Research Report

Psychological Science
2015, Vol. 26(4) 527–533

DOI: 10.1177/0956797614567511
pss.sagepub.com

Income Inequality and Status Seeking: Searching for Positional Goods in Unequal U.S. States

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Abstract

It is well established that income inequality is associated with lower societal well-being, but the psychosocial causes of this relationship are poorly understood. A social-rank hypothesis predicts that members of unequal societies are likely to devote more of their resources to status-seeking behaviors such as acquiring positional goods. We used Google Correlate to find search terms that correlated with our measure of income inequality, and we controlled for income and other socioeconomic factors. We found that of the 40 search terms used more frequently in states with greater income inequality, more than 70% were classified as referring to status goods (e.g., designer brands, expensive jewelry, and luxury clothing). In contrast, 0% of the 40 search terms used more frequently in states with less income inequality were classified as referring to status goods. Finally, we showed how residual-based analysis offers a new methodology for using Google Correlate to provide insights into societal attitudes and motivations while avoiding confounds and high risks of spurious correlations.

Keywords

income, inequality, status, Google Correlate, Internet search, relative rank, social rank, open data

Received 9/26/14; Revision accepted 12/17/14

Why and how does income inequality influence societal well-being? Negative effects of income inequality in well-developed countries are widely documented (e.g., Wilkinson & Pickett, 2009). For example, higher income inequality is associated with increased homicide rates (Daly & Wilson, 2001), lower life expectancy (Wilkinson, 1992), and higher levels of infant mortality and teenage pregnancy (Wilkinson & Pickett, 2009), and there is evidence for a causal relationship between income inequality and mortality (Zheng, 2012). Income inequality has increasingly been linked to both political polarization (McCarty, Poole, & Rosenthal, 2006) and negative economic consequences (Lansley, 2011; Pontusson, 2005; Stiglitz, 2012) in developed countries. However, the psychosocial mechanisms underlying a causal link between income inequality and societal ill-being remain unclear.

It has been suggested that there is a greater tendency to engage in unfavorable social comparisons in unequal societies and an increased concern with social hierarchy, which leads to status competition (Bowles & Park, 2005; Roberts, 2011; Veblen, 1899; Wilkinson & Pickett, 2009). According to a *social-rank hypothesis* of income inequality, greater concern with apparent status may be a rational response to higher income inequality. Income and wealth provide more reliable signals of social status and hence mate attractiveness in more unequal societies, leading to a rationally greater concern about maximizing apparent income-related social status when income inequality is high. Maximizing social status is likely to mean that reduced time will be available for leisure and the maintenance of health-protective social networks (Brown, Boyce, & Wood, 2014). High income inequality is associated with declining saving rates (Wisman, 2009), increased consumer debt (Christen & Morgan, 2005), greater expenditure on status goods (Bricker, Ramcharan, & Krimmel, 2014), and longer average working hours (Bowles & Park, 2005). A specific prediction of the social-rank hypothesis

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is that in societies with more income inequality, people will pay more attention to positional goods because such goods signal higher social status.

In our study, we tested this prediction directly. We used U.S. states as our units of analysis and the terms used in Internet searches for positional goods as a behavioral signature of status concern. We predicted that the relative proportion of searches for status-related goods would be associated with state-level income inequality after controlling for potentially confounding factors. We used millions of Internet queries aggregated by Google Correlate (GC; http://www.google.com/trends/correlate). GC allows search frequency to be linked to temporal data (time series) or spatial data (U.S. states). The algorithm behind GC calculates a minimum search frequency for each term; any frequency below this value is not provided and is fixed at that value. The output of a GC search is a list of search terms and their correlations with the variable of interest. Although it is still little used in social sciences (but see Neville, 2012), GC's algorithm can reveal important societal trends by analyzing results from millions of Google searches since 2004. The U.S. Census Bureau (2014) reports that 74.8% of U.S. households have Internet access, and in 2013 alone, more than 2.1 trillion queries were submitted to Google Search (StatisticBrain.com, 2015). This makes for a large and wide-ranging data set.

