td>
<td>16.77</td>
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<tr>
<td>Gender (ref = female)</td>
<td>0</td>
<td>1</td>
<td>0.48</td>
<td>0.50</td>
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<tr>
<td>Perceived relative income</td>
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<td>9</td>
<td>3.72</td>
<td>2.40</td>
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<td>Social trust</td>
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<td>0.29</td>
<td>0.45</td>
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<tr>
<td>National characteristics</td>
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<td></td>
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</tr>
<tr>
<td>GDP (/10,000)</td>
<td>0.02</td>
<td>8.29</td>
<td>1.57</td>
<td>1.26</td>
</tr>
<tr>
<td>(Ex) communist</td>
<td>0</td>
<td>1</td>
<td>1.74</td>
<td>0.44</td>
</tr>
<tr>
<td>Income inequality (Gini)</td>
<td>0.18</td>
<td>0.61</td>
<td>0.36</td>
<td>0.09</td>
</tr>
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</table>
ideology and social, economic, and political instability (Jen et al. 2009; Torre and Myrskylä 2014).

2.3. Methods

In our data, individuals are nested within country-survey year combinations. To avoid the underestimation of standard errors of effects of variables at the national level, multilevel analyses were conducted (Snijders and Bosker 1999). Individuals are nested within country years, and we control for time-dependency through the inclusion of year dummies in our models. Thus, standard errors for our individual-level variables are calculated based on our individual-level sample size (393,761 individuals), while standard errors for our national-level variables are based on our national-level sample size (89 countries). Individual variables represent the effects for individuals and control for composition differences between countries, while national-level variables account for differences between countries.

Multiple imputation was used to deal with missing values on all survey items. In particular, the relative high percentage of missing values (29.8%) on the perceived income question. To ensure valid predictions of missing values, next to all our variables in our model, perceptions of own social class, satisfaction with life and subjective well-being are used in the imputation process. These variables proved relatively good predictions of both self-rated health and income. A list wise deletion of missing values, or leaving income out did not alter our results.

3. Analyses

Table 2 presents the results of our multilevel models. Model 1 addresses the effect of national income inequality simultaneously with all individual control variables. Our model shows that the higher educated reported higher levels of self-rated health. Working in full-time paid employment is found to be advantageous as compared to unemployment, retirement, being a student, part-time employment, and having another daily activity. People who are married or are living together hold higher levels of self-rated health than the unmarried or people who do not live together. People’s subjective health becomes worse as they grow older, but this effect weakens out for the oldest age groups. Finally, perceived income is positively related to self-rated health. All these results are all in line with earlier research. Importantly, in Model 1 the effect of national
income inequality on self-rated health is negative, but insignificant. Hence, our results support findings from earlier studies that national income inequality has no significant main effect on self-rated health.

From Model 2, it shows that people in (formerly) communist countries reported considerably poorer health than people from non-communist countries. More interesting is that inclusion of the communistic legacy causes a significant negative association between countries’ income inequality and self-rated health. Furthermore, GDP per capita included

Table 2. Results of linear multilevel regression analysis of self-rated health on individual and national characteristics; unstandardized coefficients.

<table>
<thead>
<tr>
<th></th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
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<td>Intercept</td>
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<td>3.548**</td>
<td>2.718**</td>
<td>2.719**</td>
<td>2.882**</td>
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<td>Individual characteristics</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td>Education</td>
<td>0.032**</td>
<td>0.032**</td>
<td>0.032**</td>
<td>0.030**</td>
<td>0.030**</td>
</tr>
<tr>
<td>Daily activity (ref = employed)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part time</td>
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<td>−0.022**</td>
<td>−0.022**</td>
<td>−0.023**</td>
<td>−0.023**</td>
</tr>
<tr>
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<td>−0.003</td>
<td>−0.003</td>
<td>−0.003</td>
<td>−0.003</td>
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<td>−0.220**</td>
<td>−0.220**</td>
<td>−0.217**</td>
<td>−0.216**</td>
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<td>Housekeeping</td>
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<td>−0.066**</td>
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<td>−0.079**</td>
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<td>−0.125**</td>
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</tr>
<tr>
<td>Single</td>
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<td>−0.027**</td>
<td>−0.028**</td>
<td>−0.027**</td>
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<tr>
<td>Age²</td>
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<td>0.000**</td>
<td>0.000**</td>
<td>0.000**</td>
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<tr>
<td>Gender</td>
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<td>0.075**</td>
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<tr>
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<td>0.041**</td>
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<tr>
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<td></td>
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<tr>
<td>National characteristics</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Income inequality (Gini)</td>
<td>0.023</td>
<td>−0.434*</td>
<td>−0.043</td>
<td>0.030</td>
<td>−0.100</td>
</tr>
<tr>
<td>(Ex) communistic</td>
<td>−0.397**</td>
<td>−0.356**</td>
<td>−0.352**</td>
<td>−0.345**</td>
<td>−0.345**</td>
</tr>
<tr>
<td>GDP (log)</td>
<td>0.072**</td>
<td>0.068**</td>
<td>0.068**</td>
<td>0.069**</td>
<td>0.069**</td>
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<tr>
<td>Cross-level interactions</td>
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<td></td>
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</tr>
<tr>
<td>Gini*Trust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−0.208**</td>
</tr>
</tbody>
</table>

