

## **Does Belief in Free Will Increase Support for Economic Inequality?**

Brett Mercier<sup>1</sup>, Dylan Wiwad<sup>2</sup>, Paul K. Piff<sup>1</sup>, Lara B. Aknin<sup>2</sup>, Angela R. Robinson<sup>1</sup>, Azim Shariff<sup>3</sup>

1. Department of Psychological Science, University of California, Irvine, 4201 Social & Behavioral Sciences Gateway Irvine, CA 92697-7085

2. Department of Psychology, Simon Fraser University, 8888 University Drive, Burnaby, BC, Canada, V5A1S6

3. Department of Psychology, University of British Columbia, 2136 West Mall Vancouver, BC Canada V6T 1Z4.

Correspondence concerning this article should be addressed to Brett Mercier, Department of Psychological Science, University of California, Irvine, 4201 Social & Behavioral Sciences Gateway Irvine, CA 92697-7085.

Contact: bmercier@uci.edu

**Abstract**

In five studies, we test whether belief in free will influences support for economic inequality. Study 1 demonstrates that support for inequality is higher in countries where belief in free will is common. Study 2 demonstrates that individuals with stronger belief in free will are more likely to support inequality. In Studies 3 and 4, we manipulate belief in free will and do not find evidence for an overall change in support for inequality. However, we do find evidence that the manipulation has an indirect effect on support for inequality through a change in belief in free will. Study 5 finds that people are more willing to support inequality in a hypothetical universe where free will exists compared to one where it does not. Our results provide tentative support for the hypothesis that belief in free will increases support for economic inequality. Additionally, our research illustrates how attempts to manipulate mediating variables are often underpowered to detect an overall effect, indicating a need for researchers interested in these effects to use innovative study designs.

*Keywords:* inequality, free will, political attitudes, statistical mediation

### Does Belief in Free Will Increase Support for Economic Inequality?

In 2017, Jeff Bezos became the first person ever with a net worth of over 100 billion dollars (Isidore, 2018). In the same year that Bezos (an American) became the richest person in history, 21% of American children were living in poverty, the highest rate in any G8 country. Though many people are outraged by this level of inequality, others have responded with a distinct lack of concern support (Wiwad et al., 2018). What separates those who support the current level of economic inequality from those who oppose it? We hypothesize that belief in free will might be one factor contributing to support for inequality, and present several studies to empirically test this prediction.

### **Attitudes Towards Inequality**

Early research on attitudes towards inequality focused on how rational financial self-interest influenced support for policies aimed at addressing inequality. For example, because increasing inequality makes the median voter relatively poorer, Meltzer and Richard (1981) predicted that such increases should be accompanied by greater support for redistributive policies. However, empirical research has found limited support for this model (Kenworthy & McCall, 2008). Models based on rational self-interest struggle to explain the lackluster support for income redistribution among the poor, or why many rich people support redistributive policies which would increase their taxes (Milanovic, 2000). Thus, researchers attempting to explain attitudes towards inequality have increasingly looked beyond simple rational self-interest.

One such additional explanation is cognitive biases. For example, many people underestimate the magnitude of inequality (Davidai, 2018; Norton & Ariely, 2011), overestimate their relative position in the income distribution (Cruces, Pérez Truglia, & Tetaz, 2011), and

overestimate the probability that they will move up the income distribution relative to others (Davidai & Gilovich, 2015; Kraus & Tan, 2015, although see also Chambers, Swan, & Heesacker, 2015). A growing body of research has further examined how moral concerns—like views on many political issues—influence attitudes towards inequality (Franks & Scherr, 2018; Sears & Funk, 1991). Because cooperation within groups was an important part of our evolutionary past, humans evolved strong moral intuitions about fairness to deter free riders from consuming group resources without contributing in return (Delton, Cosmides, & Guemo, 2012). These fairness intuitions are one likely reason why beliefs about the causes of inequality have a large influence on attitudes towards inequality. People who believe that inequality is the result of individual differences in effort or ability are more likely to support inequality, and those who believe inequality results from differences in luck are more likely to oppose it (Kluegel & Smith, 1986). Likewise, in lab experiments, people are less likely to take actions to oppose inequality based on merit rather than chance, and may in fact even bolster it (Rustichini & Vostroknutov, 2014). For example, in one study participants were split into groups with unequal resources and were given a chance to distribute resources to members in either group. When group assignment was based on chance (flipping a coin) participants allocated more resources to the poor group, reducing inequality. However, when group assignment was ostensibly based on merit (performance on a math test) participants allocated more money to the rich group, increasing inequality (Harvey & Bourhis, 2013).

Evidence that perceptions of fairness influence attitudes towards inequality also comes from research on economic mobility, or the frequency with which individuals change their position in an income distribution. People who perceive high levels of economic mobility are less likely to support income redistribution, but only when this mobility is perceived to be fairly

accessible to everyone in society (Alesina & Ferrara, 2001). Similarly, experiments have demonstrated that when people are told their country has high levels of economic mobility, support for inequality increases, an effect partially mediated by the perception that inequality results from individual differences in level of effort (Shariff, Wiwad, & Aknin, 2016). Taken together, this research indicates that attitudes towards inequality are driven in large part by perceptions of the fairness with which inequality was generated. In other words, support for inequality is higher when people perceive that economic outcomes are caused by individuals' choices and behaviors. Belief in free will may contribute to the perception that all members of society make choices that can improve their economic outcomes. Here, we examine how belief in free will might shape views on economic inequality.

### **Free Will**

Philosophers have debated the existence of free will for millennia (Frede, 2011). Sidestepping this debate, social scientists have begun to study lay beliefs about free will, and how these beliefs influence attitudes and behaviors. Most laypeople think of free will as the ability to act in ways that are consistent with one's desires, especially when such actions are free from constraints (Feldman, 2017). For example, when researchers asked people to come up with a definition of free will, people frequently described the ability to make choices, the ability to act according to their desires, and the absence of constraints on behavior (Monroe & Malle, 2010). Similarly, when asked to describe a time when they acted out of free will, people often described situations where they overcame external influences on their behavior (Stillman, Baumeister, & Mele, 2011). Although most people believe in free will, the strength of this belief varies (Monroe & Malle, 2010; Sarkissian et al., 2010). This variation has been shown to influence a number of judgments about the world, particularly those related to perceptions of personal responsibility.

