The Interactive Effect of Policies and Preferences on Decision Making

Esha Dwibedi

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Sheryl B. Ball, Chair
Jason A. Aimone
Alexander C. Smith
T. Nicolaus Tideman

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(ABSTRACT)

Economic preferences are crucial in decision making. While some preferences remain stable, changes in economic preferences have been linked to institutional and policy changes. We conduct three studies to explore the ways in which decision making might be impacted by economic preferences and underlying or changing policies. Our studies span the domains of preventative healthcare, strategic interactions, and education.

Chapter 2 examines the relationship between cooperative decision making and changes in societal level institutions through a meta-meta analysis, incorporating experimental data from various previously conducted meta-analyses. We study the relationship between country or region level policy changes, as measured by economic freedom indices to experimental measures of prosocial and selfish behavior. Our results indicate a relationship between macro-level institutional changes and measures of co-operative behavior that varies based on the starting levels of economic freedom variables. This establishes a relationship between macro policies and individual behavior that suggests that governments should consider the consequences of policies on individual decision making.

Chapter 3, using vignette experiments, explores how emotion reappraisal messaging interventions affect betrayal aversion and vaccine hesitancy. The measure of betrayal aversion in our study involves hesitancy in risking being betrayed in situations involving trust related to vaccines. We find that betrayal aversion is prevalent in about a third of our study participants and that two of our messaging interventions substantially reduce betrayal aversion involving vaccination decisions. Our results suggests a targeted messaging strategy for addressing a recently discovered new component of vaccine hesitancy, an important current topic in preventative healthcare.

Chapter 4, introduces an active learning intervention in the form of a field experiment involving a health intervention nudge and explores its impact on class engagement and education outcomes of students. In addition, we look at the impact of the nudge on vaccination uptake among students. We find improved class engagement as well as improvement in test scores for students who had the opportunity and chose to participate in the nudge experiment. In addition, we find greater uptake of influenza vaccination, as targeted by the nudge treatment. Our results show that this effect is driven by men, with women having higher vaccination rates irrespective of the nudge treatment.

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The Interactive Effect of Policies and Preferences on Decision Making

Esha Dwibedi

(GENERAL AUDIENCE ABSTRACT)

This dissertation explores how policy changes in our environment, interact with our preferences and affect decision making in social decision making, healthcare and education domains. We explore macro policies designed to create country-level institutional changes, involving the legal system, monetary policy, trade and labor policy, as well as examining two individual-level interventions including targeted messaging to improve vaccination uptake, and course performance in introductory economics. These wide variety of policy interventions give us a wide spectrum of decisions to study across different domains.

Chapter 2 examines the relationship between policy changes at the macro-institutional level and aggregate cooperative decision making. In this study, we establish a relationship between baseline institutional structure and changes in cooperative behavior corresponding to changes in societal level institutions. Our results suggests that current and historic societal level institutional structures should be kept in mind when designing policies.

Chapter 3 explores the effect of messaging treatments targeting emotions on uptake of vaccination using a vignette experiment. Here, we study the effects on a particular emotion, betrayal aversion, which in our study, involves hesitancy related to the risk of getting betrayed in the context of vaccination. Our results suggest that a targeted messaging strategy, might prove to be effective in designing policies to improve vaccination uptake.

Chapter 4 explores the impact of an active learning approach on class engagement and education outcomes of students in introductory economics. Providing students the chance to participate in a field experiment designed as a vaccination nudge, we incorporate the active learning component of the course and study the impact of participation in this active learning module. Our results suggest improved engagement and education outcomes among students who had the opportunity to participate in the experiment. Our results also suggest that proximity nudges might prove to be effective in improving vaccination uptake.

We demonstrate the importance of designing context-specific policies for them to be instrumental in bringing about targeted change. At the aggregate country level, we find that similar type of policy interventions when introduced in countries with differing baseline institutional structures might lead to different results. At the individual level, we find evidence that targeted interventions does shape decisions. We find that targeted health communications messaging can lead to improvement in health behavior. We also find that introducing active learning modules improves learning outcomes among students. Taken together, the findings in this dissertation demonstrates how both economic preferences and underlying policies are important factors in decision making.

Dedication

To Ma and Baba
for their endless love and support

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Let me start by acknowledging the generations of women before me who have chipped away at the obstacles and paved the path on which I walk today. I was fortunate to have been born at a time and age where I had the freedom to pursue my dreams, whatever they might have been.

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When I first came to this foreign country, Blacksburg was just a name on the map. Over the last five years, it has become my home away from home. This acknowledgment would not be complete without the mention of this tiny town and its inhabitants. I first came to this town in a tiny airplane with a fellow cohort-mate, Abhinaba, who has over the years become a great friend. Those first few months in Blacksburg would have not been as smooth had it not been for him and Sakshi. From our daily lunch breaks and our almost daily chai sessions, they kept me sane in the madness that was my first year back in school. Abhinaba, we might not have made the most effective or productive project partners, but those projects would not have been half as fun with anyone else. Sakshi, I have always been in awe of your dedication and determination towards whatever you put your mind to. I had hoped, in vain, that hanging out with you might stamp out the procrastinator in me. While that

had always been a high ask, I would be glad to have even a fraction of the dedication you possess. In those first few years of life in Blacksburg, our occasional trip to Roanoke in search of better food would not have been possible without Ange, our designated path charter, and his trusted ride. Those weekend buffets at Taaza were what we would plan for extensively in those initial months in Blacksburg.

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Chapter 1

Introduction

Economic preferences are central to human interactions and decisions. The channels through which preferences affect decision making has long been of interest to researchers. While preferences like enduring tastes (Stigler & Becker, 1977) or genetic traits (Benjamin et al., 2012) are assumed not to change significantly over time, a growing literature has explored the temporal stability of preferences (Chuang & Schechter, 2015). Alongside, external factors including policy environment, experiences in life, etc., have also been found to have an effect on preferences (Falk et al., 2015; Fuchs-Schundeln & Schundeln, 2015). Previous work on how preferences depend on environmental factors have also looked at the role of institutions in place, policies undertaken and interaction between people (Polak, 1976; Bowles, 1998; Rabin, 1998; and Dietrich, 2014). Studying how underlying policies interact with economic preferences to affect decision making is important to understand the impact that well-designed policies would have. This dissertation consists of three essays that investigate how changes in existing policies across domains spanning social decision-making, healthcare, and education interacts with economic preferences leading to individual level decision making. We use a variety of methods to study this interactive effect, including compiling pre-existing cross-country experimental data, field experiments and survey data. We also investigate the role of behavioral factors and emotions in shaping decision making.

Chapter 2 explores the relationship between cooperative decision making and changes in societal level institutions. In this chapter, we investigate macro-level changes in policies and look at corresponding changes in strategic behavior among individuals subject to these policy changes. We develop a dataset combining independent measures of institutional economic freedom at the country level from to the salient decision making data from laboratory and field experiments found within six meta-analyses. This gives us country specific changes in strategic behavior over years. We find a quadratic relationship between changes in societal level policies and strategic behavior among individuals. Our results demonstrate the importance of designing context-specific policy interventions, as human behavior and decision making differs drastically across countries with varying baseline policy structures. This indicates the importance of taking into account the present policy environment of a region when designing policies that might impact the policy environment.

Vaccination serves as a cost-effective preventative healthcare measure worldwide, crucial for maintaining public health and reducing the disease burden. However, vaccine hesitancy is equally widespread across the globe. While this delay in acceptance or refusal of a vaccine, has typically been explained by the 3C model, which claims that three factors- confidence, convenience, and complacency influence vaccine hesitancy [(Larson H. J., 2014), (MacDonald, 2015)], recent work has also started inspecting additional factors including demographics, risk attitude, trust in institutions, and lack of information or misinformation (Truong, 2022). Betrayal aversion involves hesitancy in risking being betrayed in situations involving trust and has been linked to vaccine hesitancy in recent research (Alsharawy et al., 2021). Health communication strategies are important in increasing vaccination rates and one important aspect of designing health communication is incorporating the role of emotion in health decisions (Ferrer & Ellis, 2019). Chapter 3 investigates the impact of a policy intervention in the form of emotion reappraisal messaging interventions on betrayal aversion, and the decision to vaccinate. We find that about 29% of our participants display betrayal averse preferences and find significant decrease in betrayal aversion involving vaccination decisions through specific messaging treatments. These successful interventions either encouraged individuals to embrace their emotions to make a decision or encouraged them to focus on the positive aspects of how they would feel to make a decision regarding getting vaccinated. Our results demonstrate how emotion reappraisal messaging policies can be targeted to reduce vaccine-related betrayal aversion, thereby shaping individuals' emotional response in the decision to vaccinate.

Active teaching strategies increases attendance, engagement, and generates curiosity about subject topics (Watkins et al., 2013). Prior active learning interventions in economics have explored various in-class learning methods including paired activities, one-minute papers, in-class experiments, and team-based learning techniques to improve learning in classrooms (Hettler, 2015). Chapter 4 investigates the impact of the introduction of an active learning methodology involving participation in a field experiment in undergraduate economics courses on education outcomes. This targeted policy intervention at the college education level leads to significant improvement in both curiosity generated about subject matter as well as in test scores among the participants in our study. In addition, it also looks at the impact of the introduction of a nudge policy intervention on the decision to vaccinate. Prior studies have found functional proximity to medical facilities to be a crucial factor in improving vaccination rates (Beshears et al., 2016). We too, design a nudge treatment aimed at increasing the functional proximity of participants to vaccination facilities and find a significant increase in flu vaccination uptake among individuals in our nudge treatment as compared to our non-nudge group. Our results demonstrates the two-fold utility of introducing students to such nudge experiments through coursework, leading to improvements across education and health outcomes.

Together, these three studies help demonstrate the various ways introducing changes in policies shapes and interacts with economic preferences and affects individual level decision making. We show how similar changes in policies leads to varying levels of changes

in strategic interactions and behaviors depending on baseline policy environments. We also demonstrate how targeted policy interventions in the form of targeted messaging or nudges might lead to changes in reported and observed behavior and decision making. The findings in this dissertation, shed light on the importance of designing context specific policy interventions to bring about changes in decision making.

Chapter 2

Who plays nice? A surprising meta-meta analysis of 1259 experimental studies

Jason A. Aimone, Sheryl Ball, Esha Dwibedi, Jeremy J. Jackson, and James E. West

Abstract

Scientific, social, and political policies in all countries and locations act upon and within a foundation of basic human interaction. Exploring the relationship between cooperative decision making and societal level institutions is an important job of social science, but such work has historically faced difficulty. Survey measures of behaviors and preferences face the problem of a lack of salience. Observed behavior within each society, from field, laboratory, and observational data is fundamentally constrained by the institutions governing those behaviors, preventing clean behavioral comparisons across institutions due to a lack of comparable counterfactuals. As such, it remains an open question whether and how macro level institutions are fundamentally related to underlying social and decision making behaviors of people living under those institutions. Here we combine and connect independent measures of institutional economic freedom at the societal level from 50 countries to the salient decision making data from 1259 laboratory experiments found within six meta-analyses. In experiments conducted within countries characterized by high levels of economic freedom, we find a positive relationship between additional economic freedom and pro-social choices. In countries with low levels of economic freedom, we find a negative relationship. We find the opposite relationship (an inverted U-shaped) between additional economic freedom and Nash equilibrium strategies. A similar pattern is repeated in a secondary analysis of institutions and experimental data across U.S. Metropolitan Statistical Areas. Our results indicate that when designing policy interventions that influence economic freedom, the effect on pro-social behavior, itself an important driver of economic development, will likely depend on the baseline institutional environment inside the intervening country.

2.1 Introduction

The exploration of the differential effects of macro-level institutions upon the functioning of economies has been a topic of economics research since the early days of economics. Adam Smith (1776), for example, focused heavily upon the consideration of the different institutions within which economies flourished or floundered. More recently, this literature has addressed many questions but there still exists many puzzling gaps in understanding the connection between country level institutional environments and micro-level behavior. For instance, in the political economy literature, La Porta et al. (1999) finds that a federal government structure results in more corruption than unitary forms of government, while, Fisman and Gatti (1999) finds lower levels of corruption in decentralized political structures. In the development literature, Boubakri et al. (2005) studies bank privatization across 22 low- and middle-income countries and finds that while performance along some measures improved post privatization, the pattern of the improvement in performance was not similar across the countries in the study. They found further evidence that environmental factors also impacted performance. Similar mixed results of privatization is also found by Gasmi et al. (2013) in the telecommunication sector across 108 countries, with corresponding differences in institutional structures.

Some of these puzzles may be due to the nature of the underlying data. While self-reported and other-reported behavior of individuals and groups within an institutional structure is relatively easy to measure with self-report survey and polling data, public governmental data, and other types of empirical data, such data typically faces the problem of lacking salience and being fundamentally constrained by the institutions governing those behaviors. In other words, clean counterfactuals are typically absent. Randomized controlled trials(RCTs) can provide some evidence of the institutional influence across and within a few countries. However, they lack a broad base to explore the wide range of different macro-level institutions which influence the spectrum of development of nations. It remains unknown within the literature whether and how macro level institutions are fundamentally related to underlying social and decision making behaviors of people living under those institutions. We address this gap in the literature by bringing together over 1200 controlled experimental studies of behavior from six different meta analyses, representing 50 countries, and exploring how institutional changes within countries are related to changes in behavior within controlled experimental paradigms.

To better understand the gap in the literature, consider the situation of institutional structures within developing countries changing, leading to changes in, say property rights regimes. Here, not only are the institutions that determine the property rights regimes within these countries changing, the rules of economic interactions that were governed by these institutions are also now fundamentally different. Individual behavior falling under these economic interactions hence, will display changes which might be reflected in survey/ empirical data inspecting these behaviors.

Take the commonly used simple General Social Survey (GSS) question regarding "trust": ''Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?'' The economic exchange situations respondents consider when answering this identical question can not accurately be assumed to be the same between countries with strong or weak property rights regimes. When comparing individual responses between two countries regarding this question, one must recognize that there are multiple institutional differences at play between the two countries, not one. First, and most obviously, the macro-level institutions that govern how property can be used differs between the countries. These are rules that govern factors such as the relative positions of the economic agents upon entering the exchange situation and factors governing how the outcomes of exchange (e.g.the ex-post monetary positions of the trustor and trustee) of the trust interactions can be used outside of the interaction. Second, just as important but perhaps more subtly, the nature of the trust interactions themselves differ based upon the macro institutional structure. The modal type of interaction is not likely the same in a high property right regime and a low property right regime. In a low and high property right regime countries, when people think back to "trust" situations then people under different regimes are thinking back to trusting in a situation governed by their property right regime in question. A high property right individual may think back to their experiences in exchanges in well-defined formal market environments with contracts and lawyers, perhaps for durable goods like cars and houses, while a low property right individual may think back to informal market exchanges with hand-shakes and informal agreements for consumable goods like heating fuel and food. The two individuals are self-reporting behavior about how they perceive people can be "generally" trusted, but the information used to generate those perceptions comes from fundamentally different trust environments, not the same or even similar trust environments. Would the two individuals from different property rights regimes make different decisions when considering the same trust situation? Data from a self-reported question of the form above is incapable of providing an answer to that question.

Upon initial consideration, one may reasonably think that fixed effect analysis would solve this problem, since such an analysis would limit all variation to being variation within a country rather than between countries. While fixed effects analysis would help with doing away with the concern that people from some countries may be more predisposed to some types of interactions than people from other countries, fixed effects analysis would not be able to address the concern that the variation of interest (property rights to continue the example) may be causally responsible for differences in types of interactions individuals engage in. In order to address that concern, we need exogenous control over the micro-level exchange environment institutions under consideration, while leaving the natural endogenous macro-level institutions in place. One way to do this is through considering experimental data. Consider the same target of "trust", but as explored through a controlled experimental trust paradigm (such as Berg et al. 1995) conducted in different countries (rather than a survey.) If such an experimental paradigm is run with the same experimental institution (set of rules governing the interaction of the participants), then differences in behavior observed between data from a low property right regime and a high property right regime are coming

from differences in the macro-level institutional environment and not from differences in the micro-level institutional environment of the experimental trust interaction. [1] Experimental data of this form combined with country level fixed effect analysis helps eliminate country level systematic differences (like culture, sample biases, etc.) and would give us a rigorous analysis of the influence of macro-level institutions on micro-level economic behavior.

Exploring the influence of macro-level institutions on micro-level economic behavior is important for several reasons. Most modern day societies have built institutions that are costly to set up, in order to prevent individual opportunistic behavior. While social welfare could be larger in the absence of institutions in place to regulate economic behavior if individuals chose to never default in their actions, most societies still choose to build institutions. An analysis, like ours, is important to identify and prepare for what might be unexpected effects of such institutional changes.

In our paper, we look at macro-level institutional changes through measures of economic freedom. As defined by the Heritage Institute, "Economic freedom is the fundamental right of every human to control his or her own labor and property. In an economically free society, individuals are free to work, produce, consume, and invest in any way they please. In economically free societies, governments allow labor, capital, and goods to move freely, and refrain from coercion or constraint of liberty beyond the extent necessary to protect and maintain liberty itself." Since measures of economic freedom contain information regarding the institutional structures within a region, we can use these measures to track changes in such institutions over time. We use data from the Economic Freedom of the World (EFW) annual reports as published by the Fraser Institute to look at how macro-level institutions have changed within geographical regions of interest for us over the years. These economic freedom measures look at areas of interest to us which include the size of the government, the efficiency of the legal system, measures of monetary soundness, regulatory measures and barriers to international trade. How countries and regions change over time in these measures imply structural changes in macro-economic institutions within these regions.

We combine experimental data from six different meta-analyses on seven different behavioral paradigms (including dictator games, ultimatum games, prisoner's dilemma games, trust games, public goods games, oligopoly games, and lying behavior) to form a measure of pro-social and Nash play behavior. Using the economic freedom measures, we perform a country level fixed effect analysis to inspect the relationship between these measures of pro-sociality and macro-institutional changes. We observe a U-shaped relationship between economic freedom and pro-sociality. Pro-social behavior decreases as the economic freedom measures improve from "least free" countries which fall within the bottom 40 percentile to countries which have average levels of economic freedom. While pro-social behavior improves as economic freedom measures increase from average levels to "most free" countries which

[1] This is not to say that there are not many potential mechanisms for country level institutional differences to influence behavior in the experimental environment, but only saying that differences can be identified to be coming from the external institutional differences not due to differences from facing fundamentally different economic choices.

fall in the top 90th percentile of countries. Similar U-shaped relationship is observed across USA metro level areas too, which serves as a robustness check for our cross-country analysis.

This paper contributes to the literature on the relationship between formal institutions and preferences. This topic has been studied using various approaches. One branch of the literature has studied how individual level preferences shape the functions of formal institutions (Grief and Tabellini, 2010; Alesina and Giuliano, 2015). Another strand of the literature has attempted to establish causal effects of formal institutions on individual level preferences. Previous work on how preferences depend on environmental factors have looked at the role of institutions in place, policies undertaken and interaction between people (Polak, 1976; Bowles, 1998; Rabin, 1998; and Dietrich, 2014). Studies have also used naturally occurring events to study how exogenous institutional shocks in the form of political events (Alesina and Fuchs-Schundeln, 2007), changes in regulatory framework (Gruber and Hungerman, 2008), and economic crsis (Fisman et al., 2015) impacts preferences and have found significant effects of changes in institutional setups on trust and cooperative behavior. Other studies have used experimental data in the form of laboratory experiments to compare behavior among participants living under differing institutional setups (Gneezy et al., 2016, Herrmann et al., 2008). These studies too find differences in pro-social behavior based on differences in institutional settings. Yet another branch of studies considered the co-determined nature of preferences and institutional settings, focusing on the relationship between them and how they co-evolve (Tabellini, 2010). Our paper contributes to this literature by investigating the relationship between institutional changes and changing preferences using pre-existing experimental data on various behavioral factors. We study pro-social behavior measured through data derived from laboratory and field experiments on a variety of behavioral factors obtained from meta-analyses and find differential changes in measures of pro-social behavior across regions when institutional setups change.