n (individuals) 393,761 393,761 393,761 393,761 393,761
N (countries) 89 89 89 89 89
Average−2ll (restricted) 913,681.9 913,588.3 913,569.9 906,611.3 906,411.7
Pooled residual 0.629 0.629 0.629 0.626 0.626
Pooled variance: intercept 0.077 0.050 0.047 0.045 0.044
Pooled variance: trust 0.002

Note: Survey years are included as dummy variables in all models but are not reported.
*P < .05.
**P < .01.
in Model 3, is positively associated with feelings of health and seems to mediate the effect of income inequality on self-rated health. In Model 4 we add individual social trust to the model to test whether it is related to self-rated health, and to examine the possibility that social trust mediates the effects of (other) individual and national characteristics on self-rated health. As expected, people who put social trust in others report higher levels of health ($b = .135$).

With Model 5 our main hypothesis is tested. It presents the cross-level interaction between national income inequality and social trust. A visual representation of the interaction is displayed in Figure 2. It shows that at all levels of a nation’s income inequality individuals with high levels of social trust report better self-rated health than their lower trusting counterparts. Disparities, however, between low- and high-trusting individuals are smallest in most unequal countries. Whereas national income inequality does not appear to be related to self-rated health among individuals with low social trust, people with high social trust are harmed by living in a country with high-income inequality. In other words, the effect of income inequality is negative and significant among people with high social trust, while it is nearly absent (and not significant) among people with low social trust.

Several robustness check are performed to check the stability of our results. These are presented in Table 3. First, it may be stated that the impact of the interaction between social trust and income inequality may be driven by other factors, such as education and individual income. To test this possibility, Model 6 includes the cross-level interactions between national income inequality and education, and national income inequality and (perceived) individual income. Our results indicate

![Figure 2. The influence of national income inequality on self-rated health conditioned by social trust.](image-url)
that the effect of the income inequality and social trust interaction almost remains unchanged. It further is shown that only the (perceived) income with income inequality interaction reaches the border of significance. Furthermore, it has been argued that detrimental effects of income inequality are largest in developed countries (Wilkinson and Pickett 2006). To test this assumption, we re-analysed only high-income countries, as indicated by the Worldbank. Model 7 shows that results are fairly stable; the interaction of individual trust and national income inequality is still significant and substantial. It also has been argued that subjective measures of health are not comparable across countries (e.g. Dorling and Barford 2009).

Therefore, we checked associations within countries across time, because it is highly unlikely that questions on self-rated health are interpreted differently within countries across time. We examined within country effects by adding country and year fixed effects to the models. In applying this strategy, communistic legacy becomes almost perfectly

Table 3. Results of linear multilevel regression analysis of self-rated health on individual and national characteristics (2); unstandardized coefficients.

<table>
<thead>
<tr>
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<th>M6</th>
<th>M7</th>
<th>M8</th>
<th>M9</th>
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<tr>
<td><strong>Intercept</strong></td>
<td>2.647**</td>
<td>2.707**</td>
<td>3.318**</td>
<td>1.802**</td>
</tr>
<tr>
<td><strong>Individual characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>0.028**</td>
<td>0.028**</td>
<td>0.030**</td>
<td>0.026**</td>
</tr>
<tr>
<td>Income</td>
<td>0.030**</td>
<td>0.034**</td>
<td>0.039**</td>
<td>0.034**</td>
</tr>
<tr>
<td>Trust</td>
<td>0.200**</td>
<td>0.202**</td>
<td>0.206**</td>
<td>0.196**</td>
</tr>
<tr>
<td><strong>National characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income inequality (Gini)</td>
<td>−0.228</td>
<td>−0.374</td>
<td>−0.192**</td>
<td>0.202−</td>
</tr>
<tr>
<td>(Ex) communistic</td>
<td>−0.432**</td>
<td>−0.459**</td>
<td>0.013</td>
<td>0.146**</td>
</tr>
<tr>
<td>GDP (log)</td>
<td>0.077**</td>
<td>0.086</td>
<td>0.013</td>
<td>0.146**</td>
</tr>
<tr>
<td><strong>Cross-level interactions</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Gini*Trust</td>
<td>−0.216**</td>
<td>−0.202*</td>
<td>−0.232**</td>
<td>−0.172**</td>
</tr>
<tr>
<td>Gini*Education</td>
<td>0.008</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Gini*Income</td>
<td>0.031−</td>
<td></td>
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<td></td>
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</tbody>
</table>

n (individuals) 39,371 188,960 39,371 188,960
N (countries) 89 39 89 39
Average−2ll (restricted) 904,243.8 430,484.6
Pooled residual 0.620 0.612
Pooled variance: intercept 0.045 0.033
Pooled variance: trust 0.003 0.003
Pooled variance: education 0.001
Pooled variance: income 0.001
Adjusted R² 0.230 0.251