For example, when asked to explain the behavior of others, people with a stronger belief in free will are more likely to endorse dispositional explanations than situational explanations (Genschow, Rigoni, & Brass, 2017). Similarly, belief in free will plays an important role in attributions of responsibility for immoral or criminal actions. Forces that are perceived to limit capacity for choice, such as drug addiction or mental illness, are believed to mitigate immoral actions because they diminish the capacity to act freely (de Mamani et al., 2015; Sadava, Agnus, & Forsyth, 1980; Vonasch, Clark, Lau, Vohs, & Baumeister, 2017). People with a strong belief in free will are more likely to support harsher punishment for criminals (Martin, Rigoni, & Vohs, 2017). Likewise, manipulations that decrease belief in free will, such as reading an argument against free will or taking a neuroscience class, reduce the blame for and desire to punish transgressors (Shariff et al., 2014).

As discussed above, attitudes towards inequality are closely related to beliefs about the extent which individuals are responsible for their economic station. Thus, by engendering the belief that individuals are responsible for their economic station, belief in free will might influence support for economic inequality. Consistent with this hypothesis, past research has found that priming the concept of choice makes people more comfortable with wealth inequality and more likely to downplay the role of societal forces in creating wealth (Savani & Rattan, 2012).

Although past research makes it seem likely that belief in free will increases support for inequality, many of the past studies on belief in free will have low statistical power—which increases the risk that research findings are false positives (Ioannidis, 2005). Additionally, several replication attempts have failed to reproduce past findings about the consequences of belief in free will, including several studies which fail to find evidence that priming free will

influences attitudes about punishment (Monroe, Brady, & Malle, 2016). Thus, there is a need for adequately powered research to help clarify the psychological effects of belief in free will.

## **Present Research**

Across five studies, we test whether belief in free will contributes to support for economic inequality. In Study 1, we test whether, controlling for associated factors, countries with higher belief in free will also display higher support for economic inequality. In Study 2, we test whether, controlling for demographic factors, an individual's free will belief correlates with his or her support for economic inequality. In Studies 3 and 4, we use preregistered experiments to test whether experimentally manipulating belief in free will influences support for economic inequality. Finally, in Study 5, we use a thought experiment to test whether participants believe inequality is less acceptable in a hypothetical universe, which is inconsistent with lay intuitions about free will.

### **Study 1**

In Study 1, we used national survey data to test for a country-level association between belief in free will and support for economic inequality. We predicted that greater belief in free will would be associated with greater support for economic inequality, even after controlling for the levels of actual inequality, economic mobility, and economic development.

### **Method**

#### **Measures**

*Support for Income Inequality.* Support for income inequality was measured using a question from the International Social Survey Programme, Social Inequality module IV collected in 2009 (ISSP research group, 2017). Participants were asked to respond to the statement:

“Income differentials in my country are too large” on a Likert scale ranging from 1 = Strongly Agree to 5 = Strongly Disagree.

*Belief in Free Will.* Belief in free will was measured using the following question from the World Values Survey (World Values Survey Association, 2009):

Some people feel they have completely free choice and control over their lives, while other people feel that what they do has no real effect on what happens to them. Please use this scale where 1 means "no choice at all" and 10 means "a great deal of choice" to indicate how much freedom of choice and control you feel you have over the way your life turns out.

To match timing with the support for inequality measure, responses were taken from wave 5 (conducted between 2005-2009; World Values Association, 2009). If a country was not included in wave 5, responses were taken from the most recent wave where data for that country was available.

*Economic Development.* Economic development was measured using Gross Domestic Product per capita, with data obtained from the World Bank (World Bank, 2018). We used the 2009 estimates to match the support for inequality measure.

*Economic Inequality.* We measured level of income inequality using the Gini index, a widely used measure of inequality (Gastwirth, 1972). Gini data were obtained from the World Bank, using the 2009 estimates to match the support for inequality measure (World Bank, 2018). If 2009 data were not available for a country, we used data from the most recent year available prior to 2009.<sup>1</sup>

*Intergenerational Mobility.* We used a measure of intergenerational elasticity calculated by Corak (2016). This measure is computed by estimating the average variance in a country between the income of fathers and the income of their sons. Larger numbers indicate more variation and thus greater economic mobility between generations.



## Results

All analyses were preformed using the statistical language R (R Core Team, 2017).

Support for inequality and belief in free will were aggregated by country to produce a single average score for each country. When creating the average for a country, missing data were handled using mean imputation. We included all countries for which we had complete data on all of our measures, leaving us with a sample of 18 countries. We fit this data using a linear regression with support for income inequality as the dependent variable and belief in free will as the independent variable. As predicted, belief in free will was associated with higher support for income inequality,  $B = 0.35$ ,  $p = .003$ . See Figure 1. This effect remained statistically significant when economic development, economic inequality, and intergenerational mobility were included as dependent variables in the regression,  $B = 0.27$ ,  $p = .020$  (See Table 1).

Table 1

*Results of Multiple Regression on Country Level Support for Inequality*

| Variable                       | <i>F</i> | Adj. <i>R</i> <sup>2</sup> | $\beta$ | <i>t</i> | <i>p</i> |
|--------------------------------|----------|----------------------------|---------|----------|----------|
| Support for inequality (model) | 8.59     | .64                        |         |          |          |
| Belief in free will            |          |                            | 0.27    | 2.67     | .020     |
| Intergenerational mobility     |          |                            | -1.21   | -1.89    | .081     |
| Gini coefficient               |          |                            | 0.01    | 0.85     | .410     |
| GDP per capita                 |          |                            | 0.00    | 1.45     | .170     |

*Note.*  $\beta$  indicates unstandardized Beta coefficient.