We also contribute to the literature on economic freedom. There has been substantial work on economic freedom (which serves as our basis for measuring structural macro-level institutional changes across regions) in recent years. There has been substantial focus on the cross-country analysis using measures of economic freedom as reported in the Economic Freedom Index (Gwartney et al., 1996). Economic freedom measures have been used to explore their relationship with economic growth (Carlsson and Lundström, 2002; de Haan and Sturm, 2000; Heckelman, 2000; Gwartney et al., 1999;) and income (Gwartney et al., 1999, 2004). Measures of economic freedom has also been used to study the relationship of economic freedom with investment in general (Gwartney et al., 2006), and foreign direct investment (Bengoa and Sanchez-Robles, 2003) specifically. Prior studies have also looked at the relationship between economic freedom and direction and quantity of international trade (Berggren and Jordahl, 2005), and entrepreneurship (Bjørnskov and Foss, 2008; Nyström, 2008; Campbell and Rogers, 2007). Empirically, economic freedom has been used to explore cross-country differences in economic performance (de Haan et al., 2006). Using the components of economic freedom index instead of the aggregate index as published by The Heritage Foundation, studies have found that the cross-country differences in economic performance

differed across the components of economic freedom (Heckelman and Stroup, 2000; Carlsson and Lundstrom, 2002). Berggren and Jordahl (2006) performed a cross-country survey to explore the relationship between economic freedom and trust in societal level institutions. Institutions promoting economic freedom have been found to improve efficiency (Adkins et al., 2002). Economic freedom has also been seen to be positively correlated to tolerance and cooperation (Berggren and Nilsson, 2016), and greater transparency and less corruption (Dreher et al., 2010). Our paper ties in with this strand of literature and explores the the relationship between measures of economic freedom (at the aggregate and component level) and pro-social behavior through experimental data. Our analysis looks at various types of cooperative behavior and brings an unique perspective on the differential changes in cooperative behavior across regions by linking them to changes in measures of economic freedom.

Our paper is organized as follows. Next, in Section 2, we introduce the data used for our analysis and describe the methodology used for curating the data. Section 3 presents the models used for our analysis and the results. Section 4 discusses some implications of our analysis and concludes.

2.2 Data and Methodology

2.2.1 Behavioral Data from Meta-analyses

We base our meta-meta-analysis here upon the work of six separate meta-analyses of different experimental economics paradigms. These studies explored dictator games, ultimatum games, prisoner's dilemma games, trust games, public goods games, oligopoly games, and lying behavior. The chosen meta-analyses were identified based on topics of interest and data availability.[2] Table 2.1 details which meta-analyses are associated with which underlying paradigms.

Most of the meta-analyses' chosen, included conference papers, pre-publication studies and unpublished replications to ensure minimization of the potential bias arising from including only published studies with significant findings (Rosenthal, 1979). The six meta-analyses which together contributed to make up the 1259 different experimental studies/treatments that make up the observations of our analysis.

In addition to the data from the meta-analyses three coders independently looked at each individual study from the meta-analyses and coded each study along many margins. This coding provided the relevant variables we needed for the present study. The coders were provided a common coding procedure and spreadsheet template for data entry and instructed

[2]We thank the authors of each of these meta-analyses for either making their data/code publicly available in or connected to their published papers or providing us with their data/code directly.

to proceed in coding in a different order. Coders were instructed to look at each paper from the meta-analyses and find within the paper specific variables of interest. Relevant for this current paper were variables that coded each study's city, state, country, and year of data collection/publication. Where data was collected at a university, coders were provided with a list of "IPEDs" codes, and instructed to label the data with the relevant code for the university the data was collected at. If data was collected at multiple sites/universities, coders indicated each location. These variables were used to connect the behavioral data with the data on economic freedom in our study. Each coder also had a separate variable spot where they could indicate any problems/confusions/issues with data collection/coding for each variable in each study.

Table 2.1: Meta Analyses Used

Paradigm	Meta Analyses
Dictator Game	Engel (2011) Experimental Economics
Prisoner's Dilemma	Mengel (2018) The Economic Journal
Trust Game	Johnson and Mislin (2011) Journal of Economic Psychology
Ultimatum Game	Oosterbeek et al. (2004) Experimental Economics
Lying Game	Abeler et al. (2019) Econometrica
Oligopoly	Fiala and Suetens (2017) Experimental Economics
Voluntary Contributions Mechanism	Fiala and Suetens (2017) Experimental Economics

Once all the coders submitted their data sets, the data sets were combined to form a single data set for all the relevant variables. For any discrepancies in coding among the three coders the following procedure was used. If two codes reflected the same value, the third code was ignored. In case of discrepancies among all three sets of coded data, the variable of interest was re-inspected and re-coded from the relevant paper by the more senior student coder. This process ensured minimization of human error in the coding process.

To obtain our main variables of interest for our analysis, to indicate the degree of Nash and degree of Pro-Social behavior in each study, we generate a singular variable that maps behavior from each paradigm into common variables that are comparable between paradigms. Table 2.2 shows the definition of Nash and Pro-Social behavior that maps behavior from each of the variables of interest in the meta-analyses to the dependant variables of interest in our study. Note that Nash and Pro-social behavior are inverses of each other in the variables from the dictator game, prisoner's dilemma, VCM, and trust game paradigms. In the lying, ultimatum, and oligopoly paradigms there is not a clear "pro-social" behavior and thus there are only clean Nash behaviors. This variation helps to enable us to think about Pro-social and Nash play as separate variables, though the close connection should be noted.

Table 2.2: Variable Definitions

Game	Variable in Meta Analyses (x)	Pro-Social Variable	Nash Variable
Dictator Game	% sent	x	1-x
Prisoner's Dilemma	% cooperate	x	1-x
Trust Game: Investor	% invested	x	1-x
Trust Game: Trustee	% returned	x	1-x
Ultimatum Game: Proposer	% offered		1-x-0.1
Ultimatum Game: Respondent	% rejected		1-x
Lying Game	Lying Index		x
Oligopoly	% cooperate		1-x
Voluntary Contributions Mechanism	% contribute	x	1-x

2.2.2 Economic Freedom Index Data

Since our study seeks to connect micro-level behavioral data on propensities to engage in pro-social and Nash behavior with Macro-institutional structure, we need to have an independently constructed common measure of macro-institutional structure for every year of data collection in every country of our data. To do this, we use the index generated in the Fraser Institute Reports on World Economic Freedom (1970-2021). This data set provides objective measures of the institutions within each country in five major areas: size of government, legal system and security of property rights, sound money, freedom to trade internationally, and regulation. Table 2.3 below provides a summary of each of the five main areas. The five major areas that form the aggregate measure of economic freedom, comprises of 26 components. Many of these individual components are in turn made up of several further sub-components. In aggregate, the index consists of 44 distinct variables or sub-components. Each component and sub-component, as previously described, is scored on a scale from 0 to 10 reflecting the distribution of the underlying data. At each component stage of the index, the sub-component ratings are averaged to derive the component rating. Thus, each country in the index has a freedom score in the range of 0(least free) to 10(most free). The index itself has a two-year lag due to time needed to ensure availability of comprehensive data.

Table 2.3: Underlying categories of economic freedom: World EFI

Category name	Factors
Government size	government consumption and investment, transfers and subsidies, top marginal tax rate and state ownership of assets
Legal system and security of property rights	judicial independence, impartiality and integrity of legal institutions, protection of property rights, enforcement of contracts, regulatory cost of property sale, business cost of crime, reliability of police, military interference in rule of law and politics and gender disparity adjustment
Sound money	money growth, inflation, standard deviation of inflation and freedom to own foreign currency bank accounts
Freedom to trade	tariffs, regulatory trade barriers, black market exchange rates and regulations on movement of labor and capital
Regulations	credit market, labor market and business regulations

Using the coders data on when and where behavioral data from each study was collected and the World EFI data, we generate new variables in the data set that indicate the macro-institutional environment when the data was collected. Variables include the overall EFI score for each country and their scores in each of the main five areas above.

Figure 2.1 depicts the economic freedom measures across countries as reported in the Economic Freedom of the World: 2021 (Fraser Institute 2021 Annual Report). Here, the countries coloured in blue, depict the "most free" countries (top most quartile) which include parts of North America, Europe and Asia as well as Australia, New Zealand and Chile. The second quartile of countries, depicted in green, include countries in North and South Americas, Europe, Asia and Africa. The third quartile of countries, depicted in orange and the "least free" countries (bottom quartile), depicted in red, are distributed across South America, Africa and Asia.

We also look at the deviations stemming from individual country differences within each quintile of the world economic freedom index. Table A.1 in Appendix A summarizes the standard deviations of overall EFI as well as deviations observed for each major component of the economic freedom index in our dataset.

North American data makes up the bulk of the observations in the data set and thus provides an opportunity for a substantial analysis at metro level data. We look at the Fraser Institute Economic Freedom of North America (1981-2020) data to build the Index at the USA metro level. Similar to the world data, the sub-national index looks at three major areas: Government Spending, Taxes, and Labor Market Freedom. Table 2.4 below provides a summary of each of the three main areas. Within the three major areas, there are 10 components in the index. Similar to the world index, the sub-national index also has a freedom score in the range of 0(least free) to 10(most free).

Figure 2.1: Distribution of country-specific measure of economic freedom across the world

Source: Economic Freedom of the World: 2021 Annual Report by James Gwartney, Robert Lawson,Joshua Hall & Ryan Murphy, published by Fraser Institute, provided free of charge under a Creative Commons Attribution-NonCommercial-ShareAlike (CC BY-NC-SA) licence

Table 2.4: Underlying categories of economic freedom: Sub-national Index

Category name	Factors
Government spending	General Consumption Expenditures by Government as a Percentage of Income, Transfers and Subsidies as a Percentage of Income, Insurance and Retirement Payments as a Percentage of Income, Government Investment
Taxes	Income and Payroll Tax Revenue as a Percentage of Income, Top Marginal Income Tax Rate and the Income Threshold at Which it Applies, Top marginal income and payroll tax rate, Property Tax and Other Taxes as a Percentage of Income, Sales Tax Revenue as a Percentage of Income
Regulation	Labor Market Freedom (comprising of Minimum Wage Legislation, Government Employment as a Percentage of Total State/Provincial Employment, Union Density)

Figure 2.2 shows the distribution of economic freedom across the states of the USA as reported in the Economic Freedom of USA: 2020 (Fraser Institute Economic Freedom of North America 2020 Report). Similar to figure 2.1, here too, the economic freedom measures are divided into quartiles. The "most free" states, depicted in blue, are mostly clustered

around the Eastern and Southern parts of the country with some Midwestern states also showing higher economic freedom. The second quartile, depicted in green, consists of majorly the Midwest with some Eastern states also featuring here. The third quartile, shown in orange, covers states mostly in the Midwest alongside some Eastern and Western states. "Least free" states, depicted in red, cover large portions of the West coast as well as parts of Midwest and Alaska.

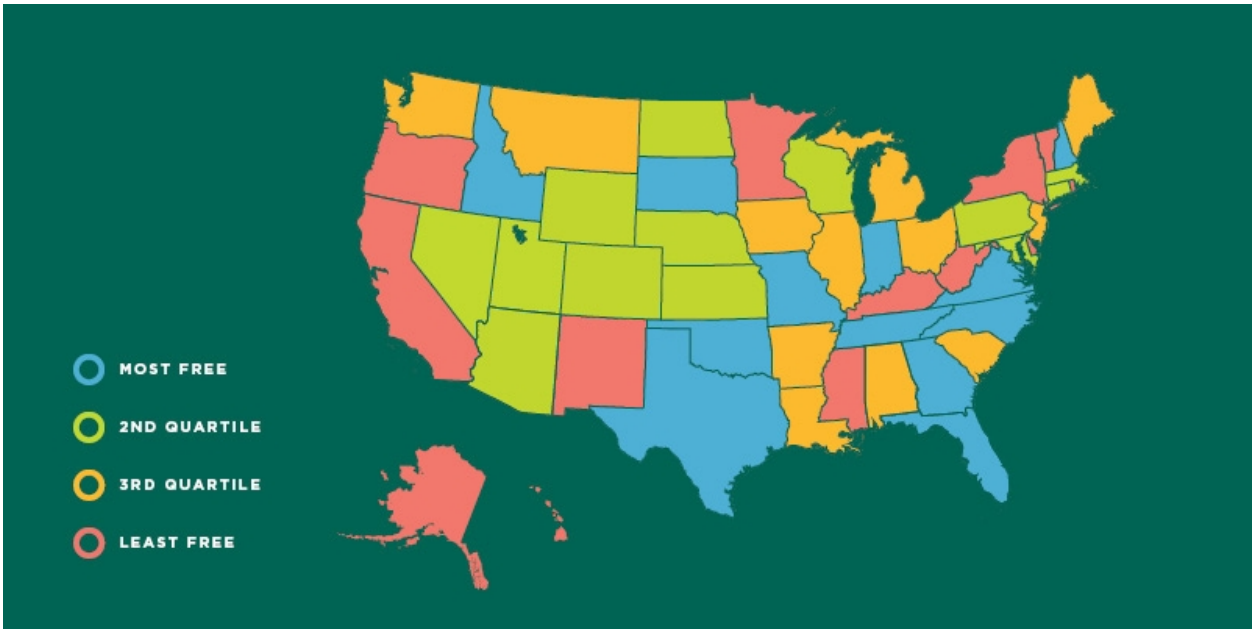


Figure 2.2: Distribution of economic freedom across states of the USA

Source: Economic Freedom of North America 2020 by Dean Stansel, José Torra & Fred McMahon, published by Fraser Institute, provided free of charge under a Creative Commons Attribution-NonCommercial-ShareAlike (CC BY-NC-SA) licence

Similar to the world freedom index, for the sub-national index too, we look at the variation in the MSA level EFI terciles stemming from the individual MSA level differences in economic freedom. Table A.2 in Appendix A summarizes the standard deviations of overall EFI as well as deviations noticed for each major component of the economic freedom index at the MSA level in our dataset.

2.3 Results and Analysis

Firstly, we replicate each of the original six meta-analyses which we use in our analysis. The replications for the six meta-analyses we use in our study can be found in Appendix A. We further calculate the standardized residuals for each study from each meta-analysis

as relevant new dependent variables which also helps factor in unexplained variations from original meta-studies. Our dependant variables: Pro-social or Nash Play are based on their respective definitions as given in Table 2.2 previously. The resulting data arising from each individual meta-analyses is merged into one single dataset. To this, we add the location, and date of study variables for each individual study within our six meta-analyses as generated by the coders. We further add the corresponding EFI data from the Fraser Institute Reports on World Economic Freedom and the Fraser Institute Economic Freedom of North America (only for studies conducted within USA).

We explore the impact of the measures of economic freedom on Pro-social and Nash behavior . We estimate the following model using a fixed effects model:

$$Y_{it} = \gamma_0 + \beta EFI_{it} + \gamma_1 C_i + \epsilon_{it} \tag{A.1}$$

where Y_{it} represents the Pro-social or Nash play variables generated, EFI_{it} is the region and year specific economic freedom index, C_i represents unobserved time-invariant heterogeneities across the regions. Letting $\alpha_i = \gamma_0 + \gamma_1 C_i$, we obtain the model:

$$Y_{it} = \alpha_i + \beta EFI_{it} + \epsilon_{it} \tag{A.2}$$

Having individual specific intercepts $\alpha_i, i = 1, 2, ..., n$ where each of these can be understood as the fixed effect of entity i representing the i^{th} region. The EFI measure includes either the overall EFI or is broken down into the major components of the overall EFI for both the world index and the sub-national index as applicable.

We look at the relationship between micro-economic behavior and both overall economic freedom measures across countries (for the country level analysis) and MSAs (for the MSA level analysis within USA) as well as the major components of economic freedom as described in the Fraser Institute index. In our analysis, as shown in Tables A.3-A.11 (in Appendix A), models (1) and (3) inspect the relationship between overall economic freedom and micro-economic behavior while models (2) and (4) look at the relationship between the components of economic freedom and micro-economic behavior.

2.3.1 World EFI

For our analysis at the world level, we categorize the countries included in our analysis based on their EFI values and group them together based roughly on EFI quintiles.

- Our first EFI quintile contains countries which fall over the 90 percentile and includes Australia, Canada, Finland, Mongolia, New Zealand, Singapore, Switzerland, United Kingdom, and United States.

- Our second EFI quintile contains countries which fall within 80 and 90 percentile and includes Austria, Chile, Denmark, Germany, Japan, Netherlands, Norway, Portugal, Rwanda, Spain, and Sweden.
- Our third EFI quintile contains countries which fall within 60 and 80 percentile and includes Belgium, Costa Rica, France, Guatemala, Iceland, Italy, Peru, South Korea, Uganda, and Uruguay.
- Our fourth EFI quintile contains countries which fall within 40 and 60 percentile and includes Columbia, Fiji, Ghana, Greece, Honduras, India, Israel, Kenya, Madagascar, Malaysia, Mexico, Morocco, Paraguay, South Africa, Tanzania, Thailand, and Turkey.
- Our fifth EFI quintile contains countries which fall under 40 percentile and includes Argentina, Bangladesh, Bolivia, Brazil, China, Ecuador, Indonesia, Papua New Guinea, Vietnam, Cameroon, Democratic Republic of Congo, Nigeria, and Zimbabwe.

For our measure of pro-social behavior, we estimate the following models:

$$Pro - social_{it} = \alpha_i + \beta EFITotal_{it} + \epsilon_{it} \tag{1}$$

$$\begin{aligned} Pro - social_{it} = \alpha_i + \beta_1 EFISizeofGov't_{it} + \beta_2 EFIPropertyRights_{it} \\ +\beta_3 EFISoundMoney_{it} + \beta_4 EFITrade_{it} + \beta_5 EFIRegulation_{it} + \epsilon_{it} \end{aligned} \tag{2}$$

here, α_i represents country specific unobserved time-invariant effect and while model (1) looks at the impact of overall economic freedom, model (2) looks at the impact of each of the major components of economic freedom on measure of pro-social behavior.

Similarly for our measure of Nash play, we estimate the following models:

$$Nash_{it} = \alpha_i + \beta EFITotal_{it} + \epsilon_{it} \tag{3}$$

$$\begin{aligned} Nash_{it} = \alpha_i + \beta_1 EFISizeofGov't_{it} + \beta_2 EFIPropertyRights_{it} \\ +\beta_3 EFISoundMoney_{it} + \beta_4 EFITrade_{it} + \beta_5 EFIRegulation_{it} + \epsilon_{it} \end{aligned} \tag{4}$$

Here too, model (3) looks at the impact of overall economic freedom, model (4) looks at the impact of each of the major components of economic freedom on measure of Nash play.