For the current study, we developed a novel methodology to overcome two potential limitations of using GC as a tool for social analysis. The first concerns the possibility of spurious correlations. If any search term can be selected and its correlation with some independent variable can be examined, there is an associated risk of false positives and "correlation hunting." Second, zero-order correlations between a predictor (e.g., income inequality) and search-term frequency could reflect effects of other variables (e.g., income) that are confounded with the variable of interest. The first problem was addressed by using a predictor variable, such as income inequality, as input to GC and taking the resulting search terms as the output. There was therefore no selection by the researcher of items to be correlated. We overcame the second problem by not using the variable of interest itself as the input for GC. Instead, we predicted the target variable (i.e., income inequality) from potential confounds (e.g., income) and used the resulting residuals as the input to GC.

Method

Variables and estimation

Our method first obtained residuals from a regression analysis in which state-level income inequality (as measured by the Gini coefficient) was regressed on household income, state population, percentage of each state's population that was foreign born, and the percentage of each state's population in urban areas, as follows:

$$\text{Gini}_i \sim \beta_0 + \beta_1 \ln(\text{income}_i) + \beta_2 \text{state population}_i + \beta_3 \text{urban population}_i + \beta_4 \text{foreign born}_i$$

Thus, our approach enables analysis of the effect of inequality when other variables are controlled for.

For each U.S. state, we obtained 5-year estimates of income inequality, household income, population, percentage of foreign-born residents, and percentage of the population in urban areas from the U.S. Census Bureau (2010, 2012a, 2012b, 2012c, 2012d). These data were derived from the 2008 to 2012 American Community Surveys and the 2010 U.S. Census. In the regression, we used the log-transformed mean household income (in 2012 inflation-adjusted dollars), which is an aggregate measure across family and nonfamily households including every member older than 15 years. Foreign-born residents were defined as citizen and noncitizen residents who were born outside of the United States. Our dependent variable, the Gini coefficient, ranged from 0 to 1 and represents income inequality (1 = highest inequality). Finally, we used 2013 estimates of the total population for each state based on the 2010 Census (the most recent available). In all analyses, the District of Columbia was excluded.

Regression residuals from our model were saved and submitted to GC on August 25, 2014. Residuals used in the analysis are available at https://osf.io/fitgz. The output of GC was the 100 search terms whose frequency was most highly correlated with these residuals; the Pearson's correlation coefficients for these terms were all greater than .6. We saved the 40 search terms whose frequency of use was most positively correlated with the residuals and the 40 whose frequency of use was most negatively correlated with the residuals. Figure 1 illustrates correlations between six specific search terms and residuals of the income-inequality model.

Term rating

We asked 60 individuals on Amazon Mechanical Turk to perform a simple rating task to determine whether the search terms in our results were related to status goods. The sample size was determined a priori so that there was at least a 95% chance of detecting a large effect size. Each participant was first given the following definition of a status good:

> Some things that people are interested in, or like to buy or find information about, are things that show how rich or successful they are compared to other