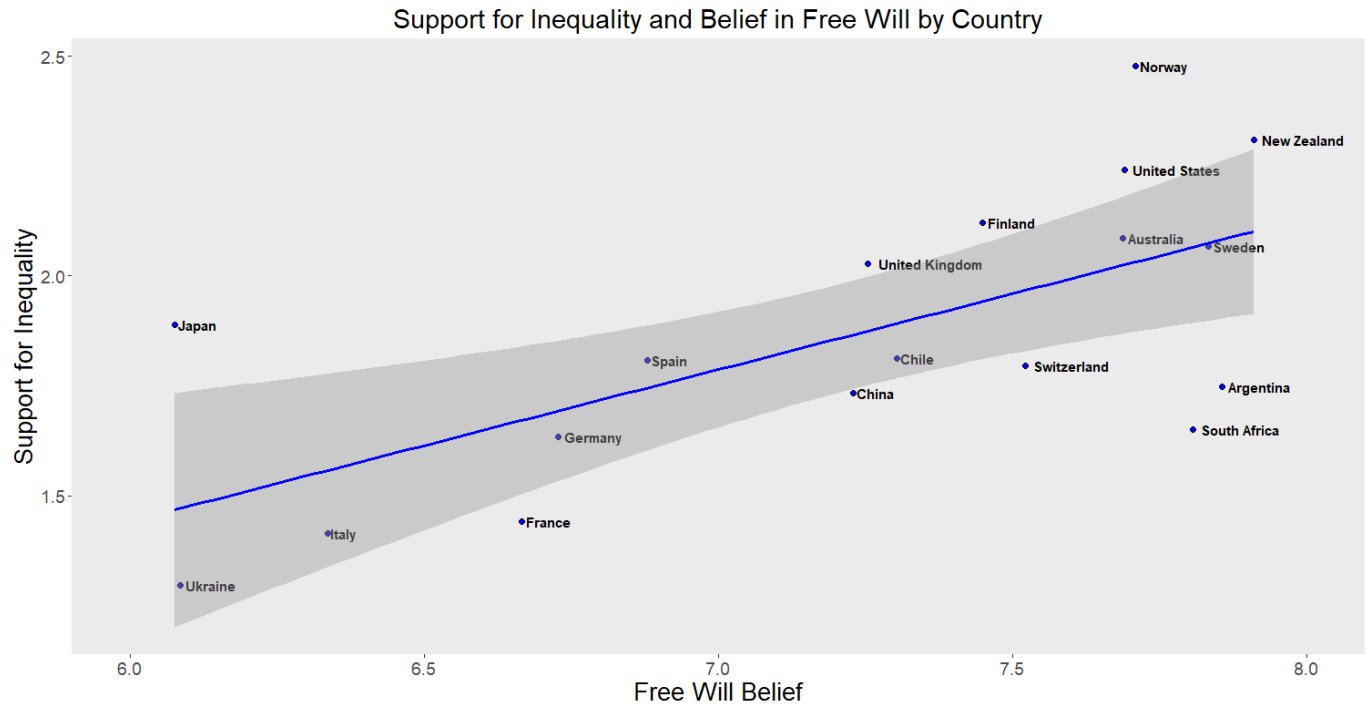


Figure 1. Support for Inequality and Belief in Free Will by Country.

## Discussion

As predicted, countries reporting higher belief in free will also express higher support for inequality, even when statistically controlling for related factors. However, one limitation of these data is that a country level association between variables does not necessarily indicate that these variables are associated among individuals (Selvin, 1958). To test whether individuals with high belief in free will are also more likely to support inequality, we conducted Study 2.

## Study 2

Expanding on the country-level analysis of Study 1, the purpose of Study 2 was to test whether belief in free will and support for inequality are associated at an individual level. We predicted that, controlling for demographic characteristics (age, gender, income, and political ideology), belief in free will would be associated with greater support for economic inequality.

## Method

## Participants and Procedure

Study 2 involved 619 participants recruited through Amazon's Mechanical Turk as part of an unrelated study. Participants completed a measure of support for inequality first, then completed the measure of free will embedded within a larger survey about political attitudes. Finally, participants completed a demographics form.

## Measures

*Support for Inequality.* Participants completed the Support for Economic Inequality scale (Wiwad, Mercier, Maraun, Robinson, Piff, Aknin, & Shariff, Under Review), a five-item measure (e.g. "Economic inequality is not a problem") with Likert response options ranging from 1 = "Strongly Disagree" to 7 = "Strongly Agree" ( $M = 2.72$ ,  $SD = 1.46$ ,  $\alpha = .92$ ).

*Free Will.* Participants completed the Free Will subscale of the Free Will Inventory (Nadelhoffer, Shepard, Nahmias, Sripada, & Ross, 2014), a five-item measure (e.g. "People always have free will") with Likert response options ranging from 1 = "Strongly Agree" to 7 = "Strongly Disagree" ( $M = 4.88$ ,  $SD = 1.21$ ,  $\alpha = .87$ ).

*Political Ideology.* Participants indicated their political views on a scale from 1 = "Very Liberal" to 7 = "Very Conservative" ( $M = 3.41$ ,  $SD = 1.80$ ). The scale also included the response options "don't know/not political" and "other"; the 10 participants who selected these options were excluded from analyses.

*Income.* Participants selected their household income from 15 income brackets. The brackets started at 1 = "under \$20,000" and increased in \$10,000 increments until reaching 15 = "150,000 +" ( $M = 5.30$ ,  $SD = 3.56$ ).

*Gender.* Participants were asked to indicate their gender from the following response options: "Male" (46.9%) "Female" (52.8%), "Other" (<.01%) "Prefer not to say" (<.01%). The

two participants who selected “Other” or “Prefer not to say” were excluded from analyses that used gender as a covariate.

*Age.* Participants were asked to report their age in years ( $M = 36.01$ ,  $SD = 11.33$ ).

### Results

We fit an initial linear regression with support for inequality as the dependent variable and belief in free will as the independent variable. As predicted, stronger belief in free will was significantly related to increased support for economic inequality,  $B = 0.32$ ,  $p < .001$ . This effect remained statistically significant when income, gender, age, and political ideology were included as independent variables in the regression,  $B = 0.13$ ,  $p = .001$ . See Table 2.

Table 2

*Results of Multiple Regression on Support for Inequality*

| Variable                       | <i>F</i> | Adj. $R^2$ | $\beta$ | <i>t</i> | <i>p</i> |
|--------------------------------|----------|------------|---------|----------|----------|
| Support for inequality (model) | 70.75    | .37        |         |          |          |
| Belief in free will            |          |            | 0.13    | 3.21     | .001     |
| Income                         |          |            | 0.04    | 2.71     | .007     |
| Gender                         |          |            | -0.13   | -1.30    | .194     |
| Age                            |          |            | -0.01   | -2.26    | .024     |
| Political ideology             |          |            | 0.46    | 16.35    | <.001    |

*Note.*  $\beta$  indicates unstandardized Beta coefficient.