We find significant positive (negative) relationships between economic freedom and Pro-social (Nash) play at the highest levels of economic freedom. In particular, freedom in the domains of Trade and Regulation play an important role in the above 90 EFI percentile countries, as seen in Table A.3.

In countries with moderate levels of economic freedom, which fall in the mid-level EFI percentiles of between 40 and 80, while overall economic freedom does not show any significant relationship with Pro-social or Nash play, we find significant negative relationship between

the domain of sound money and pro-social play, as seen in Table A.5 and A.6. Alongside, specifically in the case of countries falling under EFI percentiles between 40 and 60, Nash play also shows significant positive relationship with sound money. In this particular EFI quintile, the domain of property rights also shows significant negative relationship with pro-social play, as seen in Table A.6.

For countries at the lowest level of economic freedom, we find a negative relationship between economic freedom and pro-social behavior. In the particular domain of size of government, we find a significant negative (positive) relationship between economic freedom and pro-social (Nash) play. The domains of property rights, and sound money show significant positive relationship between economic freedom and Nash play, while the domain of trade shows significant negative relationship between economic freedom and Nash play, as seen in Table A.7.

Figure 2.3 graphically shows the distribution of the marginal effect of overall EFI on the pro-social residual for the various quintiles on our world economic freedom measure. As seen in our fixed effects model, for countries with lower level of overall EFI, any marginal increase in economic freedom leads to a decrease in pro-social behavior in these countries. The relationship between economic freedom and pro-social behavior is not significant for countries which are in the middle tiers of overall EFI. For countries within the top quintile of overall EFI, on the other hand, any marginal increase in economic freedom leads to an increase in pro-social behavior. Figure 2.3 also displays the variability in the marginal effect of total EFI on pro-social residual for countries within these pre-defined quintiles. This is further indication of how countries with the same level of economic freedom might still show wide variation on the impact of an increase in economic freedom on pro-social behavior. While there exists little variability for countries in the top quintile, for countries in the remaining quintiles, there exists moderate to significant amount of variability.

Similar to the graph for overall world EFI, we also look at the distribution of marginal effect of the components of world EFI on the pro-social residual in our study in figure 2.4. This helps illustrate the variation in each of these components across our pre-defined quintiles. Since the different components of EFI deferentially affects our outcome variables, figure 2.4 gives us an idea about the direction and the variation in the marginal effects of each individual components of EFI on pro-social behavior.

We find that countries in the top quintile display very little variation, countries in the remaining tiers display high variability on pro-sociality on marginally changing the measure of government size (figure 2.4(a)). We also see a high variation in marginal effect of property rights index on pro-social residual across all quintiles of the groups of countries with an indication of a mostly negative relationship for countries belonging to the 40-60 percentile of the EFI distribution (figure 2.4(b)). There exists some variation in marginal effect of sound money index on pro-social residual across all quintiles of the groups of countries with an indication of a mostly negative relationship for countries belonging to the 40-60 percentile of the EFI distribution. Countries belonging to the bottom quintile and the countries belonging

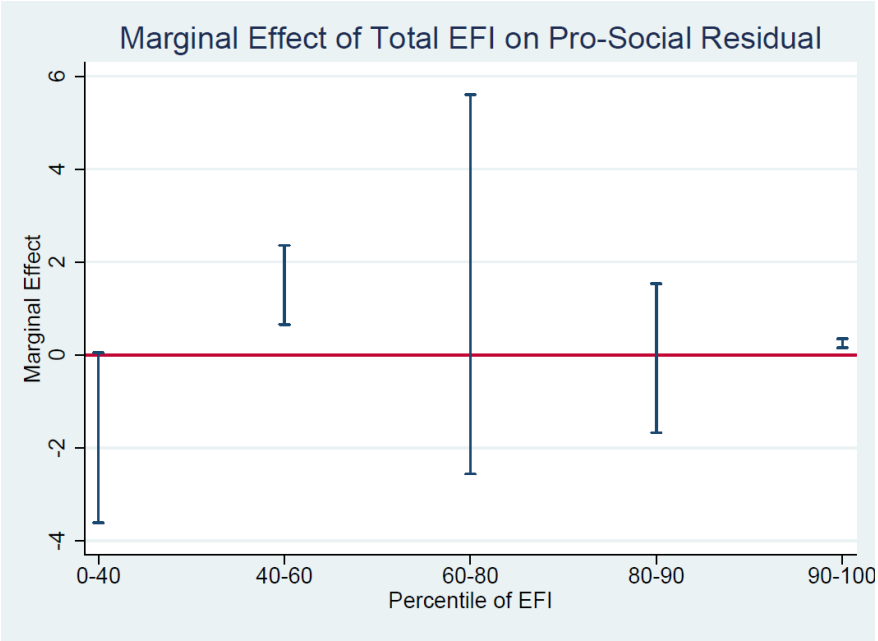
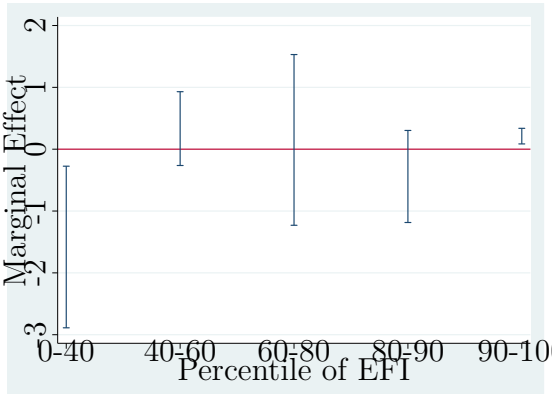


Figure 2.3: Impact of overall economic freedom on pro-social play for World EFI

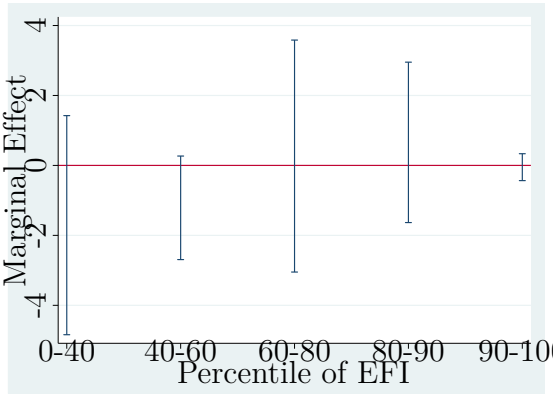
to the 60-80 percentile displays the highest variation in this aspect (figure 2.4(c)). While most quintiles show small to moderate variation in marginal effect of the measure of trade on pro-social residual, the bottom quintile of countries show a large variation (figure 2.4(d)). Countries in the top quintile display very little variation and show a positive marginal effect of the component of regulation on pro-sociality. The rest of the quintiles show moderate to significant amount of variation in marginal effect here (figure 2.4(e)).

Similar to the effects on pro-sociality, figure 2.5 shows the distribution of the marginal effect of overall EFI on the Nash residual for the various tiers of the grouped countries in our study. Here, we find a moderate to significant amount of variability in the distribution of the marginal effect for all the quintiles other than the top-most quintile of countries. The top quintile of countries also indicate a negative marginal effect on the residual, as also seen in the fixed effects model estimation for the group of countries in the 90-100 percentile. This indicates that increases in overall economic freedom in countries that are already "most free", leads to an even further reduction in Nash or selfish behavior. For other groups, there exists sizable variation among the countries in the direction of impact of an increase in economic freedom on Nash behavior.

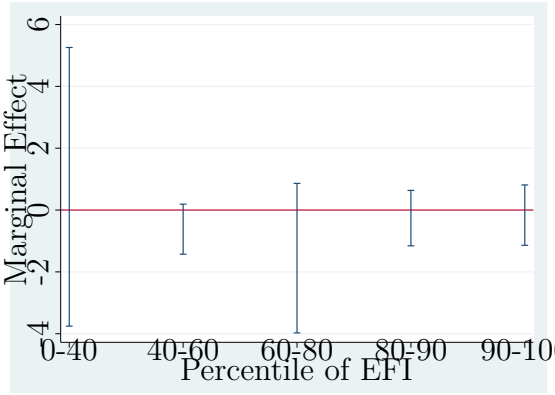
In addition, we look at the distribution of the marginal effect of the different components of the world EFI on the Nash residual in our study as shown in figure 2.6. These individual components provides us further clarity regarding the variation in the distribution of the marginal effect within the country groupings used in our study. Similar to our analysis on pro-sociality, this segmented exploration of the marginal effect of each of the components of



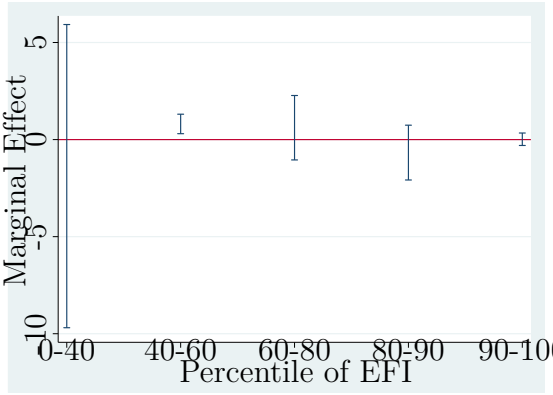
(a) Figure 4a. Size of Gov't



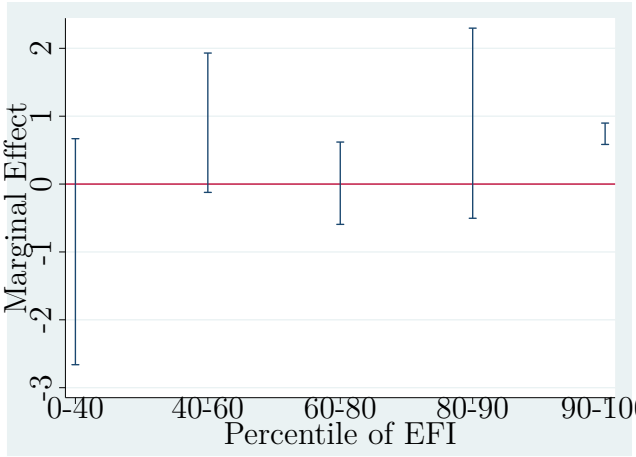
(b) Figure 4b.Property Rights



(c) Figure 4c. Sound Money



(d) Figure 4d. Trade



(e) Figure 4e. Regulation

Figure 2.4: Marginal Effect of World EFI Components on Pro-social behavior

EFI on Nash behavior provides visual cues on the variation and direction of the effects of the components of EFI on Nash behavior. We find that there exists differing levels of variation in marginal effect of the index of government size on Nash residual across the various quintiles of

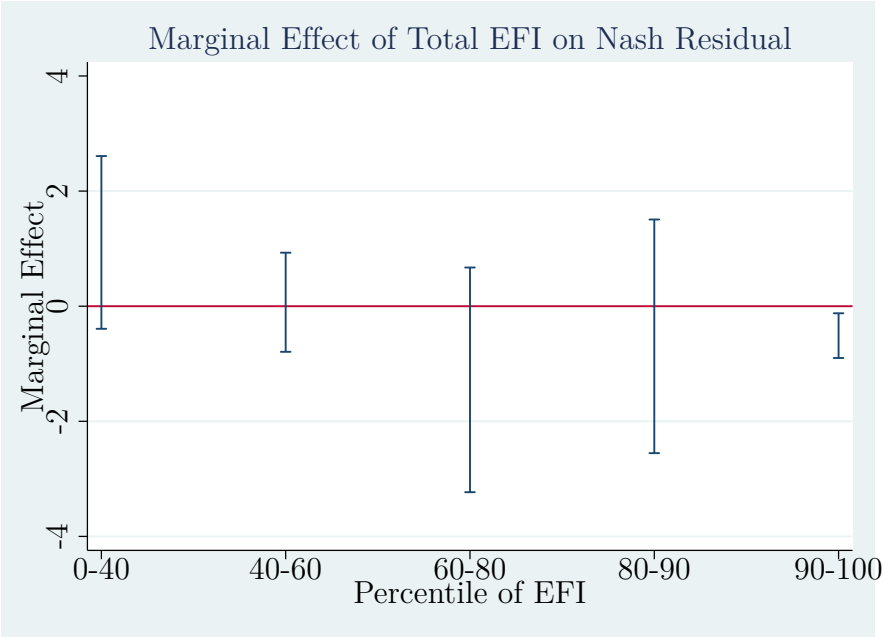
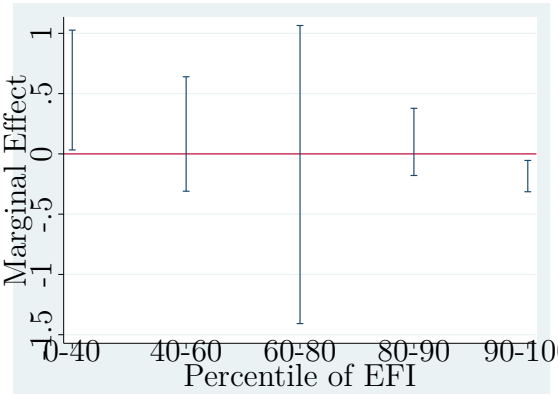


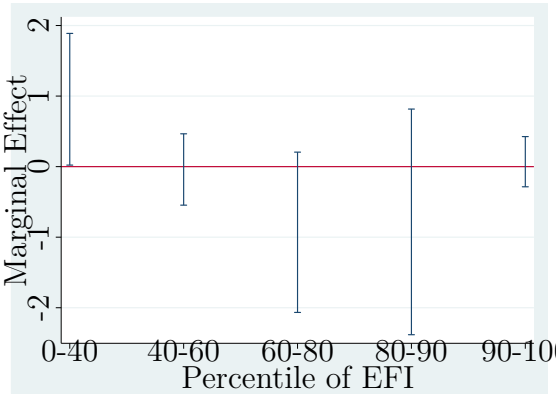
Figure 2.5: Impact of overall economic freedom on Nash play for World EFI

grouped countries. While countries in the top quintile display less variation, countries in the remaining tiers display high variability. Specifically, countries in the 60-80 percentile show a significantly high amount of variability (figure 2.6(a)). This indicates that for this quintile, different countries behave very differently along measures of Nash behavior with changes in government size. Similarly, we also see differing levels of variation in marginal effects of property rights and sound money with the 80-90 percentile showing the most amount of variation in marginal effects on Nash behavior in both cases (figures 2.6(b-c)). We see the the highest and the lowest quintiles displaying relatively less amount of variation in their distribution of the marginal effect on Nash residual for the component of trade while also showing moderate to high amount of variation across other quintiles (figure 2.6(d)). Lastly, we see a clear negative marginal effect of the component of regulation on Nash behavior for the top most quintile of "most free" countries. We see moderate to high amount of variation across some quintiles here (figure 2.6(e)).

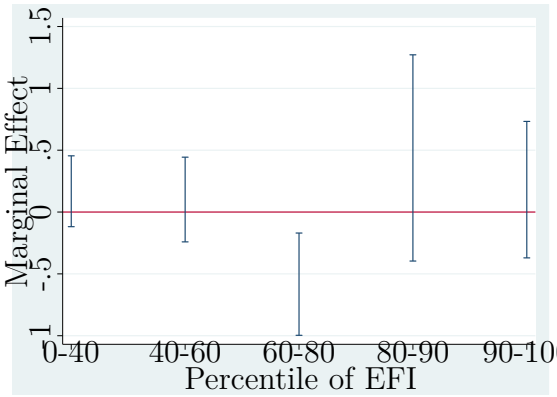
We also look at the time trends of EFI measures in Figure 2.7. Here, we look at the variations in mean measures of pro-sociality, and Nash play, alongside the variations in mean measures of EFI and its components across our pre-defined EFI quintiles over our sample years. Figure 2.7 provides us with a comprehensive idea of the changes in the measures of EFI components across the EFI quintiles corresponding to the changes in measures of co-operative behavior for these groups of countries.



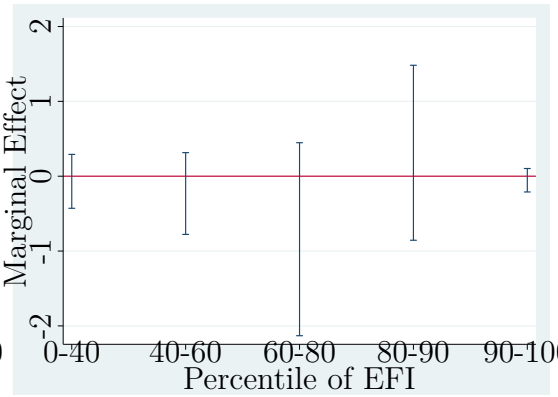
(a) Figure 6a. Size of Gov't



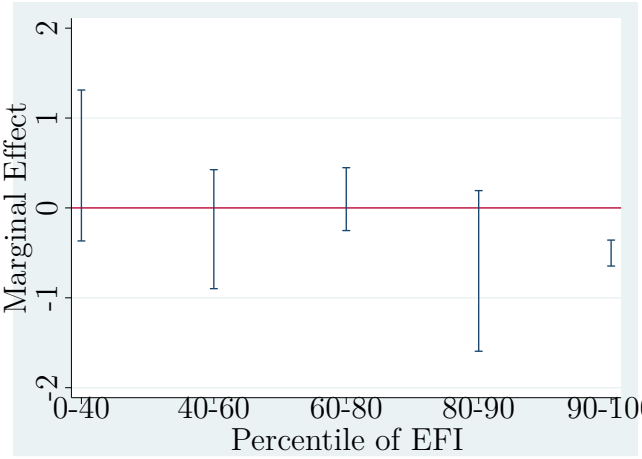
(b) Figure 6b.Property Rights



(c) Figure 6c. Sound Money



(d) Figure 6d. Trade



(e) Figure 6e. Regulation

Figure 2.6: Marginal Effect of World EFI Components on Nash behavior

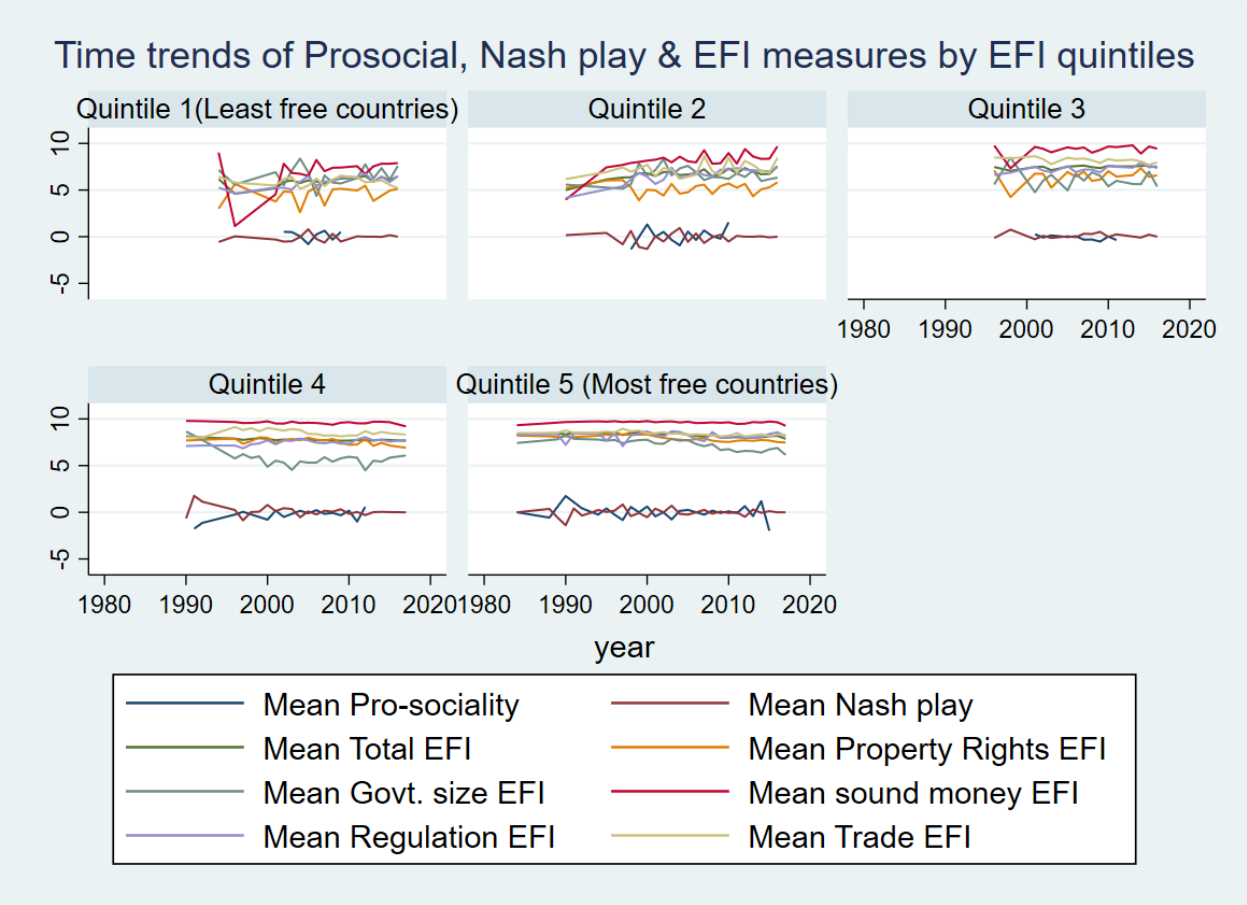


Figure 2.7: Variation in mean measures of pro-social behavior, Nash play and measures of world EFI over time for EFI quintiles

2.3.2 MSA EFI

In addition to the world economic freedom, we also look at the Fraser Institute Economic Freedom of North America data to build the Index at the USA metro level. This analyses using USA data provides corroborating evidence regarding the relationship between economic freedom and pro-social and Nash play. Looking at regions within a country provides us a different perspective on how institutional changes and changes in pro-social behavior co-evolves. Since some characteristics of institutional settings remains unchanged within a country, these within country regional analyses provides us additional proof of the differential changes in pro-social behavior than can be observed alongside even MSA level institutional changes. Due to the governance structure in USA, with power shared between the state and federal governments, we find an unique situation where some institutional changes, like taxation policies, government spending, and labour laws are decided on by state governments. This results in different MSAs within USA having differing policies on these aspects and thus

we can study how changes in these policies only might also have a relationship with changing pro-social behavior.