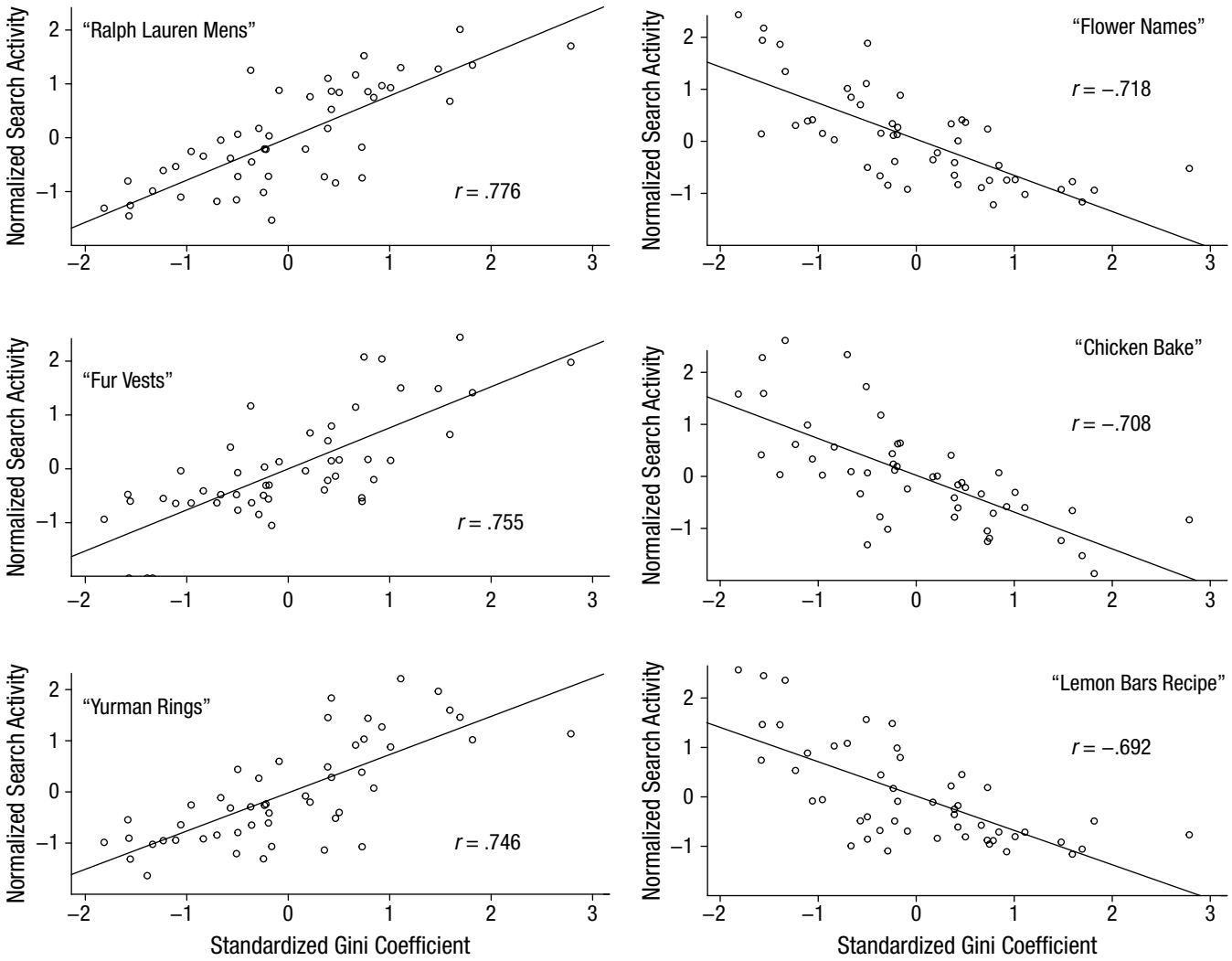

Fig. 1. Examples of the correlations between the normalized residual Gini coefficient and frequency of search terms. The scatter plots (with best-fitting regression lines) show results for three search terms that had positive associations (left panel) and three search terms that had negative associations (right panel) with income inequality. Each data point represents a U.S. state. The algorithm behind Google Correlate calculates a minimum search frequency for each term; any frequency below this value is not provided and is fixed at that value.

people. These are sometimes called "positional goods" or "status goods". Someone who buys such goods may be particularly concerned to demonstrate their social status.

Each participant was asked to indicate whether each term was likely to be related to this class of goods by clicking on-screen buttons labeled "yes" and "no." Each participant was also able to select "not sure" if he or she was not familiar with the search term. Terms were presented on screen individually in a random order. Each participant was paid $1.00.

Results

The results of the regression analysis are presented in Table 1. Figure 2 shows a state-by-state heat map of the residuals from the regression analysis along with heat maps of positive correlations between frequency of two example search terms and residual income inequality from the regression analysis.