### Discussion

Study 2 demonstrates that individuals with stronger belief in free will are also more likely to support economic inequality, even when controlling for demographic characteristics. Of course, such correlational data do not necessarily indicate that belief in free will *causes* support for inequality. To test this causal pathway, we moved to experimental methods with Study 3.

### Study 3

The purpose of Study 3 was to test whether manipulating belief in free will would change support for economic inequality. To test this, participants in Study 3 watched a video arguing either for or against the existence of free will, and then completed a measure of support for economic inequality. We predicted that participants who watched the video arguing for the existence of free will (*Pro Free Will* condition) would be more likely to support inequality than those who watched the video arguing against the existence of free will (*Anti Free Will* condition). Because belief in free will is associated with a greater desire to hold individuals accountable for their actions (Martin et al., 2017), we predicted that participants in the *Pro Free Will* condition would also be more likely to endorse meritocracy than those in the *Anti Free Will* condition. Additionally, because belief in free will leads to a focus on dispositional rather than situational influences on behavior (Genschow, Rigoni, & Brass, 2017), we predicted that the expected differences in support for inequality and meritocracy would be mediated by an increased endorsement of dispositional over contextual explanations for inequality. Finally, we tested whether participants in the *Pro Free Will* condition would be more likely to support redistribution than those in the *Anti Free Will* condition. However, because past research has found that preferences for redistribution are resistant to change (Kuziemko, Norton, Saez, & Stantcheva, 2015), we were agnostic about whether changing free will would influence support for redistribution.

The sample size for Study 3 was determined using an *a priori* power analysis conducted in R (R Core Team, 2017) using the “pwr” package (Champely, 2017). We aimed for 90% power to detect an effect of size  $d = .20$  or larger at the significance level  $\alpha = .05$ . To reflect the directional nature of our hypothesis, we conducted the power analysis assuming the use of one tailed t-tests. The power analysis indicated that 858 participants would be required. However, we

estimated that roughly 15% of participants would fail our attention check, so we increased our target sample size by 15% to 1,010 participants. Target sample size, hypotheses, and planned analyses were preregistered at [aspredicted.com](https://aspredicted.com) prior to data collection.

## Methods

### Participants and Procedure

We recruited 1,010 participants for Study 3 through Amazon's Mechanical Turk (500 male, 501 female, 7 other/prefer not to say; mean age = 36.82,  $SD = 11.98$ )<sup>2</sup>. Participants watched the video manipulation, then completed (in random order) the Support for Inequality Scale from Study 2, a measure of support for meritocracy (Horberg, 2010), and a measure of contextual and dispositional explanations for inequality (Kraus, Piff, & Keltner, 2009). After this, participants completed the measure of support for redistribution, the free will scale from Study 2, the attention check, and the demographic form.

### Materials

*Manipulation.* Participants were randomly assigned to watch one of two videos, both of which were developed for the purposes of this study. The *Anti Free Will* video ( $n = 524$ ) argued against the existence of free will and described a psychology experiment which found that unconscious brain activity can predict the onset of hand movements prior to conscious awareness of intention to perform these movements (see Libet, 1985). The *Pro Free Will* video ( $n = 486$ ) argued that free will exists and described an ostensibly real psychology experiment which found that conscious intention to make a hand movement always occurs before any unconscious brain activity related to the movement. Both videos were around three minutes in length and were matched as closely as possible in style and content.

*Attention Check.* Participants were asked to recall the main argument made in the video from a list of several possible options: “people do have free will”, “people do not have free will”, “global warming is occurring”, “global warming is not occurring”, “the earth is the center of the universe”, and “the earth is not the center of the universe”. While most participants passed the manipulation check, participants in the *Anti Free Will* condition (20%) were significantly more likely to fail than those in the *Pro Free Will* condition (14%),  $\chi^2(1, N = 1,010) = 4.87, p = .027$ . To address differential attrition rates across conditions, we conducted all statistical tests twice, once using all participants ( $n = ?$ ) and once using only those who passed the attention check ( $n = ?$ ). There were no instances where the statistical significance of a test changed depending on whether inattentive participants were excluded. Because effect sizes were generally smaller when inattentive participants were included, we report these analyses to present a conservative picture of our results.

*Support for Meritocracy.* Participants completed the Support for Meritocracy scale (Horberg, 2010), a five-item measure (e.g. “It is okay for some people to have better lives if they earned it”) with Likert response options ranging from 1 = “Strongly Disagree” to 7 = “Strongly Agree” ( $\alpha = .76, M = 4.55, SD = 1.16$ )

*Support for Redistribution.* Participants completed a three-item measure of support for redistribution (e.g. “The government should take measures to reduce differences in income levels”) adopted from World Values Survey (World Values Survey Association, 2012). Participants indicated their agreement with each item on a Likert scale ranging from 1 = “Strongly Disagree” to 7 = “Strongly Agree” ( $\alpha = .83, M = 4.97, SD = 1.53$ ).

*Explanations for Economic Inequality.* Participants completed a measure of explanations for inequality adopted from Kraus, Piff, and Keltner (2009). In this measure, participants were

given a list of 12 explanations for inequality, seven of which were contextual (e.g. “Differences in inheritance”) and five of which were dispositional (e.g. “Differences in how hard people work”). Participants were asked to indicate how important they think each of the factors is in contributing to the current level of economic inequality on a five-point Likert scale ranging from 1 = “not important” and 5 = “very important”. Following Kraus et al. (2009), we reverse coded the dispositional items and combined them with the contextual items to create a composite measure of endorsement of contextual explanations ( $\alpha = .82$ ,  $M = 2.81$ ,  $SD = 0.65$ ).

*Political Beliefs.* Participants were asked to indicate their political ideology from the following choices: 1 = “Very liberal”, 2 = “Liberal”, 3 = “Slightly liberal”, 4 = “Moderate/middle of the road”, 5 = “Slightly conservative”, 6 = “Conservative”, 7 = “Very conservative”, 8 = “Don't know/not political”, 9 = “Other”. We classified those selecting 1, 2, or 3 as liberals, and those selecting 5, 6, or 7 as conservatives.

## Results

As specified in the preregistration, we used one-tailed t-tests to test for mean differences between conditions. Following the recommendations of Ruxton (2006), Welch’s t-test was used to compare differences in means. Cohen’s  $d$  was calculated using a pooled standard deviation with sphericity correction for unequal variances. Mediation analyses were conducted in the statistical software R (R Core Team, 2017) using the “mediation” package (Tingley, Yamamoto, Hirose, Keele, & Imai, 2014). Using this package, we conducted Baron and Kenny (1986) mediation models with 1,000 Monte Carlo simulations to test for indirect effects.