We divide the MSA EFI data into terciles for ease of analyses and compare the groups similar to our analysis with the world economic freedom data. As the sub-national index varies a bit from the world index, we cannot directly compare the overall economic freedom or its components at the MSA level with those at the world level. However, we find similarities in patterns across the two economic freedom indices.

For our analysis at the MSA level, once again, we look at the impact of both overall economic freedom measure as well as the impact of the major components of economic freedom on pro-social behavior and Nash play. While our model specification for models (1) and (3) remains the same as for the country level analysis, for the MSA level, as the components of economic freedom differ, we re-specify models (2) and (4) here:

$$Pro - social_{it} = \alpha_i + \beta_1 EFITaxes_{it} + \beta_2 EFIGovernmentSpending_{it} + \beta_3 EFILaborFreedom_{it} + \epsilon_{it} \tag{2}$$

$$Nash_{it} = \alpha_i + \beta_1 EFITaxes_{it} + \beta_2 EFIGovernmentSpending_{it} + \beta_3 EFILaborFreedom_{it} + \epsilon_{it} \tag{4}$$

For the top tercile of MSAs with the most econoimc freedom, we find a significant positive relationship between the domain of taxes and pro-social play as seen in Table A.8. This mimics the positive relationship noticed between economic freedom and pro-social play among the most economically free countries in our world EFI analysis.

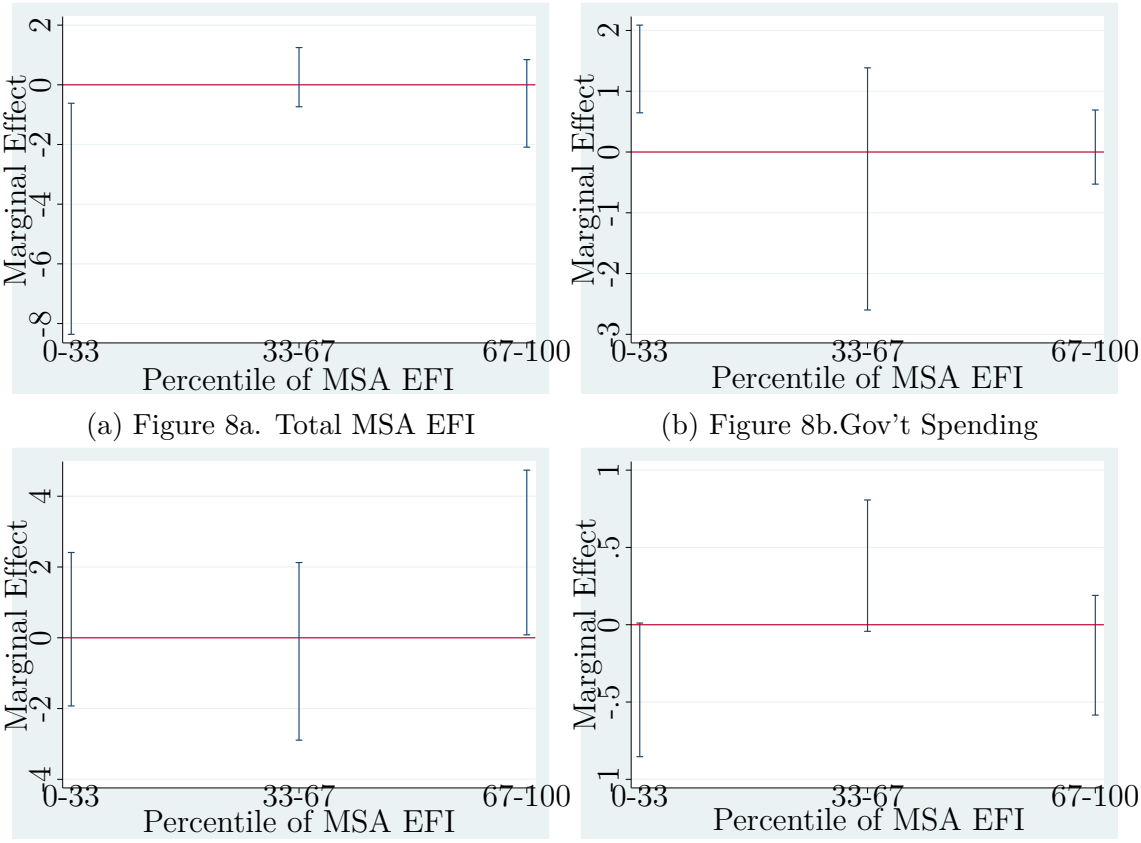
For the least economically free MSAs, we find a significant negative (positive) relationship between economic freedom and pro-social (Nash) play, as seen in Table A.10. In particular, the domains of taxes and labor freedom shows a significant negative (positive) relationship between economic freedom and pro-social (Nash) play. In addition, the domain of government spending shows a significant positive impact on pro-social play.

Similar to the world EFI measures, for the MSA EFI measures also, we look at the distribution of the marginal effect of the total EFI measure as well as the marginal effect of the components of the EFI measure on the pro-social and Nash residuals. These can be seen in figures 2.8 and 2.9 respectively.

For the MSA EFI measures, we see very high amount of variability in the distribution of the marginal effect of total EFI on the pro-social residual for the lowest tercile of MSAs. In comparison, the two upper terciles have less amount of variation in their distribution, as can be seen in figure 2.8(a).

In addition to the overall EFI measure, we also look at the marginal effect of the components of MSA EFI. Here, we find that in the case of the component of government spending, the

distribution of the marginal effect of the government spending index on the pro-social residual is very large in the case of the middle tercile. However, it is relatively more moderate in the case of the other two terciles (figure 2.8(b)). Alongside, for the distribution of the marginal effect of the index of taxes and that of labor freedom on the pro-social residual, we see moderate distributions across all terciles for both the measures (figures 2.8(c-d)).



(a) Figure 8a. Total MSA EFI

(b) Figure 8b.Gov't Spending

(c) Figure 8c. Taxes

(d) Figure 8d. Labor Freedom

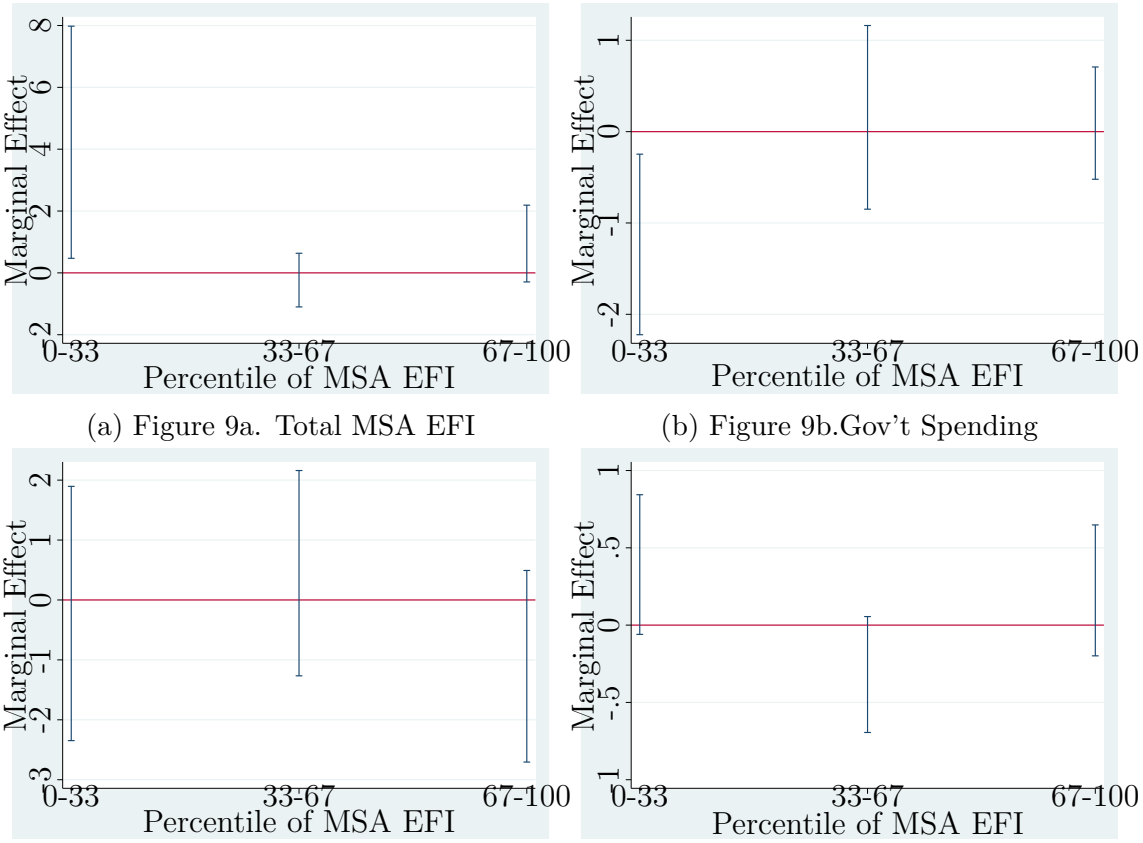
Figure 2.8: Marginal Effect of MSA EFI and its Components on Pro-social behavior

Similar to the pro-social residual, we also look at the distribution of the marginal effect of the MSA EFI measure and its components on the Nash residual. This is shown in figure 2.9.

For the distribution of the marginal effect of total EFI on the Nash residual, we see a high variability in the lowest tercile, similar to the case of the pro-social behavior. Here too, the distribution is comparatively much less in the case of the other two terciles (figure 2.9(a)).

For the case of the distribution of the marginal effect of the components of the MSA EFI on Nash residual, we see moderate levels of variability, similar to effect observed on pro-sociality, across all the terciles for all the components of the index (2.9(b-d)).

We also look at the time trends of MSA EFI measures in Figure 2.10. Here, we look at



(a) Figure 9a. Total MSA EFI

(b) Figure 9b.Gov't Spending

(c) Figure 9c. Taxes

(d) Figure 9d. Labor Freedom

Figure 2.9: Marginal Effect of MSA EFI and its Components on Nash behavior

the variations in mean measures of pro-sociality, and Nash play, alongside the variations in mean measures of MSA EFI and its components across our pre-defined MSA EFI terciles over our sample years. Figure 2.10 provides us with a comprehensive idea of the changes in the measures of EFI components across the EFI terciles corresponding to the changes in measures of co-operative behavior for these groups of MSAs within USA. These visual changes in mean measures of the EFI components alongside the corresponding changes in mean measures of co-operative behavior provides a visual representation of the correlation between them.

Our MSA level EFI analyses show some similarities in trends to our world EFI analyses. While the components of EFI for our MSA levels are different from those of world EFI, we do have some measure which are comparable. For the top most levels of EFI groups for world (top quintile) and MSA (top terciles), we see similarities in the positive relationship between pro-sociality and regulations and trade at the world level, and taxes at the MSA level. However, at the world level while we see a positive relationship between pro-sociality and overall economic freedom, we do not find any significant relationship between them at

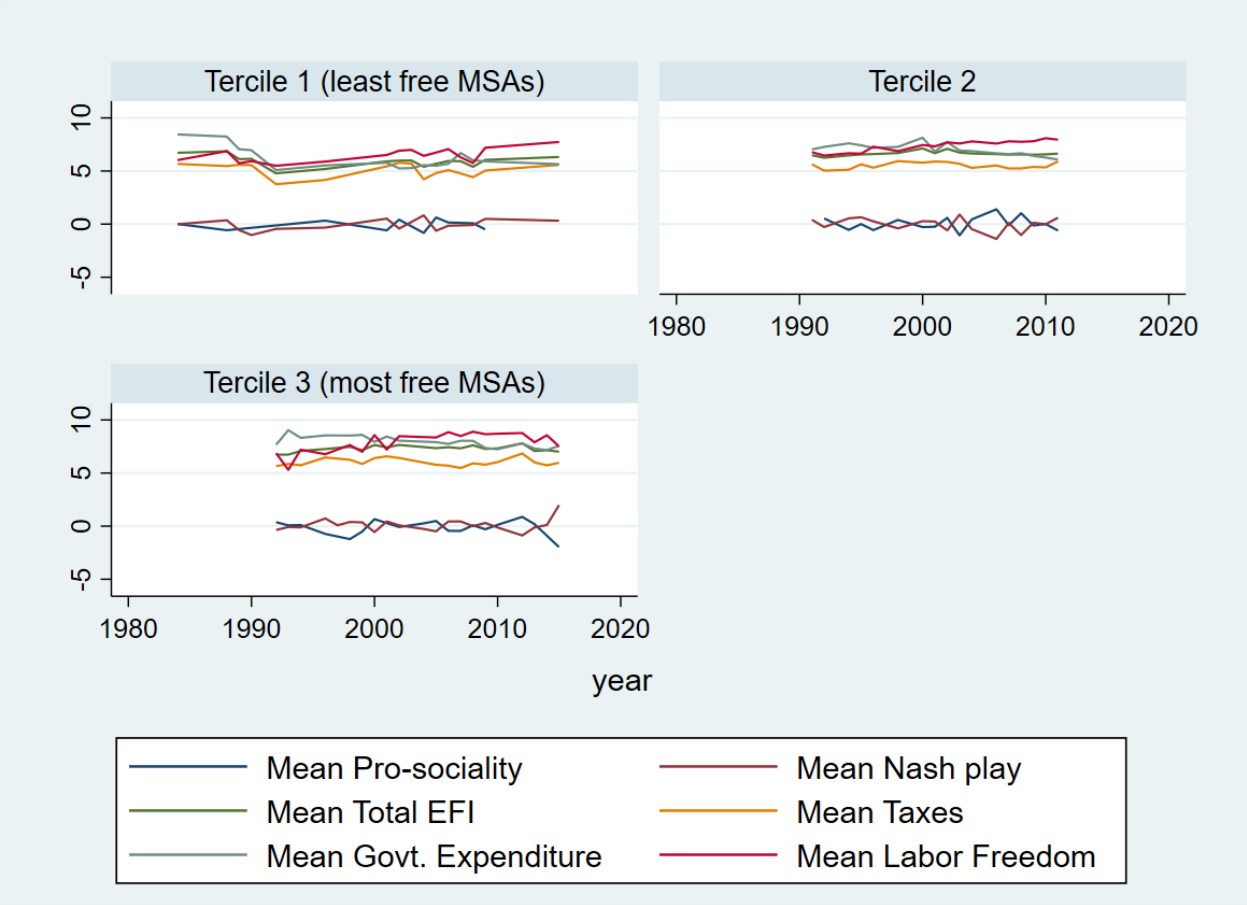


Figure 2.10: Variation in mean measures of pro-social behavior, Nash play and measures of MSA EFI over time for EFI terciles

the MSA level. For our middle rung of countries, we find significant negative relationship between an effective monetary system and pro-sociality, as well as between property rights and pro-sociality for the world EFI measures. Since both these measures do not change across MSA levels within USA, we do not have any corresponding analysis for our MSA EFI analses. For the least free segment of regions in both analyses, we observe a negative relationship between overall economic freedom and pro-sociality. However, while government spending has a positive relationship with pro-sociality for our MSA EFI analysis, we find a negative relationship between size of government and pro-sociality in our world EFI analysis. In addition, both taxes and labor freedom has a negative relationship at the MSA level while we do not see any significant relationship between regulation and pro-sociality in the world level analysis. Additionally, we do find a negative relationship between trade and Nash behavior at the world level, which does does not have a comparable measure at the MSA level. At the world level, in addition, property rights and efficient monetary system has a positive relationship with Nash behavior here. Since both these measures do not change

across MSA levels within USA, once again, we do not have any corresponding analysis for our MSA EFI analses for these.

2.3.3 Eastern Block Countries

In addition to the world economic freedom index and the sub-national economic freedom index in the case of USA, we also look at the eastern block countries specifically to inspect the relationship between economic freedom and pro-social and Nash play in these countries. These countries had a communist form of governance that shaped their societal institutions till early 1990s. Since these countries share similarities in their historical institutional background, we look into the relationship between the components of economic freedom and the level of pro-social behavior and Nash play in these societies. Since one important factor for our world level analyses has been similarities in the directional relationship between countries with similar baseline institutions, it makes sense to study the Eastern Block countries separately to explore whether we would find a directional relationship between measures of pro-social behavior and components of economic freedom by grouping these countries together and using a country fixed effects model.

These group of countries contain countries across four quintiles of our original grouping of countries based on their economic freedom. In our analyses, we have data on Georgia, Lithuania, Slovakia, Czech Republic, Hungary, Poland, Russia, and Romania. Inspite of this variation in levels of economic freedom, we do find significant directional relationship between components of economic freedom and pro-sociality. This indicates that baseline institutional structures, in this case, due to these countries shared history of following the ideologies of communism, might be pervasive even with subsequent changes in government policies.