Table 1. Results of the Regression Analysis Predicting State-Level Income Inequality

Predictor	β	*t*(45)	*p*
Log(mean income)	–0.33	–1.86	.070
Percentage of foreign-born citizens	0.33	1.21	.233
State population	0.42	2.50	.016
Percentage of the population in urban areas	–0.01	–0.04	.970

Note: Adjusted R^2 for the regression model was .28.

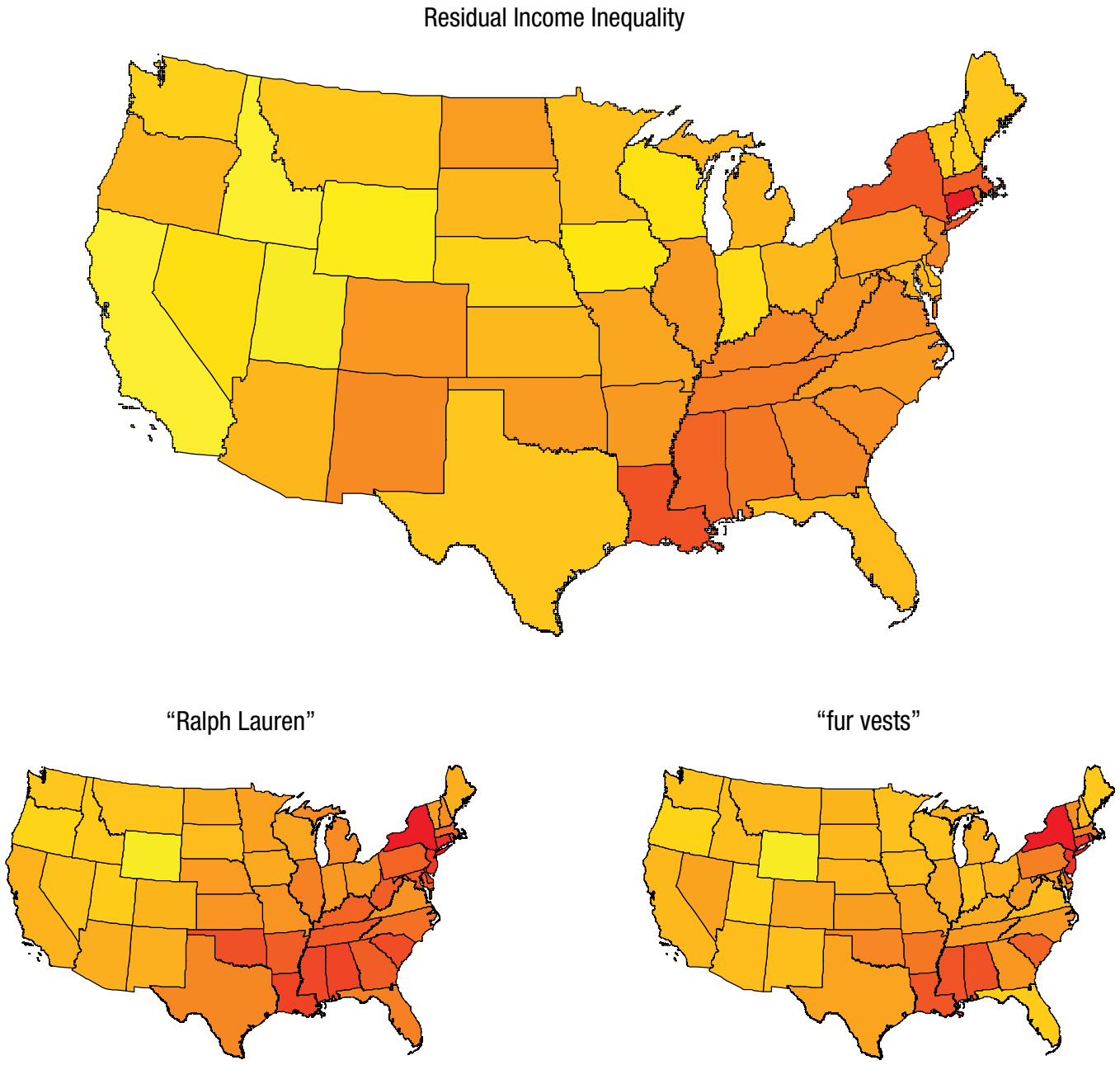

Fig. 2. Heat maps illustrating income inequality in the United States and correlations between frequency of search terms and state income inequality. The top map shows residual income inequality for each U.S. state. Redder states had higher income inequality. The bottom maps show the level of correlation for search terms that were positively associated with residual state income inequality. Redder states had greater positive associations.

The 40 terms whose normalized search activity on Google were most positively correlated with our measure of residual income inequality, and the 40 terms whose relative search frequencies were most negatively correlated, are presented in Table 2. It is clear that the majority of search terms that were positively associated with our measure of income inequality refer to positional goods. The search terms included luxury brands (e.g., "Ralph Lauren," "David Yurman jewelry") and material possessions such as furniture, jewelry, and shoes. Search terms that were negatively correlated with income inequality, in contrast, include terms clearly unrelated to status goods (e.g., "chicken bake," "lemon bars recipe," "chick flick movies").

We calculated the proportion of "yes" responses (i.e., judgments that the item was related to status) out of all

Table 2. Search Terms, Their Correlations With Income Inequality, and Raters' Responses

Terms positively correlated with inequality					Terms negatively correlated with inequality				
		Raters' responses[a]					Raters' responses[a]		
Search term	*r*	"Yes"	"No"	"Not sure"	Search term	*r*	"Yes"	"No"	"Not sure"
Ralph Lauren mens	.78	57	3	0	Mekenna	−.72	6	19	35