## Manipulation Check



Belief in free will was higher in the *Pro Free Will* condition ( $M = 4.94$ ,  $SD = 1.24$ ) than in the *Anti Free Will* condition ( $M = 4.72$ ,  $SD = 1.34$ ), indicating that our manipulation was effective,  $t(1008) = 2.77$ ,  $p = .003$ ,  $d = 0.17$ , 95% CI [0.05, 0.30].

### Planned Analyses

Our main hypothesis was that the manipulation of belief in free will would influence support for inequality. We did not find evidence that support for inequality was higher in the *Pro Free Will* condition ( $M = 2.93$ ,  $SD = 1.47$ ) than in the *Anti Free Will* condition ( $M = 2.90$ ,  $SD = 1.46$ ),  $t(1001) = 0.39$ ,  $p = 0.347$ ,  $d = 0.02$ , 95% CI [-0.10, 0.14]. Furthermore, we did not find evidence that condition had an indirect effect on support for inequality through endorsement of dispositional explanations for inequality,  $B = 0.01$ ,  $p = .724$ .

We also predicted that support for meritocracy would be higher in the *Pro Free Will* condition. We did not find evidence for this hypothesis, as support for meritocracy was not greater in the *Pro Free Will* condition ( $M = 4.54$ ,  $SD = 1.13$ ) compared to the *Anti Free Will* condition ( $M = 4.56$ ,  $SD = 1.19$ ),  $t(1007.3) = -0.18$ ,  $p = .571$ ,  $d = -0.01$ , 95% CI [-0.13, 0.11]. Likewise, condition did not have an indirect effect on support for meritocracy through endorsement of dispositional explanations for inequality,  $B = 0.01$ ,  $p = .748$ .

Finally, we did not find evidence that support for redistribution was lower in the *Pro Free Will* condition ( $M = 4.99$ ,  $SD = 1.54$ ) than in the *Anti Free Will* condition ( $M = 4.96$ ,  $SD = 1.52$ ),  $t(999.59) = 0.38$ ,  $p = .650$ ,  $d = 0.02$ , 95% CI [-0.10, 0.15].

### Exploratory Analyses

After conducting our preregistered analyses, we conducted several exploratory analyses. Consistent with Study 2, a linear regression found that when controlling for age, sex, and

political affiliation, belief in free will was associated with support for inequality,  $B = .12, p < .001$ .

Additionally, we found that condition had a significant indirect effect on support for inequality through change in belief in free will,  $B = -0.04, p = .002$  (see Figure 2). However, an important assumption of mediation analyses is the absence of unmeasured confounding variables which influence both the mediated variable (belief in free will) and the outcome variable (support for inequality; Green, Ha, & Bullock, 2010). To reduce the influence of confounding variables, we re-estimated the indirect effect after controlling for several variables which might have a causal influence on both free will and support for inequality: political affiliation, socioeconomic status, gender, and age. After controlling for these factors, we still found evidence that condition had an indirect effect on support for inequality through free will,  $B = -0.02, p = .008$ .

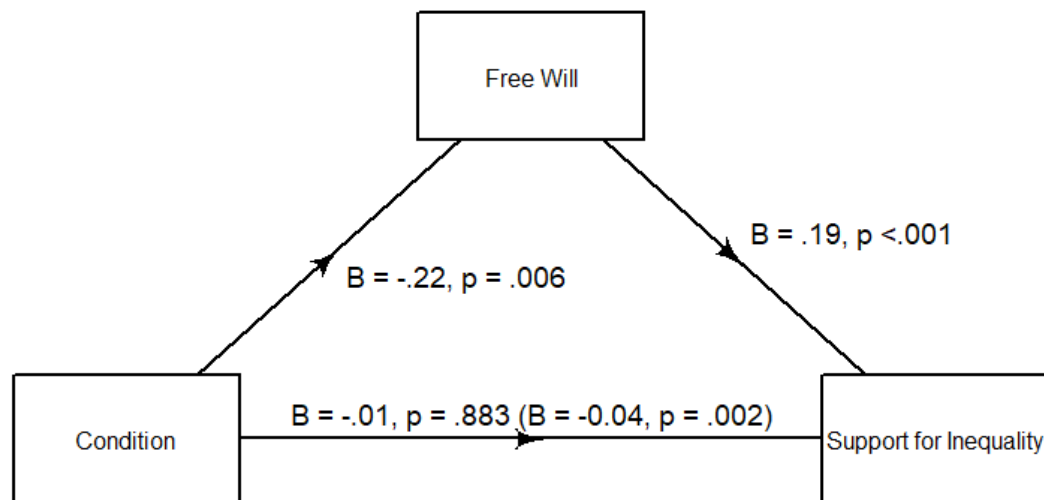


Figure 2. Mediation model depicting the indirect effect of the manipulation on support for inequality, though belief in free will

Finally, we tested the effect of the manipulation on support for inequality separately in liberals and conservatives. Among conservatives ( $n = 264$ ), support for inequality was higher in the *Pro Free Will* condition ( $M = 4.09$ ,  $SD = 0.97$ ) than in the *Anti Free Will* condition ( $M = 3.82$ ,  $SD = 1.01$ ),  $t(252.26) = 2.25$ ,  $p = .013$ ,  $d = 0.28$ , 95% CI [0.03, 0.52]. In contrast, among liberals ( $n = 503$ ) we did not find evidence that support for inequality was higher in the *Pro Free Will* condition ( $M = 2.85$ ,  $SD = 0.69$ ) than in the *Anti Free Will* condition ( $M = 2.91$ ,  $SD = 0.75$ ),  $t(500.98) = -1.02$ ,  $p = .846$ ,  $d = .09$ , 95% CI [-0.08, 0.27].