Note: Control variables (daily activity, work status, age, age square and gender) and survey years are included as dummy variables in all models but are not reported.
*P < .05.
**P < .01.
~P < .10.
identifiable with our country and year dummies, and therefore is dropped. As Model 8 shows, we again found the negative interaction between a nation’s income inequality and trust as predicted. Also, this did not change when we applied this to high-income countries only (Model 9), as well as when we added additional national-level control variables to our model, respectively, average age, the human capital index from the Penn’s World Trade Tables, and unemployment rate (models available upon request).

To test whether the results were sensitive to our dichotomous measure of social trust, we also tested our hypothesis using the first four waves of the European Social Survey (2002–2008). In these waves, trust was also available measured on a 10-point scale. Results of these analyses were rather similar to those in our main models (results available upon request). Although we have to be careful in comparing the European Social Survey with our dataset, because of differences in sampling design, countries included, time period, and measurements, these similarities provide good indications that our results are insensitive to the alternative measurements of social trust.

4. Conclusion

Within the academic world there is a vigorous debate about the consequences of income inequality for people’s health. The well-known IIH presumes that income inequality is detrimental for people’s health, but so far empirical research has reported mixed results. To shed more light on the relationship between national income inequality and health, we merged all waves of the EVS and WVS and created a large data set including 393,761 respondents within 89 countries. With this dataset, we examined whether the relationship between national income inequality and self-rated health is conditioned by social trust, being that foremost people with high trust are affected by living in a country with a high-income inequality. By investigating whether social trust conditions the relationship between national income inequality and health, we are among the first who tested whether effects of national income inequality on health are conditional on social characteristics of individuals involved.

A key reason why income inequality would be detrimental for people’s health is that in unequal societies differences between people are larger which might cause stress and thus lower levels of health (Wilkinson and Pickett 2006). We indeed found a negative and significant association between national income inequality and self-rated health, after we
controlled for (former) communistic history of countries. This effect however seemed significantly mediated by a country’s wealth status (GDP) turning the association between national income inequality and self-rated health insignificant. Most importantly, our results indicate that high social trust acts as a condition under which income inequality lowers people’s health. While, in general, individuals with high social trust report higher levels of health, the health gap between low-trusting and high-trusting individuals appeared to be the smallest in most unequal countries. This suggests that people with low social trust are hardly affected by income inequality, whereas people with high trust experience poorer health if they are living in an unequal country. This underscores the idea that harmful influences of national income inequality may be present only under certain conditions such as a having high social trust.

Our study has some drawbacks that may be dealt with in future research. First, although numerous studies have tested the IIH on other than objective health measures such as depression, murder rates, anxiety, subjective well-being (e.g. Wilkinson and Picket 2009), and self-rated health (e.g. Subramanian and Kawachi 2006; Mansyur et al. 2008; Jen et al. 2009), the original hypothesis started from health effects of income inequality on objective health measures. Future research may want to utilize various health outcomes to further investigate which aspects of people’s physical and mental health are most affected by the combination of high social trust and high-income inequality. Second, we foresee progress in increasing our study’s generalizability by employing information on (even) more countries, as well as by using innovative longitudinal surveys. Prospective designs in particular would make it possible to deal with issues of causality. For example, it may be determined whether having high trust in others precedes a person’s feelings of health, or that it works the other way around. Third, social trust may be seen a rather broad measure that captures several aspects of people’s social connectivity and social capital. We hypothesized that social trust conditions the relationship between national income inequality and self-rated health, because it serves as a broad measure for people’s experiences in society, the number of different social ties across society they have, and their pro-social personality. Future research may want to further disentangle these various mechanisms underlying social trust to obtain more precise knowledge on what aspect of social trust acts as a condition for income inequality to negatively affect self-rated health. Especially, the influence of social networks deserves additional attention because
networks sometimes lower stress and may act as a buffer against negative effects of stress caused by income inequality (Cohen and Wills 1985).

All in all, our research underscores that the absence of a relationship between national income inequality and health in earlier studies does not necessarily mean that people’s health is unaffected by living in unequal societies. Our study clearly demonstrates that income inequality is detrimental under the individual condition of having high trust in others. Future research examining the IIH therefore should pay explicit attention to the differing impact of income inequality for various social groups. In doing so, it is necessary to articulate clearly through which mechanisms income inequality at the national level is related to health outcomes. Without a clear theorizing about conditional effects of income inequality, many of the possible harmful consequences of living in an unequal society will remain unnoticed.

Disclosure statement

No potential conflict of interest was reported by the authors.

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References


Madrid: ASEP/JDS.