We find a significant negative relationship between pro-social play and the domains of economic freedom including size of government, property rights, sound money, and trade, as seen in Table A.11. Additionally, we find significant positive relationship between Nash play and the domains of size of government, and trade. Our results here mimics the relationship found among the least free countries in our world EFI analysis for multiple components of economic freedom. Similar to those countries, here we see a negative relationship between pro-sociality and trade as well as size of government. This is also similar to our MSA level analysis, where the least free regions had a negative relationship between taxes, which can be seen as comparable to the size/burden of the government in this analysis. Our results indicate that a decrease in government size, where communist countries typically tended to have a large federal governance system, would lead to an improvement in pro-sociality. However, opening up trade might lead to reduced pro-sociality. In addition, our results here have some similarities with countries in the middle rungs of our world EFI levels, with similar negative relationship between pro-sociality and property rights as well as, an efficient monetary system.

2.3.4 Additional Analyses

We also perform Romano-Wolf Multiple Hypothesis Correction, which asymptomatically controls the familywise error rate (FWER), i.e., the probability of rejecting at least one true null hypothesis in a group of hypotheses under test (Clarke et al., 2020).

Corresponding to equations (1) and (3), our null hypothesis is that $\beta = 0$, versus the two-sided alternative hypothesis $\beta \neq 0$. Similarly, corresponding to equations (2) and (4), our null hypothesis is that $\beta_i = 0$, versus the two-sided alternative hypothesis $\beta_i \neq 0$, where i=1,...,5.

Figure A.1 shows the graph of null distributions for each hypothesis pooled over all EFI quintiles. We observe that our null distributions become less exacting as we move from the most significant variable (present at the top left-hand panel of the figure A.1) to the least significant variable (located at the left-hand panel in the final/bottom row of the figure A.1). The corresponding model, resampled and Romano-Wolf p-values can be found in Table A.12. Our results indicate that for the pooled quintile sample for world EFI, the component of regulation still remains significant while other components are no longer significant at the 5% siginificance level ($P < 0.05$) following the Romano-Wolf corrections. The "Resample p-value" (which as defined, remains uncorrected for the multiple hypothesis testing) which consists of contrasting each of the original estimates with the null distribution, do not change our results in any significant way. However, the Holm correction and the Romano-Wolf correction leads to only the regulation component remaining significant.

When looking at the multiple hypothesis correction with the data segmented into EFI quintiles we once again find the measure of EFI Regulation remains significant ($P < 0.001$) for the "most free" quintile of world measures of EFI (Table A.13). The other significant results do not remain significant on applying the Romano-Wolf correction. The Romano-Wolf correction avoids making any type I error and is therefore, a severe measure. Given the small sample size of the data when we divide it into quintiles of EFI measure, we do lose out on power during our analysis. Therefore, the Romano-Wolf adjusted p-values are somewhat more sensitive to model specifications, which leads to only the measure of regulation remaining robust in our analysis after this correction.

Similarly, corresponding to the respecified equations (2) and (4) for the MSA EFI measures, our null hypothesis is that $\beta_i = 0$, versus the two-sided alternative hypothesis $\beta_i \neq 0$, where i=1,...,3. Alongside, we also consider the previously specified null and alternate hypothesis for equations (1) and (3).

Similar to the world measures of EFI, for the MSA measures of EFI too, we perform Romano-Wolf Multiple Hypothesis Correction. Figure A.2 shows the graph of null distributions for each hypothesis pooled over all MSA EFI terciles. Here, we fail to reject any of our null hypotheses. The corresponding model, Re-sample p-values and Romano-Wolf p-values can be found in Table A.14. For the pooled sample, the Romano-Wolf correction does not significantly change our results.

For the individual terciles, the Romano-Wolf correction leads to significant results for various components of the MSA EFI for the bottom or "least free" tercile of regions (Table A.15. We find our results for this tercile for all components of EFI related to the measure of Nash play remains unchanged alongside our results on the relationship between the component of tax and pro-sociality. However, in other terciles, using Romano-Wolf correction leads to a loss in significance of the model results. Here, as we look at regional differences, our sample sizes are even small for each quintile, which is a major factor why a severe test like the Romano-Wolf correction leads to this result.

2.4 Discussion

Institutional change rests at the heart of modern research in development, political economy, environmental, and many other forms of applied economics. Such studies typically utilize broad survey or governmental data or utilize narrow randomized control trial data to explore the impact of institutional change upon economic decision making. These methods largely complement each other as RCTs typically provide exogenous control with an intentionally narrow geographic and institutional scope (focused typically upon a very specific institution in one or a few countries,) while survey/governmental data lack tight control but can provide a breadth of institutional and geographic scope. These studies provide a bounty of intriguing and interesting results while also bringing about lingering questions. RCTs often face a problem of lower replicability in other countries while survey results often face salience problems in drawing firm conclusions. When we observe a survey result, distinguishing between the impact of the legislative macro-institutions in an economy and the types of interactions that occur in the micro-economy and corresponding micro-institutions; e.g. the informal and formal institutions that govern individual person to person interactions, often proves to be problematic. In our study, we contribute to these literature with a meta-meta-analysis of over 1200 experimental studies from 6 meta-analyses and 50 countries to explore the relationship between country-level macro-institutional structure and behavior in person-to-person economic decision making in exogenously controlled micro-institutional economic decision making environments.

We find that marginal changes in macro-institutions have differential effects on changes in pro-social/Nash play depending upon the baseline institutional structure of the macro-economy. Our results indicate that policy-makers should not assume that policies that are effective in one country will result in similar behavior when applied in a different country, and may help explain why such exogenously implemented changes have failed in the past. Gasmi et al. (2013) looked at effect of privatization in the telecommunications sector, studying the impact of such reforms over a period of over 20 years across 108 countries and found differing effects of privatization on sector performance across the countries in their study. While the OECD countries alongside some countries in coastal Africa and Asia, and Central America and the Caribbean showed positive effect of privatization, countries in South America and

landlocked countries in Africa showed a negative impact of privatization. They explain these differences through variation in institutional structures across these countries. They find that countries with successful privatizations focused on creating institutional structures which helped facilitate the implementation and effectiveness of policies. On the other hand, privatization outcomes were poor in countries which lacked effective contracts and proper enforcement of policies in the infrastructure sector.

We find a similar pattern of results when looking at institutional changes across different metro areas within the United States that we find when looking across different countries. This helps reinforce the relationship between preferences and institutional setups in our study. Across various regional groupings, we find evidence that depending on the baseline/historic institutional structures in a country, changes in present day policies often show differential effects on our outcome variables of pro-social behavior and Nash behavior.

Our findings have large implications for the importance of replication in applied microeconomics studies of policy and institution change. Our results suggest that empirical findings about the effects of institutional change from a subset of areas are not likely to apply to institutional changes that occur in an alternative non-tested areas that have different baseline institutional foundations. Replications/extensions of such studies are needed in these alternative environments to be confident in the generalizability of findings from such applied studies. Take the development literature for example. The data of Sukhtankar (2017) showed that of 1,138 empirical development studies published in the top 10 general interest economics journals from 2000 to 2015, only 6.2 percent had another paper self-report being an attempted replication (either successful or unsuccessful.) In order to avoid the issues we indicate are possible, pure replications are not sufficient, replications that extend studies to different baseline institutional environments within a country and/or different countries is needed.

Finally, it should not be forgotten that institution change can occur from the top down (arising from a desire for change within the governing body) or bottom up (through pushes for change by the people being governed.) The degree to which each of these forms of change occurs would, of course, be expected to differ between countries. Our fixed effects analysis is useful in removing country specific time-invariant correlates of institutional change from our results. It is possible however that some country specific factors that change over time may be related to both institution change and pro-social behavior, such as changes to underlying culture and norms. Our results indicate that propensity to engage in pro-social decision making is related to institutional structure but we make no claims as to whether the institutional structural changes are causing underlying changes in factors like norms for pro-social play or whether changes in institutional structure are caused by such underlying changes in factors like norms. Our work provides strong evidence that there is an underlying mechanism that needs to be explored more. We hypothesize that future work will likely find that the causal relationship actually runs in both ways. We suspect that savvy governmental agents that notice underlying changes in their constituent populations culture and norms would adopt new policies with these changes in mind, given that these agents' incentives are

tied to the decisions of the population. Likewise, we suspect that institutional changes are noticed by a constituent population and the accompanying incentive changes expose such a population to a new set of decisions and constraints. These new decision environments require adaptation and learning which would likely be associated with an adapted culture, norms, etc. Future work is needed however to explore these causal mechanisms more directly. Our study exogenously imposes and holds the underlying decision making environment and micro-level institutions constant and explores decisions making in such environments across the spectrum of naturally varying, endogenously set, macro-level institutions. Other work that exogenously varies macro-level institutions and that allows micro-level institutions to naturally (endogenously) vary would be informative and would complement our study well.

Along the same lines, the quadratic relationship we observe between economic freedom and pro-sociality suggests that similar relative changes are resulting in differential behavioral results. This may be due to the unobserved relationship between how/why policy changes occur and the base-level of economic freedom within a country. If high and low base levels spawn bottom-up or top-down institutional changes at different rates, this may help explain why they result in differential behavioral responses changes. In the hidden costs-of-control literature, Falk and Kosfeld (2006) indicates that when individuals are exogenously controlled it matters a great deal the manner in which that control comes about. This literature suggests that those individuals who are being controlled respond differently depending upon whether control regimes comes about voluntarily or involuntarily, exogenously or endogenously, uniformly or discriminatorily, etc. Our study suggest there is great potential value in applying this experimental laboratory work more broadly to understand the relationships we between institutions (implicitly "control") and decision making that we see at play in our data.

In addition to looking at measures of economic freedom, in future, we plan on incorporating other measure of macro-institutional structure to build an an independently constructed measure for every year of data collection in every country of our data. This would include a variety of macro-institutional measures over time, relevant for macro-economic analysis, spanning the wide range of countries present in our experimental data taken from Kremer et al.(2021), which would include measurements of taxes on goods and services (as a percent of revenue), military expenditures (as a percent of GDP), measurements of political stability, regulatory quality, rule of law, and control of corruption, alongside our current measures on economic freedom. This dataset would help us explore additional measures of macro-institutional changes over time across countries, to better understand the relationship between metro-level macro-institutions and pro-social and Nash decision making.

Chapter 3

Betrayal Aversion and Emotion Reappraisal: The Case of Vaccines

Esha Dwibedi, Abdelaziz Alsharawy, Jason Aimone, and Sheryl Ball

Abstract

Betrayal aversion involves hesitancy in risking being betrayed in situations involving trust and has been linked to vaccine hesitancy in recent research. In this pre-registered vignette experiment, we inspect the impact of emotion reappraisal messaging on both vaccine hesitancy and betrayal aversion. We find that ambiguous and positive emotion reappraisal messaging leads to a significant decrease in vaccine-related betrayal aversion. The effect of these reappraisal message specifically targeted the betrayal aversion channel of vaccine hesitancy without increasing the overall willingness to get the vaccine in scenarios that lack the element of betrayal. We conducted our experiment on 1189 United States residents through Amazon Mechanical Turk in September 2021. Our results demonstrate how emotion reappraisal messaging can be targeted to reduce vaccine-related betrayal aversion, thereby shaping individuals' emotional response in the decision to vaccinate.

3.1 Introduction

Vaccination serves as a preventative healthcare measure worldwide, crucial for maintaining public health. Vaccines serve as a low-cost public health intervention which can prevent disease outbreak and lower the disease burden. Despite this, a portion of population remains vaccine hesitant. This phenomenon of a delay in acceptance or refusal of a vaccine, has typically been explained by the 3C model, which claims that three factors- confidence, convenience, and complacency influence vaccine hesitancy [(Larson H. J., 2014), (MacDonald, 2015)]. While vaccine hesitancy remains context specific, varying across time, place and vaccines, alongside the 3C model, recent works have also started inspecting other factors like demographic factors, individual risk attitudes and perception of responsibility, trust in authorities involved with vaccination drives, and lack of information or vaccine misinformation that might influence vaccine hesitancy (Truong, 2022).

To effectively promote vaccine confidence, designing appropriate health communication strategies are often necessary. Emotions like fear, anger and happiness, etc., play an important role in health decisions and incorporating emotions in health communications might lead to effective health strategies (Ferrer & Ellis, 2019). Incorporating emotions in health messaging strategies can complement other important facets of vaccine related educational strategies. Emotions maybe leveraged to attend to notions of fear and anxiety and related negative emotions, or to attend to notions of altruism and hope and related positive emotions in vaccination related messages to the public (Chou, 2020). Emotional engagement has been used extensively in strategies related to changes in health behavior (Perugini & Bagozzi, 2001). Appeals to individuals' emotions have been used effectively in designing health message interventions for changes in health behavior (Dillard & Nabi, 2006), (Lang & Yegiyan, 2008).

Betrayal aversion is a preference associated with decision-making pertaining to avoiding situations related to trust to circumvent the disutility linked with experiencing negative emotions on being betrayed (Koehler & Gershoff, 2003), (Bohnet, Greig, Herrmann, & Zeckhauser, 2008), (Aimone & Houser, 2012), (Aimone, Ball, & King-Casas, 2015). Betrayal aversion differs from risk avoidance related to environments of trust. While selecting amongst products related to safety like airbags or vaccines, individuals who are betrayal averse might tend to take up less protection from the possibility of injury due to an accident or falling ill due to the disease, to stave off a comparatively small additional chance of getting hurt by the safety device. Individuals showed significantly higher probability of buying safety devices like smoke alarms and airbags, and marginally higher probability of getting vaccinated when the risks associated with these safety products involved no chance of betrayal (Koehler & Gershoff, 2003). In a recent vignette experiment, willingness to get vaccinated reduced when there was an additional chance of getting betrayed (death resulting from side effects stemming from the vaccine) compared to a non-betrayal risk (Alsharawy et al., 2021).

Betrayal aversion, while being a significant factor influencing the decision to vaccinate, was

not captured by current vaccine hesitancy measures (Alsharawy et al., 2021). In line with the experimental framework that captures vaccine-related betrayal aversion, we designed a pre-registered vignette experiment which involves a highly infectious hypothetical disease. Our experiment is designed to measure willingness to get vaccinated across different emotion reappraisal messaging treatments while keeping the total risk level fixed. We hypothesize that vaccine hesitancy is higher when there is an additional risk of betrayal (death resulting from side effects stemming from the vaccine) compared to a non-betrayal risk. This is in line with the findings of Alsharawy et al., (2021), which we successfully replicate demonstrating again the prevalence of vaccine-related betrayal aversion. Our study further contributes to this literature by exploring the effect of different kinds of message treatments on betrayal aversion in vaccination decision environments. We also explore the effect of these messages on betrayal aversion related vaccine hesitancy.

The COVID-19 pandemic has led to heightened emotions among the population due to the changes in societal norms and structure, the prospect of and the lived reality of losing loved ones, as well as lived reality of loss of social and professional networks, financial problems, and fear regarding the disease itself [(Nicola, et al., 2020), (Taylor, 2019)]. Increased emotional reactions to the COVID-19 pandemic have led to increased anger (Lwin, et al., 2020) and fear and anxiety [(Jungmann, 2020), (Lwin, et al., 2020)] among individuals. On the other hand, a steady stream of news updates and increased polarity regarding the pandemic might also lead to a reduction in emotions related to the pandemic, and increased detachment from the crisis, resulting on some individuals underestimating the threat posed by COVID-19 [(Hall Jamieson, 2020), (Tyson, 2020)]. The prolonged and uncontrollable nature of the pandemic and the associated uncertainty has also led to increased detachment of the population from the resulting fatigue [(Morgul, et al., 2020), (Tyson, 2020)].

Prior studies on the effects of reducing emotional responses on betrayal aversion found a decline in levels of betrayal aversion alongside increased selection of safer alternatives when introduced to factors that reduce emotional response to potential betrayals, like shifting the source of betrayal from an action to an omission, or through introduction of positive imagery, or through visual or graphical representation of the associated risks, deciding for others, and thinking using an intuitive style (Gershoff & Koehler, 2011). In this study, we explore the impact of various emotion reappraisal messages on willingness to vaccinate and their impact on betrayal aversion in the context of the vaccination decision.

Research in psychology has explored the subject of psychological flexibility as a determinant of healthy living (Kashdan, 2010). One way such flexibility can be tapped into is through emotion regulation mechanisms. Emotion regulation is defined as "a process by which individuals influence what emotions they have, when they have them, and how they experience and express them" [(Gross J. J., 2015a) (Gross J. J., 2014) (Gross J. J., 2015b)]. Emotion regulation has previously been used to reduce, strengthen, or maintain the positive or negative emotions as required (Gross J. J., 2014) and has been found to have positive effect on psychological health and well-being and in achieving goals (Aldao, 2015).

Emotional appraisal refers to mechanisms through which individuals' cognition about incidents can foretell their emotional responses to them. Reappraisal focuses on restructuring the understanding and effect of an emotion eliciting situation (Gross J. J., 2003) while also changing the way an individual thinks about incidents and their impact on themselves, which might alter their emotional reactions to such events (Holmstrom, 2015). Our study also contributes to this literature by studying different kinds of emotion reappraisal messaging in the context on vaccination decisions. In our study, we explore the impact of antecedent-focused (employed before the emotional response) emotion reappraisal strategies on betrayal aversion and related vaccine hesitancy. Betrayal aversion, in this case, involving the decisions of vaccination, provides the basis for the messaging interventions aimed at emotion reappraisal targeted to reduce betrayal aversion. We design five different emotion reappraisal messaging treatments aimed at modifying the impact of the vaccination decisions. We also measure the impact of our reappraisal messaging through the SAM scale, as an additional method to explore changes in emotion brought about by our messaging treatments. The Self-Assessment Manikin (SAM) is a non-verbal pictorial assessment tool that is used to measure the reactions of an individual in the domains of pleasure, arousal, and dominance (Bradley, 1994). We use this scale to collect reported subjective affective ratings from the participants to explore changes in emotion reaction because of our messaging treatments alongside looking at effects on betrayal aversion.

Our results indicate that messages targeting emotion reappraisal related to betrayal aversion in the decision to vaccinate can reduce betrayal aversion. We find significant decrease in the measure of betrayal aversion (difference between the willingness to vaccinate in non-betrayal vs. active betrayal conditions) for messaging conditions as compared to our baseline non-messaging condition. Additionally, when looking at each individual messaging treatment, our results indicate reduction in betrayal aversion for two of our messaging treatments. While one of these treatments asked participants to "really focus on using your emotions" to help in their vaccination decisions, the other asked participants to "really focus on the emotions associated with how good you would feel" regarding the positive effects of their decision to vaccinate.

Unlike other studies that reported higher willingness to become vaccinated in the presence of effective communication [(Quinn, et al., 2013), (Nyhan, Reifler, Richey, and Freed, 2014), (Odone, et al., 2015), (Milkman, et al., 2021)], participants exposed to our message treatments do not show significant increase in willingness to get vaccinated for either the non-betrayal condition or the active betrayal condition. However, we do find willingness to vaccinate to be highly correlated with political affiliation. Our results indicate that republicans are significantly more vaccine hesitant and are more likely to "wait and see" or only get vaccinated "only if required" as compared to democrats.