### Discussion

Our main prediction was that manipulating belief in free will would influence participants' support for economic inequality. Although our manipulation produced a small change in belief in free will ( $d = .17$ ), we did not find evidence that support for inequality was different across conditions. Thus, our primary hypothesis was not confirmed. Similarly, we did not find evidence that endorsement of meritocracy or support for redistribution differed across conditions. However, exploratory analyses revealed evidence that our manipulation had an indirect effect of support for inequality through free will. Additionally, we found evidence that the free will manipulation influenced support for economic inequality among participants who identify as politically conservative. Although we did not expect our findings to be moderated by political beliefs, research in political psychology frequently finds individual differences between liberals and conservatives. For example, research on moral foundations theory has found that liberals and conservatives use different intuitions when making moral judgments (Graham, Haidt, & Nosek, 2009). However, because accepting unexpected results increases the rate of false positives (Simmons, Nelson, & Simonsohn, 2011), we conducted a pre-registered direct replication of Study 3 to test the reliability of this finding.

### Study 4

Study 4 was a direct replication of Study 3, albeit with a few modifications. Study 3 found that participants in the *Anti Free Will Condition* were more likely to fail the attention check than participants in the *Pro Free Will* condition. To test whether this finding was due to our manipulation influencing participants' level of attention, we added a second attention check question which was unrelated to the content of our manipulation. We specified in our preregistration that the attention checks would be used if a chi-squared test of differences revealed that the rate of failure was different across conditions. Additionally, because we were interested in testing whether political affiliation influenced the effect of our manipulation, we selectively recruited equal numbers of liberals and conservatives. Finally, we added several exploratory measures that are not reported here but are included in the supplemental materials (our preregistration explicitly stated which measures were exploratory).

As outlined in the pre-registration, we predicted that the free will manipulation would result in a significant change in support for inequality among conservatives, but not among liberals. Additionally, we planned to test whether the manipulation influenced support for redistribution, and to test whether the manipulation had a significant indirect effect on support for inequality through free will. We planned to conduct both of these analyses separately for liberal and conservative participants. Hypotheses, sample size, and analysis plan were preregistered at [aspredicted.com](https://aspredicted.com) prior to data collection.

### Methods

#### Participants and Procedure

Participants in Study 4 were recruited through Amazon's Mechanical Turk. In order to recruit equal numbers of liberals and conservatives, and to match the total sample from Study 3,

we aimed to recruit 505 liberals and 505 conservatives. Participants began the survey by completing a screening question that asked them to indicate their political ideology from the following choices: 1 = “Very liberal”, 2 = “Liberal”, 3 = “Slightly liberal”, 4 = “Moderate/middle of the road”, 5 = “Slightly conservative”, 6 = “Conservative”, 7 = “Very conservative”, 8 = “Don't know/not political”, 9 = “Other”. After completing the screening question, liberal participants (those selecting 1, 2, or 3) and conservative participants (those selecting 5, 6, or 7) advanced to the main survey. If participants selected 4, 8, or 9, or if the 505-participant target for their political affiliation had been reached, they were excluded from participating in the main study and thanked for their willingness to participate. Our final sample consisted of 1047 participants (527 Conservative, 520 Liberal, 549 male, 495 female, 3 other; mean age = 36.61,  $SD = 12.41$ )<sup>3</sup>.

The procedure in the main study was nearly identical to Study 3, with several small exceptions. First, the demographic measures were presented at the start of the study, immediately following the screening question. Second, we added a general attention check question (“Because you're paying attention to this survey, please select 'Agree' for this question”) into the measure of belief in free will. Finally, several measures were added at the end of the survey, which were preregistered to be exploratory (for brevity these measures are only reported in the supplemental materials).

## Results

### Attention check

A chi-squared test of differences did not find evidence to conclude that the proportion of participants incorrectly recalling the manipulation differed across conditions (*Anti-Free Will*: 29%, *Pro-Free Will*: 31%),  $\chi^2(1, N = 1047) = 0.21, p = .651$ . Similarly, we did not find evidence

that the proportion of participants failing the general attention check differed across conditions (*Anti-Free Will*: 9%, *Pro-Free Will*: 7%),  $\chi^2(1, N = 1047) = 0.51, p = .475$ . Thus, analyses were only preformed on participants who successfully completed both attention checks ( $n = 718$ ).

### Manipulation check

Belief in free will was higher in the *Pro Free Will* condition ( $M = 5.09, SD = 1.21$ ) than in the *Anti Free Will* condition ( $M = 4.75, SD = 1.23$ ), indicating that our manipulation was effective,  $t(714.46) = 3.69, p < .001, d = 0.28, 95\% CI [0.13, 0.42]$ .

### Analysis

Overall, we found no evidence that the free will manipulation produced a change in support for inequality. We did not find evidence that support for inequality was higher in the *Pro Free Will* condition ( $M = 2.99, SD = 1.56$ ) than in the *Anti Free Will* condition ( $M = 2.97, SD = 1.54$ ),  $t(712.18) = 0.11, p = .454, d = 0.01, 95\% CI [-0.20, 0.20]$ . However, as in Study 3, a mediation model controlling for political affiliation, socioeconomic-status, gender<sup>3</sup>, and age revealed a significant indirect effect of condition on support for inequality through free will,  $B = -0.04, p < .001$ .

Our main hypothesis was that the manipulation of free will would only affect support for inequality among conservatives. Contrary to this hypothesis, we did not find evidence that conservatives were more supportive of inequality in the *Pro Free Will* condition ( $M = 3.85, SD = 1.55$ ) compared to the *Anti Free Will* condition ( $M = 3.91, SD = 1.38$ ),  $t(333.95) = -0.35, p = .637, d = .04, 95\% CI [-0.17, 0.25]$ . Similarly, we do not find evidence that liberals were more supportive of inequality in the *Pro Free Will* condition ( $M = 2.18, SD = 1.05$ ) compared to the *Anti Free Will* condition ( $M = 2.11, SD = 1.12$ ),  $t(369.99) = 0.63, p = .263, d = .07, 95\% CI [-0.11, 0.24]$ . However, we did find evidence for an indirect effect of condition on support for

inequality through free will (controlling for socio-economic status, gender, and age) for both conservatives ( $B = -0.06, p = .026$ ) and liberals ( $B = -0.03, p = .036$ ).