Ralph	.77	23	31	6	Flower names	−.72	4	55	1
Ralph Lauren womens	.76	57	3	0	Blizzard entertainment	−.71	4	50	6
Paula Zahn	.76	16	21	23	Stumbler	−.71	2	48	10
Fur vests	.75	53	6	1	Chicken bake	−.71	2	58	0
David Yurman earrings	.75	47	1	12	Mt Pinatubo	−.71	4	37	19
Vineyardvines.com	.75	20	21	19	Pirate talk	−.71	0	59	1
Brown suede	.75	35	24	1	Top view	−.70	6	50	4
Ralph Lauren blue	.75	58	2	0	Chick flick movies	−.70	3	56	1
Fig trees for sale	.75	6	50	4	Heroes of	−.70	1	57	2
Dix Bay	.75	7	23	30	Diablo	−.70	1	52	7
Little Dix Bay	.75	5	27	28	Firefox add	−.70	3	55	2
Yurman rings	.75	42	2	16	Barfing	−.70	0	59	1
Designer rain boots	.74	59	1	0	Super moist	−.70	1	58	1
Maxima spoiler	.74	18	34	8	Tactic	−.70	0	56	4
Jumby Bay Antigua	.74	26	15	19	Ram?	−.69	1	57	2
Ralph Lauren	.74	58	2	0	Spamcop	−.69	1	47	12
David Yurman rings	.74	51	0	9	Lemon bars recipe	−.69	3	55	2
Ralph Lauren baby	.74	57	3	0	Word dictionary	−.69	2	58	0
Navy blazer	.74	42	17	1	Battery care	−.69	3	57	0
Woman attacked	.74	1	57	2	Extractors	−.69	3	55	2
St Thomas Ritz	.73	39	8	13	Radeon 7950	−.69	13	27	20
Fibroadenoma	.73	2	39	19	Pinatubo	−.69	1	23	36
Penny loafer	.73	31	26	3	Postage price	−.69	2	57	1
David Yurman	.73	32	7	21	Komodo	−.69	9	44	7
Yurman	.73	29	9	22	5 gen	−.69	8	37	15
Ralph Lauren boys	.73	55	5	0	Internet IP	−.69	1	57	2
Johnston and Murphy	.73	24	11	25	Transfer windows	−.69	3	53	4
Little Dix	.73	5	33	22	Smart cast	−.68	4	44	12
Yurman earrings	.73	43	3	14	Origami ninja	−.68	3	49	8
Well appointed house	.73	38	14	8	Moist chicken	−.68	2	56	2
Yurman.com	.73	31	6	23	No post	−.68	0	59	1
Bass loafers	.73	36	16	8	Pony beads	−.68	8	40	12
Driving loafers	.73	35	22	3	Name definitions	−.68	2	56	2
Worth collection	.73	33	10	17	Crystal disk	−.68	18	27	15
Champagne punch	.73	35	21	4	Viking sewing	−.68	10	41	9
Seersucker blazer	.73	47	7	6	Sanitizing	−.68	2	58	0
Fatal attraction	.73	1	58	1	Viking sewing machine	−.68	10	38	12
Tibi dresses	.73	33	8	19	Action camera	−.68	16	40	4
David Yurman jewelry on sale	.73	43	2	15	Obituary California	−.68	1	53	6