Our paper is organized as follows. Next, in Section 2, we introduce the vignette experiment we conducted and describe the data and the methodology used for the analysis. Section 3 presents the relevant results of our study. Section 4 discusses some implications of our analysis and concludes.

3.2 Methodology

We conducted an online Qualtrics survey through Amazon Mechanical Turk (MTurk). The eventual sample includes 1189 participants for our pre-registered hypotheses (https://osf.io/4k3zu). This study was approved by the Institutional Review Board of a public university in the United States. Participants in our study provided informed consent and received $2.5 as compensation for completing the survey, which on average took 16 minutes to complete. Participants were asked to self-report their emotions at the beginning of the experiment using the Self Assessment Manikin (SAM) tool. They were next asked questions about a hypothetical highly infectious disease scenario (described below in Tables 3.2- 3.3). They were then asked to re-assess their emotions using the SAM tool. The participants next assessed their real-life experiences with vaccines, including exposure to decision-making related to COVID-19 alongside answering questions regarding regulation of their emotions.

Participants were specifically asked about their general perceptions regarding vaccination and toward COVID-19 in particular. Additional survey questions comprised of demographic characteristics, two extensively used vaccine hesitancy eliciting surveys adopted from the Parental Attitudes About Childhood Vaccines questionnaire [(Opel, et al., 2011), (Opel, et al., 2013)] (the 5-question PACV-short version [(Opel, et al., 2013), (Oladejo, et al., 2016)]) and the Vaccine Confidence Index questionnaire (the 4-question VCI core survey [(Larson, et al., 2016), (Larson H. J., 2018)]), and the Emotional Regulation Questionnaire (ERQ) used to gauge regulation and management of emotions in regular life [(Gross, 2003), (Ochsner, 2005)]. The survey was conducted in the United States between September 17th, 2021 and September 30th, 2021.

In our experiment, participants were introduced to a hypothetical scenario regarding a highly infectious and deadly novel future disease. Participants were informed that there exists a free and easy-to-take vaccine (via a pill) aimed to prevent this disease. To explore betrayal aversion, we modified the Koehler & Gershoff (2003) safety product task (where marginal effect on vaccine betrayal was observed) to build a within-subject survey design to detect betrayal aversion to vaccines [(Koehler & Gershoff, 2003), (Gershoff & Koehler, 2011)] similar to the design adopted by Alsharawy et al., 2021. Participants were informed that unvaccinated individuals encounter a 2% risk of death. Individuals who get vaccinated encounter a 1.01% risk of death, where 1% of the risk is attributed to the virus, while the explanation for the remaining 0.01% of the risk varies across the study treatments. In the benchmark Non-Betrayal treatment, the 0.01% risk of death encountered by individuals who get vaccinated was described as "problems unrelated to the vaccine." The reason for the 0.01% risk of death encountered by individuals who get vaccinated in our Active Betrayal treatment was described as "vaccine-induced complications (side effects)." The measure of vaccine hesitancy in our study is captured through a question to indicate participants' willingness to get vaccinated (single 7-point Likert question with options ranging from "Definitely reject" at 1 to "Definitely accept" at 7) under both betrayal scenarios. The order of the two betrayal scenarios presented were counterbalanced across participants for each of the messaging

treatments.

The difference between an individual's willingness to get vaccinated in the Active Betrayal treatments and their willingness to get vaccinated in the Non-Betrayal treatment gives us the measure of betrayal aversion at the individual level. This framework was previously tested to show that current vaccine hesitancy measures were ineffective in capturing the phenomenon of betrayal aversion despite betrayal aversion proving to be a significant source of unwillingness to get vaccinated (Alsharawy et al., 2021).

In our experiment, we inspect the impact of various emotion reappraisal messages on betrayal aversion and vaccine hesitancy. We compare the betrayal aversion changes in the different emotion reappraisal messaging treatment as compared to the baseline condition, where participants are not presented with a message. In addition, we also study changes in vaccine hesitancy for the non-betrayal and the active betrayal conditions for each message treatment compared to our baseline condition. We also explore the mechanisms through which betrayal aversion affects vaccine hesitancy in our experiment. We explore whether the hypothesized changes as per our pre-registration, in willingness to vaccinate across the various message treatments can be explained through desire to protect one-self as opposed to protecting others or through other measures like waiting for a longer period to examine the efficiency of the vaccine or accepting the vaccine only if it is mandatory.

The emotion reappraisal messaging treatments used in our study contained a message that was presented to the participants in the various messaging treatment conditions as a statement that has been circulated to the public. The statements varied across treatments in only one aspect, how the participants were asked to approach the emotions related to their decision to vaccinate.

The following statement was displayed uniformly across messaging treatments 1-4 (including *Neutral, Ambiguous, Negative and Positive* emotion reappraisal messaging conditions) in Table 3.1:

> "Health is very personal, so people often have emotional reactions associated with medical procedures. Sometimes, people do not make their best decisions when they are feeling emotional; that is why it's good to plan ahead. For the medical decision here, (*...). Register today to get the vaccine at an opportune time."

The statements for messaging treatments 1-4 varied in one aspect, as shown in Table 3.1. Take for example the *Ambiguous* messaging treatment. Here, the whole statement displayed to the participant was as follows:

> "Health is very personal, so people often have emotional reactions associated with medical procedures. Sometimes, people do not make their best decisions

when they are feeling emotional; that is why it's good to plan ahead. For the medical decision here, really focus on using your emotions to help you make a good decision. Register today to get the vaccine at an opportune time."

Table 3.1: Variation in Messaging Conditions Displayed Statements

Sl.No.	Message Treatment	Statement Displayed
1	Neutral	(*…adopt a neutral attitude by thinking objectively and analytically rather than in an emotional way)
2	Ambiguous	(*…really focus on using your emotions to help you make a good decision)
3	Negative	(*…really focus on the emotions associated with how bad you would feel if you experienced the negative effects of getting the disease if you chose to not get vaccinated)
4	Positive	(*…really focus on the emotions associated with how good you would feel if you experienced the positive effects of receiving the additional protection against the disease if you chose to get vaccinated)

The statement for the *Betrayal aversion* messaging treatment was different from the rest of the statements. Here, we described the notion of betrayal aversion and displayed a message intended to specifically target the emotions related to betrayal aversion related to vaccination decisions. For this messaging condition, the statement displayed was:

"Health is very personal, so people often have emotional reactions associated with medical procedures. Specifically, negative emotions associated with a fear of the procedure itself causing harm is known as 'betrayal aversion'. While this response can be helpful for avoiding certain dangerous situations, we do not want betrayal aversion to prevent us from receiving safe and effective protection against the virus. For the medical decision here, try to avoid letting any feelings of betrayal aversion prevent you from getting your vaccine. Register today to get the vaccine at an opportune time."

For the hypothetical disease scenarios that were described in the experiment, the vaccinated might face a *Divided Risk* scenario, where they face a 1.01% risk of death, where 1% was due to the virus, while the explanation for the remaining 0.01% varies depending on whether the betrayal stemmed from "problems unrelated to the vaccine" (*Non-Betrayal* treatment), or from "vaccine-induced complications (side effects)" (*Active Betrayal* treatment) (Table 3.2). The divided risk scenarios provide insights into the effect of our messaging treatments on betrayal aversion related to the decision to get vaccinated faced by participants in our study. Comparing the messaging interventions, we get an idea on the relative effectiveness of our messaging treatments on reducing betrayal aversion related to decision to getting vaccinated in our hypothetical disease scenario.

Table 3.2: List of Divided Risk Treatment Conditions

Treatment (Explanations for the 1.01% chance of Death after Vaccine)		
Message Treatment	Betrayal aversion question 1/ Betrayal aversion question 2	Participants
No message	Non betrayal[1@] / Active Betrayal[2@]	102
Neutral reappraisal	Non betrayal / Active Betrayal	100
Embrace Emotions Ambiguous Reappraisal	Non betrayal / Active Betrayal	104
Embrace Negative Emotions Reappraisal	Non betrayal / Active Betrayal	97
Embrace Positive Emotions Reappraisal	Non betrayal / Active Betrayal	97
Betrayal Aversion message	Non betrayal / Active Betrayal	97
Total # of Participants		597

Note for Table 3.2: Number of participants for Betrayal Aversions question 1 & 2 are order counterbalanced for each reappraisal messaging condition.

The other possibility in the hypothetical disease scenarios as described in the vignette experiment is for the participant to face an *Undivided Risk* scenario, where they face a 1.01% risk of death due to contracting the virus (Table 3.3). For these treatment conditions, we study the effect of the emotion reappraisal messages on vaccine hesitancy and explore the channels through which vaccine hesitancy might be affected in our study. Here, alongside asking participants to report their willingness to get vaccinated under the hypothetical disease scenario, we also ask participants to choose reasons for getting vaccinated raging from protecting self or protecting others to getting vaccinated only if required by their work/law. The undivided risk scenarios provide insights into the effect of our messaging treatments on vaccine hesitancy.

Table 3.3: List of Undivided Risk Treatment Conditions

Treatment (Explanations for the 1.01% chance of Death after Vaccine)	
Message Treatment	Participants
No message	96
Neutral reappraisal	99
Embrace Emotions Ambiguous Reappraisal	99
Embrace Negative Emotions Reappraisal	101
Embrace Positive Emotions Reappraisal	99
Betrayal Aversion message	98
Total # of Participants	597

3.3 Results

3.3.1 Vaccine Related Betrayal Aversion Analysis

We compare willingness to get vaccinated when the 0.01% additional risk is due to vaccine related side-effects (Active Betrayal condition) instead of vaccine-unrelated problems (Non Betrayal condition) (Figure 3.1 A and B). Participants (N=597) reported a significantly lower willingness to get vaccinated when the risk associated with vaccination was due to Active Betrayal ($M_{difference} = 0.320$; Wilcoxon signed-rank test, $P < 0.001$). This demonstrates that, similar to (Alsharawy et al., 2021), vaccine related betrayal aversion is a significant and important phenomenon for our sample of participants.

To derive a measure of betrayal aversion at the individual-level, we calculate the difference between willingness to get vaccinated in the Non Betrayal and Active Betrayal conditions. The distribution of the measure of betrayal aversion is right skewed. Our results indicate about 29% of participants can be classified as betrayal averse i.e., individuals reporting positive levels of betrayal aversion. This is relative to about 63% of participants who are betrayal neutral i.e., reporting no difference between Non Betrayal and Active Betrayal, and only 8% of participants who reported negative levels of betrayal aversion (Figure 3.1 (C)).

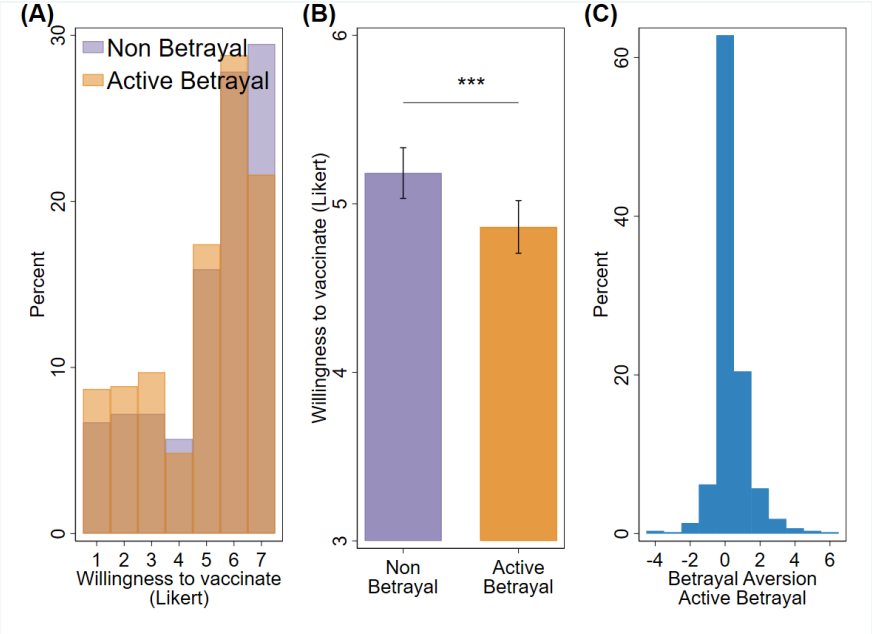


Figure 3.1: Willingness to vaccinate and betrayal aversion

Figure 3.1 (A) Distribution of willingness to vaccinate responses across Non Betrayal and Active Betrayal treatments. (B) Average willingness to vaccinate across betrayal treatments. (C) Distribution of Betrayal Aversion pooled across treatments. Errors bars denote 95% confidence intervals. Two-sided paired t-tests: $***P < 0.01, **P < 0.05, *P < 0.1$.

We also explore the general effect of messaging on betrayal aversion by comparing the betrayal aversion measure of participants in the *No Message* (Control) group with that of participants in all the message treatments pooled together. We find significant decrease in betrayal aversion among the participants (N=495) in the pooled message treatments as compared to those in the Control group (N=102) ($M_{difference} = 0.320$; Two-sample Wilcoxon rank-sum test, $P = 0.005$) (figure 3.2).

Next, we turn to our main question of exploring the impact of our five different forms of messaging upon vaccine related betrayal aversion. Table 3.4 shows the means of betrayal aversion and vaccine hesitancy measures for the different message associated emotion reappraisal treatments as compared to betrayal aversion in the baseline no message treatment.

Our results suggest that there is substantial heterogeneity in the effectiveness of different forms of messaging on reducing betrayal aversion. As compared to the No Message (N=102) condition, we find significant decreases in betrayal aversion for the *Embrace Emotions Ambiguous Reappraisal* (N=104) treatment ($M_{difference} = 0.385$; Two-sample Wilcoxon rank-sum test, $P = 0.003$) and for the *Embrace Positive Emotions Reappraisal* (N=97) treatment ($M_{difference} = 0.272$; Two-sample Wilcoxon rank-sum test, P=0.014). The betrayal aversion measure is marginally significantly lower in the *Neutral Reappraisal* (N=100) treatment ($M_{difference} = 0.229$; Two-sample Wilcoxon rank-sum test, $P = 0.056$). No significant differ-

ences in betrayal aversion are seen in the *Embrace Negative Emotions Reappraisal* (N=97) treatment ($M_{difference}$ = 0.189; Two-sample Wilcoxon rank-sum test, P=0.108) and the *Betrayal Aversion message* (N=97) treatment ($M_{difference}$ = 0.179; Two-sample Wilcoxon rank-sum test, P=0.106) when compared to the *No Message* condition.

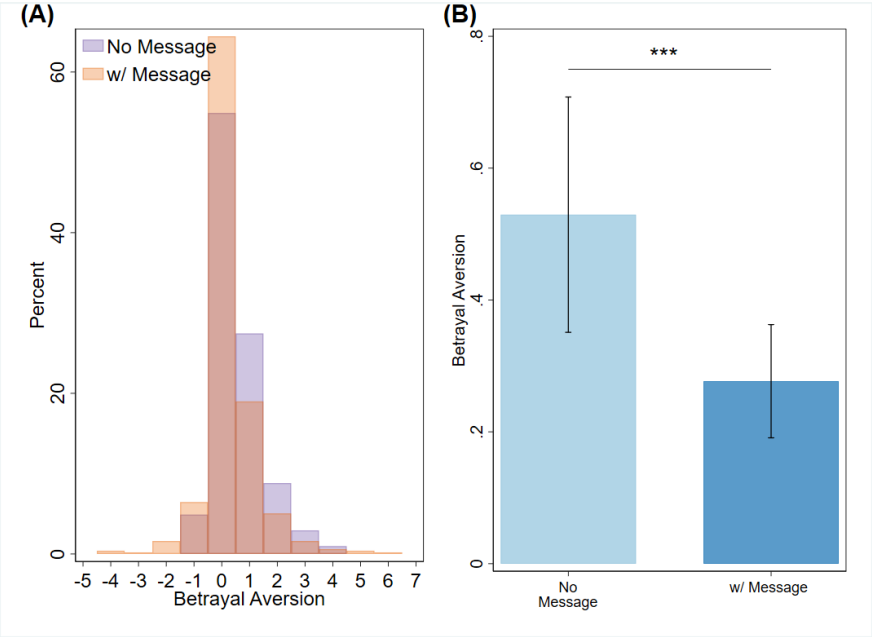


Figure 3.2: Betrayal aversion for Pooled messages vs. baseline

Figure 3.2 (A) Distribution of betrayal aversion for pooled messages vs. baseline. (B) Average betrayal aversion for pooled messages vs. baseline. Errors bars denote 95% confidence intervals. Two-sided paired t-tests: $***P < 0.01, **P < 0.05, *P < 0.1$.

Our results show that reappraisal messaging treatments that either asked participants to embrace emotions experienced during the decision to vaccinate, or to focus on the positive emotions they will experience after getting vaccinated, while they are making their vaccination decisions were the most effective in reducing betrayal aversion related to vaccination decisions among participants. These messages created an environment where people lowered their levels of distrust. We also see marginal benefits in the treatment condition which asked participants to think objectively about their decision making rather than thinking emotionally. We find no impact of the messaging treatment which asked participants to focus on the negative emotions related to getting the disease if they chose to not getting vaccinated. Specifically describing the fear related to betrayal aversion and asking participants to avoid feeling that way also does not reduce betrayal aversion. Our results indicate that leveraging emotional reactions of participants might be effective in reducing betrayal aversion if the emotional reaction can be focused on either simply recognizing that emotions related to the decision or by focusing on the positive emotions associated with either the decision or its outcome.

Table 3.4: Differences across Messaging Treatments (Two sample t-test)

Message Treatment	Vaccine Hesitancy			
	Non Betrayal (Mean)	Active Betrayal (Mean)	Betrayal Aversion (Mean)	P-values(Non Betrayal / Active Betrayal / Betrayal Aversion)
No message	5.206	4.677	0.529	
	(0.175)	(0.182)	(0.090)	
Neutral	5.02	4.72	0.3*	0.490/0.875/0.075
	(0.204)	(0.209)	(0.092)	
Ambiguous	5.077	4.933	0.144***	0.609/0.320/0.003
	(0.181)	(0.182)	(0.091)	
Negative	5.227	4.887	0.340	0.936/0.445/0.156
	(0.194)	(0.207)	(0.098)	
Positive	5.330	5.072	0.258**	0.626/0.133/0.030
	(0.184)	(0.190)	(0.086)	
Betrayal Aversion	5.247	4.897	0.351	0.872/0.416/0.231
	(0.189)	(0.201)	(0.120)	

Note for Table 3.4: Here, the P-values correspond to the Non Betrayal / Active Betrayal / Betrayal Aversion p-values for the Two sample t-test for each reappraisal message treatment as compared to the baseline No message treatment. Two sample t-tests: $***P < 0.01, **P < 0.05, *P < 0.1$.

Given we have several treatments, we also perform a multiple hypothesis correction procedure (comparing multiple messaging treatments with the control (*No Message* condition)) using the multiple hypothesis method in (List, 2019). We continue to find a significant p-value for the *Embrace Emotions Ambiguous Reappraisal* treatment (P=0.009), and a marginally significant p-value for the *Embrace Positive Emotions Reappraisal* treatment (P=0.064) (Appendix B Table B.7). Note this is using two-tailed tests. Given our a-priori hypotheses that these messages would decrease betrayal aversion we could have used 1-tail tests, in which case the *Embrace Positive Emotions Reappraisal* treatment would be more than marginally

significant and the *Neutral Reappraisal treatment* and the *Betrayal Aversion message* treatment would both be marginally significant, even after correcting for multiple hypotheses. All considered, the negative relationship between reappraisal messages and betrayal aversion appears robust.