Turning to redistribution, we did not find evidence that support for redistribution was lower in the *Pro Free Will* condition ( $M = 4.89, SD = 1.66$ ) relative to the *Anti Free Will* condition ( $M = 4.84, SD = 1.65$ ),  $t(712.92) = 0.35, p = .683, d = .03$ , 95% CI [-0.12, 0.17]. Similar tests also found null results among conservatives (*Pro Free Will*:  $M = 3.84, SD = 1.62$ ; *Anti Free Will*:  $M = 3.89, SD = 1.54$ ;  $t(340.09) = -0.28, p = .388, d = .03$ , 95% CI [-0.21, 0.27]) and liberals (*Pro Free Will*:  $M = 5.86, SD = 0.96$ ; *Anti Free Will*:  $M = 5.73, SD = 1.20$ ;  $t(360.59) = 1.21, p = .886, d = .12$ , 95% CI [-0.05, 0.30]).

We did however, find evidence for an indirect effect of the manipulation on support for redistribution through belief in free will, controlling for political affiliation, socioeconomic-status, gender, and age,  $B = .04, p = .004$ . Likewise, controlling for socioeconomic-status, gender, and age, we find evidence for similar indirect effects among conservatives ( $B = .05, p = .04$ ) and liberals ( $B = .04, p = .036$ ).

### **Discussion and Bayesian analysis of null effects**

Study 4 failed to replicate the finding that manipulating free will affects support for economic inequality among conservatives, indicating that the effect in Study 3 was likely a false positive. Study 4 did, however, replicate the indirect effect of the manipulation on support for inequality through free will.

Although Studies 3 and 4 did not find evidence that the free will manipulation influences support for inequality, this does not provide evidence for the absence of an effect. To test this, we calculated a Bayes Factor comparing the likelihood of the data under a null model (a point estimate of  $d = 0$ ) compared to an alternative model with a normal distribution centered around  $d$

= .43 with a standard deviation of 0.30 (the average reported effect size in social psychology and the standard deviation of these effects; Richard, Bond, & Stokes-Zoota, 2003). For the data from Study 3, this analysis produced a  $BF_{01} = 14.51$ , meaning that the data in Study 3 are 14.51 times more likely to be observed under the null model than a model with the average reported effect size in social psychology. Similarly, in Study 4 this analysis produced a  $BF_{01} = 13.61$ .

However, while we present the analysis above as a reference, we argue that the most appropriate comparison for our effect is not the average effect size in psychology. Kenny and Judd (2014) show that when an independent variable  $X$  is expected to affect a dependent variable  $Y$  exclusively through the influence of a mediating variable  $M$ , a large sample size is often required to detect an overall change in  $Y$ . This is because the overall change in  $Y$  is the product of two effects, making it smaller than either of the individual effects. Put another way, in this design the change in  $Y$  is equal to the change in  $M$  produced by  $X$  multiplied by the relationship between  $M$  and  $Y$ . Unless both  $X$  and  $M$  produce large effects, the overall effect on  $Y$  will be much smaller than the direct effect and will require a much larger sample to detect

To illustrate this concretely, consider the effects we observed in Study 3. Our manipulation had a small effect on belief in free will ( $d = 0.17$ ), which resulted the conditions differing by 0.22 points on the five-point scale measuring belief free will. In the regression model from Study 3 which estimates the relationship between belief in free will and support for inequality, we find an unstandardized coefficient of  $B = 0.12$ . Thus, if belief in free will does cause increased support for inequality, and if the regression accurately estimates the magnitude of this effect<sup>5</sup>, we should expect the observed 0.22 point increase in belief in free will to result in a 0.03 point increase on the scale measuring support for inequality ( $0.12 * 0.22 = 0.03$ ). This difference translates to an effect of size  $d = 0.02$ , which Study 3 had only a 9% achieved power



to detect. A similar calculation reveals that we should have expected the manipulation in Study 4 to produce an effect of size  $d = 0.03$  on support for inequality, which Study 4 had a 10% achieved power to detect.

If we compute a Bayes factor comparing the likelihood of our data under a null model to the likelihood under a model with the expected effects from above, we find  $BF_{01} = 3.63$  for Study 3 and  $BF_{01} = 3.98$  for Study 4. Under the conventional guidelines for interpreting Bayes factors recommended by Lee and Wagenmakers (2014), this is only “moderate” evidence in favor of the null model. Thus, we argue that the failure to find a direct effect in Studies 3 and 4 does not provide strong evidence that belief free will does not cause support for inequality.

### **Study 5**

Because we were unable to achieve adequate statistical power using the experimental design from Studies 3 and 4, in Study 5 we attempted to test our hypothesis without manipulating belief in free will. To do this, we used a thought experiment adopted from Nichols and Knobe (2007). Specifically, we asked participants to imagine two different universes: a deterministic universe where behaviors are the inevitable consequence of the events that precede them, and an indeterministic universe where behavior is not an inevitable consequence of past events. We argue that the lay conception of free will cannot exist in the deterministic universe, as this view sees free will as making choices which are not determined by the external environment (and in the deterministic universe, all choices are determined by the past environment). Thus, we predicted that participants would report greater support for inequality in the indeterministic universe compared to the deterministic one.

### **Method**

#### **Participants**

Study 5 was completed through MTurk at the end of an unrelated survey. We excluded eight participants for failing to correctly answer an attention check question (“Because you're paying attention to this survey, please select 'Tends to be true' for this question”) leaving 442 participants (240 female, 198 male, 4 other; mean age = 39.54 years,  $SD = 11.40$ ).

## Materials and Procedure

*Hypothetical Universes.* Using a procedure adopted from Nichols and Knobe (2007), we asked participants to imagine two different universes: Universe A, a deterministic universe where human decisions are the predetermined result of everything that occurred before them, and Universe B, a universe where human actions are not predetermined by prior events. Following this, we asked participants to indicate whether Universe A or B was most similar to our own.

*Support for Inequality.* For our Universe, Universe A, and Universe B, we asked participants how acceptable they think it is that “some people have a great deal of money, status, and resources, while others have very little”. Participants responded on 10-point scales ranging from 1 = “not at all acceptable” to 10 = “completely acceptable”.

## Results

Most participants (83%) believed that our universe is more similar to the indeterministic universe than the deterministic universe. Confirming our pre-registered predictions, a paired t-test revealed that participants reported greater support for inequality in the indeterministic universe ( $M = 5.77$ ,  $SD = 2.65$ ) than in the deterministic universe ( $M = 5.43$ ,  $SD = 2.65$ ),  $t(435) = 2.70$ ,  $p = .007$ ,  $d_{av} = 0.13$ , 95% CI [.04, .22]<sup>6</sup>. Participants also indicated greater support for inequality in our universe ( $M = 5.79$ ,  $SD = 2.65$ ) compared to the deterministic universe (MEAN AND SD),  $t(436) = 3.00$ ,  $p = .003$ ,  $d_{av} = 0.13$ , 95% CI [.04, 0.23].