[a]Raters were asked whether each search term was related to status goods. The "Yes," "No," and "Not sure" columns indicate how many of the 60 raters chose each response option.

"yes" and "no" responses for each of the 80 search terms, excluding the "not sure" answers. The proportion of "yes" responses was significantly higher for positively correlated search terms (M = .66, SD = .31) than for negatively correlated search terms (M = .08, SD = .10), $t(46.32)$ = 11.12, 95% confidence interval = [0.47, 0.68], $p < .001$, d = 3.27. We also computed a Bayes factor using the default Bayesian t test (Rouder, Speckman, Sun, Morey, & Iverson,

2009), $BF_{10} = 5.02 \times 10^{16}$. This test provided decisive evidence for a difference ($r = 1$).

General Discussion

We found that search terms that occur with relatively higher frequency in states with greater residual income inequality are more likely to concern status goods—designer brands, expensive jewelry, and so forth—than nonstatus goods. Our results are consistent with findings that income inequality increases the general consumption of middle-income households, even after controlling for those households' own income (Bertrand & Morse, 2013). Bertrand and Morse suggest that the additional consumption is particularly tilted to more visible goods (see also Bricker et al., 2014).

Our results go beyond existing expenditure-based data by showing that when income inequality is high, additional cognitive resources and time, proxied here by Internet searching, are allocated to status-relevant goods (which may or may not actually be purchased). We interpret the results in terms of the social-rank hypothesis of income inequality (Brown et al., 2014). This notion is consistent with evidence suggesting that status goods serve an evolutionary signaling role (Saad, 2011) and that an individual's subjective well-being is predicted not by their income but by the ranked position of their income within a social comparison group (Boyce, Brown, & Moore, 2010). Further research will be needed to explore the consequences of devoting increased time and resources to status-related activities at the likely expense of alternatives that may be more conducive to the health and well-being of self and society. For example, our mechanism offers potential for understanding how materialism exerts a detrimental impact on well-being (Kasser, 2003).

We also draw a methodological conclusion about GC's potential in social science. We suggest that problems such as high risk of spurious correlations and confounding variables can be overcome if the researcher (a) does not select items to be correlated, and (b) uses residuals rather than potentially confounded variables.

Author Contributions

The initial study idea came from G. D. A. Brown and was developed by both authors. The authors contributed equally to the study design and analysis. L. Walasek prepared the first draft of this manuscript, which was further revised by both authors.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Funding

This work was supported by Economic and Social Research Council Grant ES/K002201/1 and Leverhulme Trust Grant RP2012-V-022.

Open Practices

All data have been made publicly available via the Open Science Framework and can be accessed at https://osf.io/fitgz. The complete Open Practices Disclosure for this article can be found at http://pss.sagepub.com/content/by/supplemental-data. This article has received the badge for Open Data. More information about the Open Practices badges can be found at https://osf.io/tvyxz/wiki/view/ and http://pss.sagepub.com/content/25/1/3.full.

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