Our results inspecting the effect of reappraisal messages (pooled together) on betrayal aversion are robust to exploring the data with a multiple linear regression analysis while controlling for individual characteristics (see Appendix B), measures of vaccine hesitancy, and geographic regions using fixed effects linear regression models ($\beta_{message} = -0.05, P < 0.001$; Appendix B Table B.2). Multiple linear regression analysis of effect of individual reappraisal message types on betrayal aversion also show strongly significant results for the same three messaging treatments that we saw with significant or marginally significant relationships in the non-parametric analysis above ($\beta_{(Neutral)} = -0.046, P < 0.001$in (1) and $\beta_{(Neutral)} = -0.045, P < 0.05$ in (2); $\beta_{(Ambiguous)} = -0.065, P < 0.001$ in (1) and $\beta_{(Ambiguous)} = -0.065, P < 0.05$ in (2); $\beta_{(Positive)} = -0.059, P < 0.001$ in (1) and (2); Appendix B Table B.3 (where (1) and (2) represent the fixed effects linear regression models with different measures of vaccine hesitancy: PACV and VCI (average) respectively)) The regressions (Table B.3) also show that there may be a marginally significant and negative relationship between the *Betrayal Aversion* message and betrayal aversion as well. Only the *Embrace Negative Emotions Reappraisal* treatment message never shows a significant or marginally significant relationship with betrayal aversion.

The regression analysis (Tables B.2 and B.3) show little correlation between control variables and betrayal aversion. Only self-reported Hispanics (positively related to betrayal aversion, $p < 0.05$ in Table B.2) and some college education (negatively related to betrayal aversion, $p < 0.05$ in Table B.2) show a significant relationship to betrayal aversion. Other control variables (like gender, political affiliation, PACV, etc.) do not show a significant relationship with betrayal aversion.

3.3.2 General Vaccine Hesitancy Analysis

Our main analysis and results also explore how emotion reappraisal messages relate to vaccine related betrayal aversion. Since betrayal aversion is calculated as a difference in willingness to be vaccinated, comparisons between treatments of betrayal aversion leave unexplored general differences in willingness to be vaccinated between treatments. Next, we turn our attention to this question of how messages affect vaccine hesitancy.

Pooling our reappraisal message treatments together, we do not observe significant differences in vaccine hesitancy between general messaging conditions and the No Messaging control for either the Non Betrayal treatment ($M_{difference} = 0.028$; Two-sample Wilcoxon rank-sum test, P=0.856) or the Active Betrayal treatment ($M_{difference} = -0.225$; Two-sample Wilcoxon rank-sum test, P=0.108). We also do not find differences in the effectiveness of any individual reappraisal messaging treatments on reducing vaccine hesitancy among par-

ticipants as compared to the No Messaging treatment for either the Non Betrayal treatment or the Active Betrayal treatment. The results hold on exploring the data with a multiple linear regression analysis while controlling for individual characteristics (see Appendix B), measures of vaccine hesitancy and geographic region in fixed effects linear regression models (Appendix B Table B.4).

We continue to find no significant relationship between messaging treatment type and willingness to vaccinate when breaking willingness to vaccinate up into motivating factors (vaccination to protect oneself, to protect others, to wait and see, and to only get vaccinated if required) on performing Two-sample Wilcoxon rank-sum (Mann-Whitney) tests for all our messaging treatments. Our result holds when we use a multiple linear regression analysis of effect of individual reappraisal messages on willingness to vaccinate disassociated by the motivating factors to get vaccinated (Table B.5-B.6).

Unlike betrayal aversion, we do see that willingness to vaccinate is highly correlated with political affiliation. More specifically, whether looking at non-betrayal treatments ($p < 0.05$), active betrayal treatments ($p < 0.1$), or breaking up willingness to vaccinate into motivating factors ("benchmark", "to protect oneself", or "to protect others"; $p < 0.01$ in each case) republicans are significantly more vaccine hesitant than democrats (and significantly more positively correlated with motivating factors of "wait and see", $p < 0.01$, and "only if required", $p. < 0.05$).

3.4 Discussion

Betrayal aversion has been shown to be an important contruct in the preference related to the decision of vaccination while also not being considered by the current measures of vaccine hesitancy (Alsharawy et al., 2021). Like other decision-making situations involving safety products where these products despite reducing overall risk, due to the small probability of harming individuals are often not chosen, in the realm of vaccination decision-making, we explore the impact of different emotion reappraisal messaging on the willingness to vaccinate and on betrayal aversion.

We find specific message interventions to be highly effective in reducing betrayal aversion without increasing the overall willingness to get the vaccine in scenarios that lack the element of betrayal. This indicates that the emotion reappraisal messages were successful in targeting individuals' betrayal aversion. Messages that appealed to embrace the ambiguity in the emotions felt regarding vaccination decisions as well as messages that appealed to embracing the positive emotions from getting vaccinated were both successful in decreasing betrayal aversion among the subjects as compared to the no message baseline condition.

While our betrayal aversion message cautioning about the emotions associated with betrayal aversion does not lead to an increase in willingness to vaccinate nor a decrease in betrayal aversion, this contrasts with previous studies that show messaging to be have a positive effect

on willingness to vaccinate [(Milkman, et al., 2021), (Loomba, de Figueiredo, Piatek, de Graaf, & Larson, 2021)]. We also do not see significant effect in the specific channels through which the message treatments might affect the willingness to vaccinate decision. Specifically targeted messaging treatment inducing regret was previously shown to significantly impact willingness to vaccinate through the desire to protect others (Alsharawy et al., 2021). In addition, we find differences along political orientation and level of education among factors (to protect oneself, to protect others, to wait and see, and to only get vaccinated if required) which are important in the decision to get vaccinated.

The results of this study would motivate research in the context of both emotion reappraisal messaging and vaccine hesitancy, while bringing forth betrayal aversion as an important factor in the decision to vaccinate. While vignette experiments are often an important preliminary step in a multi-method research project, further field research on messaging that influences betrayal aversion might prove helpful in the context of decision making regarding various safety products, which might have a small probability of causing harm, while overall reducing risk. More research is required in the channels through which betrayal aversion affects vaccine hesitancy. This would help design better interventions that would target vaccine hesitancy through reduction of betrayal aversion.

Chapter 4

Impact of a Nudge Experiment on Academic Outcomes and Flu Vaccination

Esha Dwibedi, Sheryl Ball, and Steve Trost

Abstract

Introductory economics courses are often taught using traditional classroom lectures and assignments. We propose a supplementary method of instruction by introducing the option of taking part in a nudge experiment as part of coursework to improve understanding and build curiosity on topics related to the proposed experiment. We find significant improvement in terms of both class engagement and test scores on topics related to the experiment for students who had the opportunity and chose to participate in the experiment. In addition, since the nudge treatment was designed to improve flu vaccination uptake, we also find significant improvement in flu vaccination uptake among individuals who received the nudge. Our results indicate significant gender effects on vaccination uptake alongside differences in uptake based on political orientation.

4.1 Introduction

Active learning is a pedagogical technique incorporating in-class activities and problem-solving approaches to improve student engagement in learning and understanding of study material. Active engagement in the classroom leads to better learning outcomes as compared to the passive lecture environment. This observation is supported by extensive research, especially in college-level science courses (Deslauriers et al., 2011; Freeman et al., 2014). There also exists evidence that active teaching strategies lead to increased attendance, engagement, and improved attitudes regarding the subject matter (Watkins et al., 2013). However, traditional methods of lecturing are used extensively, especially in large-enrollment college courses (Handelsman et al., 2004; Stains, M. et al., 2018). Introductory economics, as is taught in most classrooms is usually a blend of core economic theories and real-world applications. The usual mode of instruction in most cases is a traditional lecture on these theories and their real-world applications supplemented by reading assignments. Prior active learning methods in economics have explored paired activities, one-minute papers, classroom experiments, and team-based learning techniques to improve learning in classrooms (Hettler, 2015).

Active learning studies in economics and business studies have explored the use of a variety of techniques aimed at improving student engagement and a better understanding of the subject matter. Prior studies have used stand-alone procedures like one-minute papers (Chizmar and Ostrosky, 1998), classroom experiments (Ball et al., 2006), paired activities (Mills and Cottell, 2003), etc., which introduce specific activities geared towards generating independent thinking and improved engagement within the traditional mode of classroom instruction. Other studies have used methods like Team-Based Learning (TBL) (Michaelsen et al., 2003; Espey, 2012; Hettler, 2006), Classroom Response Systems (CRS) (Fies and Marshall, 2006), service learning (Ziegert and McGoldrick, 2008), etc., that restructured the course to incorporate active learning approaches to improve education outcomes. The intervention used in our study falls under the former category and uses the one-minute paper intervention alongside the opportunity to participate in a field experiment to improve education outcomes and student engagement.

The one-minute paper is a classroom assessment technique that has been used as a means for continuous quality improvement (Soetaert, 1998). One-minute papers have been used to engage students and provide feedback to instructors on effective learning and the effectiveness of teaching approaches (Vonderwell, 2004).

In the last few minutes of the class, the one-minute paper is provided to the students, wherein they are asked to respond to a variation of the following two questions:
1. What is the most interesting thing you learned in today's class?
2. What question do you still have about the topic discussed in today's class?

These two questions together provide instant and detailed feedback on the effectiveness of classroom instruction on students' learning. Chizmar and Ostrosky (1998) empirically proved one-minute papers to have an effect on students' understanding of the coursework,

irrespective of instructor and students' ability in an introductory economics course. However, there exists evidence of limited use of one-minute papers in economics instruction, with a survey of 591 US academic economists showing almost no usage of techniques like the one-minute paper (Becker and Watts, 2001). In a similar vein, Stead (2005) found the use of one-minute papers among only 3.7% of survey respondents in York's Department of economics. Interestingly, in a different survey conducted among subscribers of an online forum on economic history instruction, Stead (2005) found that 38.9% of respondents have used one-minute papers in their classes. The author does contribute this difference primarily to the potential sample bias from the active user pool in the online forum. Our study uses the submission of the one-minute paper as a measure of engagement in the class.

Our study contributes to the literature on active learning by exploring the effects of participation in a longer-term experiment on the education outcomes of undergraduate students in the context of economics education. We propose a health intervention nudge experiment that can be conducted in multiple phases during one semester, to involve students in a field experiment on a topic relevant to their course. This would provide students with a broader understanding of how field experiments are conducted in economics as well as provide us an understanding of how education outcomes might be affected by exposure to field experiments during an early introduction to economics as a subject to college-going students. We measure education outcomes through test scores as well as a measure of engagement in the classroom and find a significant increase in both test scores relevant to the topic of the experiment and in displayed engagement among both individuals who had the opportunity of participating in the experiment and individuals who actively participated in the experiment as compared to individuals who were only taught about the experiment.

In addition to serving as a mechanism of active learning in classrooms, the proposed experiment also serves as a nudge experiment designed to improve flu vaccination uptake. Influenza can be a grave and potentially fatal disease across all age groups. Influenza outbreak among college students have been previously studied and shows high transmission rates with the highest being among students who live on-campus (Uchida et al., 2012; Guh et al., 2011; Pons et al., 1980). Illness resulting from influenza can also adversely affect academic performance and class attendance (Nichol et al., 2005). While the seasonal flu vaccine has been proved to be successful in stopping influenza among otherwise healthy college-going adults (Couch, 1996), the incidence of influenza vaccination is consistently low among college-going adults (Uddin et al., 2010; Poehling et al., 2012).

Additionally, since the advent of COVID-19, ensuring widespread seasonal influenza vaccinations would also help mitigate the effects of COVID-19 in two ways. First, reducing flu incidence allows the healthcare system to conserve resources for treating COVID-19 (van Binsbergen and Opp, 2020). Second, existing research indicates that flu vaccinations have been associated with decreased risk of COVID-19 (Marín-Hernández, et al., 2020) that flu is associated with contracting other infectious diseases (Cohen et al., 2015), and that widespread flu vaccination has the potential to significantly decrease COVID-19 incidence (Li et al., 2020).

Various interventions designed to increase the uptake of vaccination have been used across the world, with varying degrees of success. These range from educational interventions, reminders, and messaging interventions, to incentives and reducing the proximity of services (Siddiqui et al., 2022). One such approach to increasing the utilization of preventative healthcare services is to improve access to healthcare facilities by reducing the distance between an individual's location and available healthcare facilities, to reduce travel and time costs related to healthcare. There exist conflicting results from prior studies on the relationship between the distance from an individual's location and health care facilities and utilizing those health care facilities (Buchmueller et al., 2006; Allard, 2003; Baumgardner et al., 2006). Beshears et al., (2016) explored the impact of functional proximity as compared to actual proximity to medical facilities in improving workplace vaccination. They found that individuals who had an increased chance of passing by the vaccination clinic for reasons other than specifically arriving to get vaccinated, showed a higher likelihood of getting vaccinated through the free influenza vaccination clinic at their workplace. They hypothesized this result to arise from these individuals walking by the vaccination clinic for any other purpose and getting reminded of the chance to get vaccinated and defined this as functional proximity. They found this to be a better measure of improving vaccination as compared to direct physical proximity to the vaccination clinic. Our study also contributes to this literature on studying how reducing proximity to healthcare services affects health outcomes. We use a similar principle as Beshears et al., (2016) in designing our nudge treatment by increasing the chance of individuals in the nudge treatment being near a vaccination facility and find a significant increase in flu vaccination uptake among individuals in our nudge treatment as compared to our non-nudge treatment.

Our paper is organized as follows. Next, in Section 2, we describe the nudge experiment we implemented and describe the survey data used we collected for our study. Section 3 presents the models used for our analysis and the results. Section 4 discusses some implications of our analysis and concludes.

4.2 Materials and Methods

We conducted a Nudge experiment on students enrolled in introductory Principles of Economics course at a University in the fall of 2021. The final sample included 928 participants. This study was approved by the Institutional Review Board of a large public university in the United States. Participants provided informed consent and were eligible for extra credit as an incentive for taking part in the two rounds of surveys as part of the experiment. [1]

Two classes of introductory Principles of Economics were chosen and treatment conditions

[1] There was an additional option of writing an essay on a topic related to behavioral economics and health interventions, that was designed to require a similar time investment as taking part in the two surveys and performing the task required after the first survey. This served as an alternative to earning extra credit for students who were not interested in taking part in the surveys.

were randomly assigned to the two classes as part of the experiment. The third class of introductory Principles of Economics served as the Control group. The instructor for the two treatment condition classes was the same. However, the instructor for the class selected for the Control group was different. Participants were assigned to treatment groups based on the class they were enrolled in. The experiment was presented as a chance to take part in a field experiment relevant to a topic to be covered in class. This active learning approach to the particular module on behavioral economics, which was a part of the course structure, thus enabled students to learn about the topics discussed in class later on in the semester, through introspection of their responses as well as through aggregate results of the experiment that were discussed on the day the topic was covered in class. The experiment was introduced by the instructor during a normal class session. The students were provided a link for the survey and given around a week to complete each phase of the survey, with around a month's gap between the two surveys. The students were given a code at the end of the survey that they had to upload as part of the course assignment, which was matched with the survey responses for awarding the extra credit assigned to the completion of the surveys.

The participants enrolled in the two classes selected for the two treatment conditions were asked to complete the first round of survey questions aimed at collecting demographic questions as well as questions on vaccination attitudes and knowledge using Qualtrics. At the end of this first survey, participants were provided information on avenues providing flu vaccination and then were shown a message asking them to take a picture of themselves at certain venues(depending on the treatment condition they were assigned to).

The participants assigned to the *Incentive* treatment were asked to take their picture at "any Sports Facility (gym, sports practice courts, etc.)", while those assigned to the *Incentive and Nudge* treatment were asked to take their picture at "any venue that is currently providing flu-shots". The experiment was designed to keep the time cost and travel cost to the two types of venues (described in the two treatment conditions) for the participants equivalent.

The participants in the two treatments were asked to complete a second survey after around a month after the first survey completion. Participants were asked to provide the picture they were asked to take as part of the experiment here. They were asked to upload their picture using Qualtrics. These photos were then manually verified to ensure that they fit the criterion specified in the message shown to the participant. They were also asked about their current flu season vaccination status. Participants received extra credit for each survey they completed. For the health outcome analysis, We included participants who took part in both the surveys in our final sample. The summary statistics of relevant demographic information collected through the surveys can be found in Appendix C Table C.1.

Participants assigned to the two treatment arms as well as the control condition were next asked to attend a lecture by a guest lecturer on behavioral economics and nudges (with a special focus on their application in health interventions) during scheduled class times and were thereafter tested on their knowledge on topics relevant to behavioral economics and nudges. We had a guest lecturer take this class across all our conditions to minimize any

instructor effect on the participants' education outcomes. This test consisted of five questions covering the understanding of behavioral economics, nudges, and health interventions. Each question carried a score of 1 leading to a total score of 5 for the exam. We standardize this total score for our analysis.

They were also assigned a one-minute paper assigned to gauge their class engagement. We use the submission of the Minute Paper assignment as an indicator of class engagement. This indicator takes the value of 1 for submission of the Minute Paper and 0 for non-submission of the Minute Paper.

Our final sample for the education outcomes analysis included data from participants across the two treatments and the control condition who took the assigned test on the topic of the guest lecture. The detailed breakup of participants across the treatment and control conditions for both the education outcome and the health outcome analysis is given in Table 4.1.

Table 4.1: List of Conditions

Condition/Treatment	# Participants	
	Education Outcome	Health Outcome
Control	88	-
Incentive	413	246
Incentive and Nudge	427	282

4.3 Results

We explore the effect of the interventions on education outcomes in the form of test scores and class participation, and on health outcomes in the form of vaccination uptake. The summary statistics can be found in C.1.

4.3.1 Education Outcomes

We look at the impact of being given a chance to participate in an actual nudge experiment on class engagement, measured through submission of the assigned Minute Paper. We see that participants assigned to either of the treatment conditions (N=840) showed significantly higher engagement as compared to the participants assigned to the Control condition (N=88), who did not have the opportunity of participating in the experiment (Pearson's chi-squared test= 289.87, d.f.= 1, $P < 0.001$; Fisher's exact test, $P < 0.001$)(Figure 4.1(A)). We also find significant difference in engagement among participants who took part in the experiment

when given the opportunity (N=507) as compared to participants who did not participate in the experiment when given the opportunity (N=333) (Pearson's chi-squared test= 27.45, d.f.= 1, $P < 0.001$; Fisher's exact test, $P < 0.001$)(Figure 4.1(B)).