## General Discussion

Overall, our findings provide tentative support for the hypothesis that belief in free will causes greater support for economic inequality. In Study 1, we find that in countries where belief in free will is strong, support for inequality is also strong, even when controlling for a number of possible confounding factors. In Study 2 we demonstrate this relationship on an individual level; people who believe in free will are more likely to support economic inequality, even when controlling for political beliefs and demographic differences. In Studies 3 and 4, we manipulate belief in free will, and do not find evidence that this manipulation results in significant differences in support for inequality. Yet, because the design of Studies 3 and 4 had low power to detect an overall change in support for inequality, this null result is unlikely to be meaningful. Consistent with this interpretation, a Bayesian analysis revealed that the observed data provide only moderate evidence for a null effect. Additionally, Studies 3 and 4 both provide evidence that the manipulation produced an indirect effect on support for inequality through change in belief in free will. However, when unmeasured variables influence both the mediating and dependent variables in a mediation model, the observed indirect effect is an overestimation of the true effect (Green et al., 2010). Although we try to correct for this by including several possible covariates in our mediation model, it is possible that some unknown confounding variables are missing from our analysis. As a result, the indirect effects observed in Studies 3 and 4 may be smaller than we estimate, or may even be null effects.

Thus, we argue that the best evidence that belief in free will causes support for inequality is found in Study 5. Here, we find that participants were more willing to support inequality in an imaginary universe that is deterministic (and thus inconsistent with lay intuitions about free will), compared to both our actual universe and an imaginary universe that is indeterministic.

### **Research and Methodological Implications**

Social psychologists frequently recommend experimentally manipulating potential mediators (Smith, 2012; Spencer, Zanna, & Fong, 2005). However, mediation models have much less power to detect an overall effect than an indirect effect (Kenny & Judd, 2014). In an experimental design where the manipulation affects the mediator, the resulting change in the mediator then affects the dependent variable. Unless both effects in this pathway are large, this leads to an overall effect that is significantly smaller than the indirect effect. In this paper, Studies 3 and 4 illustrate why this makes attempts to manipulate a mediator problematic. Although our manipulations produce only small changes in belief in free will, these effects are similar in magnitude to other studies which manipulate belief free will. As we describe, this means that manipulations of belief in free will are likely to produce only very small changes in other variables. Thus, unless they have access to extremely large sample sizes (or are predicting extremely large effects), researchers interested in the causal effect of belief in free will should find ways to do so that do not involve manipulating belief in free will. In Study 5, we provide one example of a method of doing so.

The typically low power to detect an overall effect when manipulating a mediator also means that, when a manipulation of a mediator does not produce an overall effect, this should not be taken as the absence of an effect. Although researchers should never accept the null hypothesis, doing so is especially problematic when a design does not have the statistical power to detect an effect if one exists (cite). For example, Monroe and colleagues (2016) manipulate belief in free will and do not find evidence that this effect produces an overall effect on support for punishment. Because this design has low statistical power to detect an overall effect, it is not clear whether this failure to find an effect occurs because free will does not cause increased support for punishment, or because the researchers did not have the power to detect this effect.

## **Theoretical Implications**

Past research has found that belief in free will influences the type of causal attributions people make about the actions of others (Genschow et al., 2017), and the views people have about crime and punishment (Martin et al., 2017). We extend this research by (tentatively) showing that belief in free will can influence attitudes about the economic structure of society. Specifically, we provide evidence that belief in free will leads to greater support for economic inequality. This finding is largely consistent with past research, as it suggests that belief in free will leads people to see individuals as responsible for their economic positions.

However, it is interesting to consider the present work in light of past research finding that belief in free will leads to greater condemnation of immoral actions, such as recommendations of more severe punishment for criminals (Martin et al., 2017). Many people express negative attitudes towards very wealthy individuals, and often view their wealth as unjustified (Sussman, Dubofsky, Levitan, & Swidan, 2014). If belief in free will increases the desire to punish criminals, why doesn't it also increase the desire to hold the rich accountable for their unjustified wealth, leading to lower support for inequality? One possibility is that support for inequality is more strongly driven by attitudes towards the poor than attitudes towards the rich, and belief in free will increases the extent to which the poor are blamed for their situation. If this is the case, this could mean that belief in free will can also lead people to blame those who are less fortunate for their circumstances. We invite future research to explore these directions further.

Future research may also choose to examine how free will relates to other types of economic attitudes. Conservative political parties refer to the value of individual freedom as a justification policy positions (e.g. Republican National Platform, 2016). For example, many

conservatives claim to oppose government regulations because they restrict individual choice (Kuh, 2012). Perhaps belief in free will contributes to other types of economic conservatism, such as a general opposition to government regulation .

Author contributions:

B. Mercier, D. Wiwad, A.F. Shariff, P. Piff, and L. Aknin developed the study concept

B. Mercier, A.F. Shariff, P. Piff, D. Wiwad, and L. Aknin collected the data

B. Mercier drafted the manuscript.

D. Wiwad, A. Robinson, P. Piff, A. F. Shariff, and L. Aknin provided critical feedback and revisions to the manuscript.

**Footnotes**

1. Because the World Bank does not estimate the Gini coefficient for New Zealand, this estimate was obtained from the CIA world factbook (Central Intelligence Agency, 2018)
2. Two participants were excluded from this analysis, reporting “1990” and “5” for age.
3. One participant was excluded from this analysis for reporting “1988”
4. For all analyses involving gender in study 4, we excluded participants who did not indicate male or female (because of the small number of these participants).
5. We note that the true causal effect is not necessarily equivalent to the effect estimated by a regression model. Although we control for possible covariates in an effort to improve the accuracy of our estimate, past research suggests that even when controlling for covariates regression models are still likely to overestimate the true causal relationship between variables (Gordon, Zettermeyer, & Chapsky, 2016). Thus, we are likely overestimating the true effect, meaning our achieved power and confidence in the null hypothesis are likely even lower than the estimates we provide for Studies 3 and 4.
6. As suggested by Lakens (2013), we report  $d_{av}$  as the effect size for a paired t-test, which is calculated by dividing the mean paired difference between the measures by the average standard deviation of the measures.