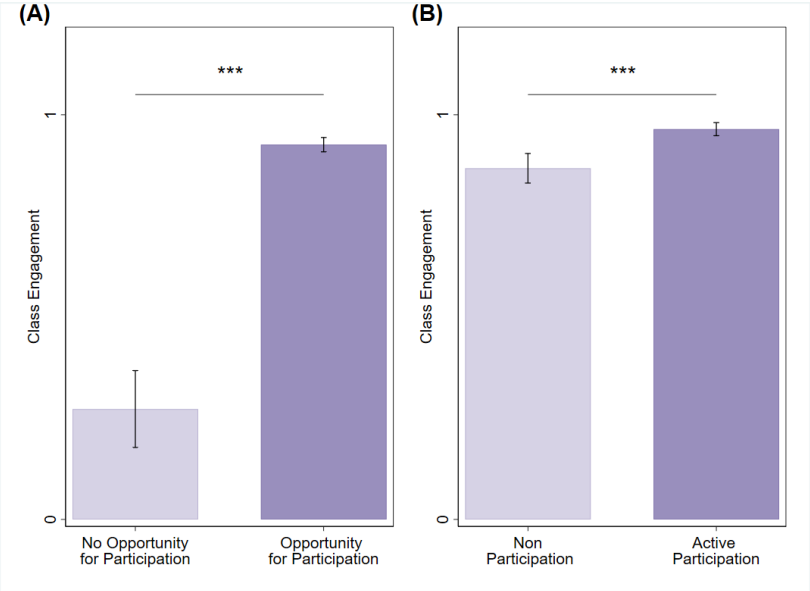


Figure 4.1: Differences in class engagement. (A) Differences in engagement based on opportunity of participation in nudge experiment. (B) Differences in engagement based on active participation vs. non participation in nudge experiment when given the opportunity

We use a binary logistic model to estimate the effect of the *Incentive* treatment and the *Incentive and Nudge* treatment as compared to the *Control* on the submission of Minute Paper, which we use as an indicator for class engagement. We find a positive significant effect ($P < 0.001$) of the both the treatments as compared to the control on submission of the minute paper. We also find a positive significant effect ($P < 0.001$) of active participation (participating in the experiment when given an opportunity to participate) on submission of the minute paper (Appendix C Table C.2).

We also investigate the impact of opportunity of participation in the nudge experiment and impact of actual participation in the experiment on education outcome in the form of test score. We standardize the original test score containing values 0 to 5 to form our dependent variable. We observe a significant improvement in standardized test scores among participants (N=840) assigned to either of the treatment conditions as compared to participants (N=88), who did not have the opportunity of participating in the experiment ($M_{difference} = -0.228$; Two-sample Wilcoxon rank-sum (Mann-Whitney) test, $P < 0.05$)(Figure 4.2(A)). When comparing the standardized test scores of participants who took part in the experiment when given the opportunity (N=507) as compared to participants who did not participate in the experiment when given the opportunity (N=333) we find significant improvement in test scores for participants who actively participated ($M_{difference} = -0.268$;

Two-sample Wilcoxon rank-sum (Mann-Whitney) test, $P < 0.001$)(Figure 4.1(B)). We do not find any significant difference in test score outcome between the two treatment arms ($M_{difference} = 0.102$; Two-sample Wilcoxon rank-sum (Mann-Whitney) test, P=1.289). Thus, while opportunity to take part and actually participating in the experiment does have an impact on test scores, placing individuals in any particular treatment intervention within the nudge experiment does not have any impact on test scores.

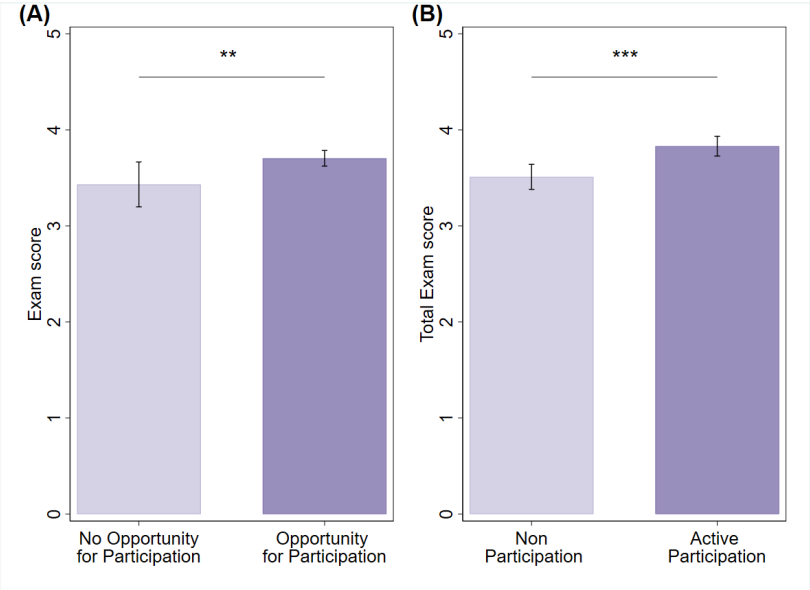


Figure 4.2: Differences in test scores. (A) Differences in test scores based on opportunity of participation in nudge experiment. (B) Differences in test scores based on active participation vs. non participation in nudge experiment when given the opportunity

We use a multiple linear regression model to estimate the effect of the *Incentive* treatment and the *Incentive and Nudge* treatment as compared to the *Control* on our standardized test scores. We do not find significant effect of either of the treatments on the standardized test scores across most of our models (Appendix C Table C.3, models 2-4). We do find positive significant effect ($P < 0.05$) of the *Incentive* treatment on test scores for model 1 (Appendix C Table C.3). However, the *Incentive and Nudge* treatment is not significant here either. We do find a positive significant relationship ($P < 0.001$) between active participation in the experiment and test scores (models 2 and 4 (Appendix C Table C.3)). We also find a positive and significant impact ($P < 0.001$) of submission of minute paper, indicating interest in the topic, on test scores (models 3 and 4 (Appendix C Table C.3)).

4.3.2 Health Outcomes

Other than education outcomes, We also look at the impact of our two interventions on health outcome represented by the uptake of flu vaccination. We have data on health outcomes

for 528 participants (who completed both the surveys). Since our two treatments differed on the introduction of a nudge, we look at the impact of the nudge on flu shot uptake. We find participants (N=246) assigned to the *Incentive and Nudge* treatment shows significant difference from participants (N=282) assigned to the *Incentive* treatment (Pearson's chi-squared test= 33.79, d.f.= 1, $P < 0.001$; Fisher's exact test, $P < 0.001$)(Figure 4.3(A)). We also find that while there exists significant differences in flu shot uptake between male participants (N=148) assigned to the *Incentive and Nudge* treatment as compared to male participants assigned to the (N=176) *Incentive* treatment (Pearson's chi-squared test= 38.12, d.f.= 1, $P < 0.001$; Fisher's exact test, $P < 0.001$), there doesn't exist any significant differences between female participants (N=95) assigned to the *Incentive and Nudge* treatment as compared to female participants assigned to the (N=103) *Incentive* treatment (Pearson's chi-squared test= 38.12, d.f.= 1, $P < 0.001$; Fisher's exact test, $P < 0.001$)(Figure 4.3(B)).

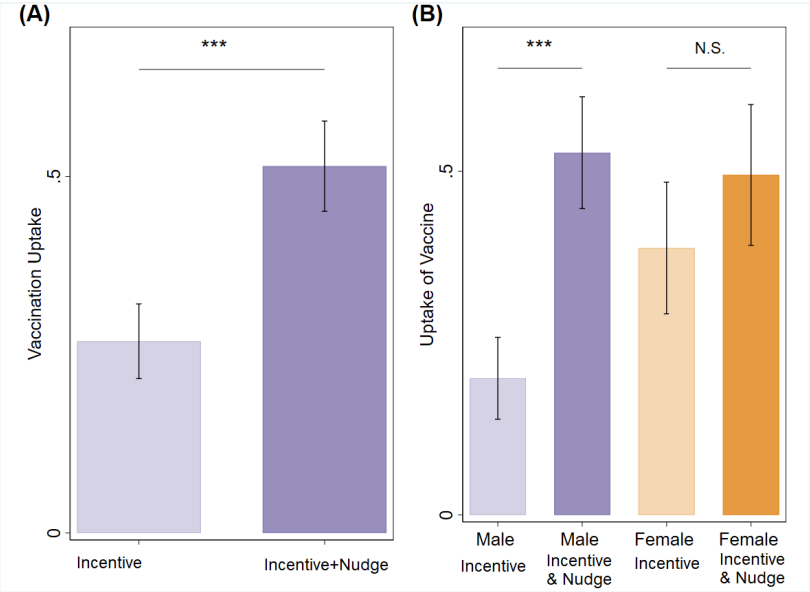


Figure 4.3: Differences in flu shot uptake. (A) Differences in flu shot uptake based on treatment assignment. (B) Differences in flu shot uptake based on gender across treatments

We also find differences in vaccine uptake for the two interventions based on political ideologies. We find participants (N=145) who identify as Republican show significant differences among participants (N=64) assigned to the *Incentive and Nudge* treatment as compared to participants assigned to the (N=81) *Incentive* treatment (Pearson's chi-squared test= 19.37, d.f.= 1, $P < 0.001$; Fisher's exact test, $P < 0.001$). Similarly for participants (N=140) who identify as Independent, we see a significant difference among participants (N=66) assigned to the *Incentive and Nudge* treatment as compared to participants assigned to the (N=74) *Incentive* treatment (Pearson's chi-squared test= 17.59, d.f.= 1, $P < 0.001$; Fisher's exact test, $P < 0.001$). However, we do not find any significant differences among participants (N=94) assigned to the *Incentive and Nudge* treatment as compared to participants assigned

to the (N=94) *Incentive* treatment (Pearson's chi-squared test= 2.64, d.f.= 1, $P = 0.104$; Fisher's exact test, $P = 0.109$) for individuals who identify as Democrat (N=186) (Figure 4.4).

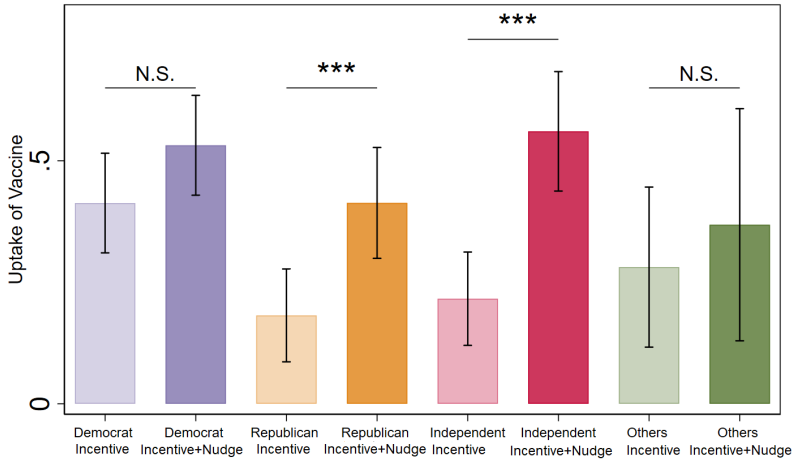


Figure 4.4: Differences in flu shot uptake based on political ideologies

We use a binary logistic model to estimate the effect of the nudge treatment (model 1), controlling for demographic factors (model 2), knowledge and perception regarding flu (model 4), risk and time preferences, and well as measures of altruistic nature and reciprocal behavior (model 5) (Appendix C Table C.4). We find the nudge treatment to have a positive and significant effect ($P < 0.001$) on uptake of flu vaccination across all models (1-4). Age has a negative and significant effect ($P < 0.05$) on uptake of vaccination (model 2-4). We also find a negative and significant impact ($P < 0.05$) of identifying as a Republican as compared to a Democrat (model 2) on flu vaccination uptake. Last year's reported flu vaccination and strong perception regarding dangers associated with flu has a positive significant effect ($P < 0.001$) on vaccination uptake. Knowledge regarding flu shot also has a positive significant effect ($P < 0.05$) while knowledge about flu has a negative significant effect ($P < 0.05$) on vaccination uptake.

4.4 Discussion

Our results suggest that introducing supplementary methods to traditional lecture style of education can lead to improved education outcomes and improve class engagement among students at the college level. Introducing real-world application of economic theories and encouraging participation in experiments would prove to be beneficial in generating an interest in topics related to the coursework. While participation in multiple elaborate field experiments might not be possible during the duration of one course, actual participation in one such experiment might also lead to increased class engagement and interest in learning

about theories and real-world applications in other topics taught in the course. Future work in this direction could provide a better understanding of whether active learning modules for some course topics would lead to better education outcomes for the course overall. We do not control for individual fixed effects in our study other than using the submission of the Minute Paper as an indicator of class engagement, while looking at the impact of test scores. Controlling for individual academic performance fixed effects, by incorporating the academic history of individual participants would lead to a more robust model with a better understanding of the active learning method in improving education outcomes.

Depending on the kind of experiment being chosen, it might also lead to other beneficial real-world outcomes. In our experimental design, we observe an improvement in flu vaccination uptake among participants who were introduced to the nudge treatment in the experiment conducted. This additional health outcome benefit also supports the existing literature on various behavioral interventions designed to improve vaccination rates. We find evidence that functional proximity to vaccination centers, which is a factor relevant in vaccination decisions, can be strengthened by introducing nudges that places individuals in close proximity to vaccination centers. Policies aimed at improving vaccination rates as well as other preventative healthcare measures can be improved upon through inclusion of such nudge interventions, which reduced the functional proximity of the preventative care center and the individual. Our results indicate policies and incentives that can be implemented for college going adults, who exhibit one of the lowest vaccination rates for influenza vaccine among adults.

We also find significant gender differences in uptake of flu vaccines, with male subjects significantly increasing their vaccination uptake in the nudge treatment. We also find differences in vaccination attitudes along political ideologies, with Republicans and Independents significantly increasing their flu vaccination when nudged. These indicates that designed incentives and nudges might disproportionately change the behavior of a particular demography. Further work on designing incentive structures and nudges targeted at particular demographics might provide a more comprehensive idea about the impact of targeted incentive structure and nudges and lead to better designed targeted policies.

Bibliography

[1] **Abeler, J., Nosenzo D., and C. Raymond.** 2019. "Preferences for truth-telling." *Econometrica*, 87(4): 1115–1153.

[2] **Adkins, L.C., Moomaw R.L., and A. Savvides.** 2002. "Institutions, Freedom, and Technical Efficiency." *Southern Economic Journal*, 69(1): 92–108.

[3] **Aghion, P., Algan Y., and P. Cahuc.** 2011. "Civil society and the state: The interplay between cooperation and minimum wage regulation." *Journal of the European Economic Association*, 9(1): 3–42.

[4] **Aimone, J., Ball S. & King-Casas B.** 2015. "The Betrayal Aversion Elicitation Task: An Individual Level Betrayal Aversion Measure." *PloS one*, 10: e0137491.

[5] **Aimone, J., & Houser D.** 2012. "What You Don't Know Won't Hurt You: A Laboratory Analysis of Betrayal Aversion." *Experimental Economics*, 15: 571–588.

[6] **Aldao, A., Sheppes G., and J. J. Gross.** 2015. "Emotion regulation flexibility." *Cogn. Ther. Res.*, 39.

[7] **Alesina, Alberto, and Nicola Fuchs-Schündeln.** 2007. "Good-bye Lenin (or Not?): The Effect of Communism on People's Preferences." *American Economic Review*, 97(4): 1507–1528.

[8] **Alesina, Alberto, and Paola Giuliano.** 2015. "Culture and Institutions." *Journal of Economic Literature*, 53(4): 898–944.

[9] **Algan, Y., and P. Cahuc.** 2010. "Inherited Trust and Growth." *The American Economic Review*, 100: 2060–2092.

[10] **Allard SW, Tolman RM, Rosen D.** 2003. "Proximity to service providers and service utilization among welfare recipients: the interaction of place and race." *J Pol Anal Manage*, 22: 599–613.

[11] **Alsharawy, A., Dwibedi E. Aimone J.-Ball S.** 2022. "Vaccine Hesitancy and Betrayal Aversion." *Ann Biomed Eng*, 50(7): 794–804.

[12] **Arrow, K.J.** 1972. "Economic Welfare and the Allocation of Resources for Invention." *Rowley C.K. (eds) Readings in Industrial Economics. Palgrave, London*, 219–236.

[13] **Ashby, N.J.** 2007. "Economic Freedom and Migration Flows between U.S. States." *Southern Economic Journal*, 73(3): 677–697.

[14] **Ball, Sheryl B., Catherine C. Eckel, and Christian Rojas.** 2006. "Technology Improves Learning in Large Principles of Economics Classes: Using Our WITS." *American Economic Review Papers and Proceedings*, 96(2).

[15] **Baumgardner DJ, Halsmer SE, Steber DL-et al.** 2006. "Does proximity to clinic affect immunization rates and blood pressure?" *Int Psych Med*, 36: 199–209.

[16] **Becker, W., and M. Watts.** 2001. "Teaching Methods in US Undergraduate Economics Course." *Journal of Economic Education*, 32(3).

[17] **Bengoa, M., and B. Sanchez-Robles.** 2003. "Foreign direct investment, economic freedom and growth: new evidence from Latin America." *European Journal of Political Economy*, 19: 529 – 545.

[18] **Benjamin, D. J., Cesarini D. Van Der Loos M. J. Dawes C. T. Koellinger P. D. Magnusson P. K. Chabris C. F. Conley D. Laibson D. Johannesson M. Visscher P. M.** 2012. "The genetic architecture of economic and political preferences." *Proceedings of the National Academy of Sciences of the United States of America*, 109(21).

[19] **Berggren, N., and H. Jordahl.** 2005. "Does free trade really reduce growth? Further testing using the economic freedom index." *Public Choice*, 122: 99–114.

[20] **Berggren, N., and H. Jordahl.** 2006. "Free to Trust: Economic Freedom and Social Capital." *KYKLOS*, 59(2): 141–169.

[21] **Berggren, N., and T. Nilsson.** 2016. "Tolerance in the United States: Does economic freedom transform racial, religious, political and sexual attitudes?" *European Journal of Political Economy*, 45(Supplement): 53–70.

[22] **Berg, J., Dickhaut J., and K. McCabe.** 1995. "Trust, reciprocity, and social history." *Games and Economic Behavior*, 10(1): 122–142.

[23] **Beshears, J., Choi J.J. Laibson D.I. Madrian B.C. Reynolds G.I.** 2016. "Vaccination Rates are Associated With Functional Proximity But Not Base Proximity of Vaccination Clinics." *Medical Care*, 54(6): 578–583.

[24] **Bjørnskov, C., and N. Foss.** 2008. "Economic freedom and entrepreneurial activity: Some cross-country evidence." *Public Choice*, 143(3): 307–328.

[25] **Bohnet, I., and Y. Baytelman.** 2007. "Institutions and trust. Implications for preferences, beliefs and behavior." *Rationality and Society*, 19: 99–135.

[26] **Bohnet, I., Greig F. Herrmann B., and R. Zeckhauser.** 2008. "Betrayal aversion: Evidence from Brazil, China, Oman, Switzerland, Turkey and United States." *American Economic Review*, 98: 294–310.

[27] **Bohnet, I., Greig F. Herrmann B. & Zeckhauser R.** 2008. "Betrayal Aversion: Evidence from Brazil, China, Oman, Switzerland, Turkey, and the United States." *American Economic Review*, 98: 294–310.

[28] **Boubakri N., Cosset J.-C., Fischer K., and Guedhami O.** 2005. "Privatization and Bank Performance in Developing Countries." *Journal of Banking and Finance*, 29: 2015–41.

[29] **Bowles, S.** 1998. "Endogenous preferences: the cultural consequences of markets and other economic institutions." *Journal of Economic Literature*, 36(1): 75–111.

[30] **Bradley, M.M., and P.J. Lang.** 1994. "Measuring emotion: The self-assessment manikin and the semantic differential." *Journal of Behavior Therapy and Experimental Psychiatry*, 25(1).

[31] **Buchmueller TC, Jacobson M, Wood C.** 2006. "How far to the hospital? The effect of hospital closures on access to care." *Journal of Health Economics*, 25: 740–761.

[32] **Bénabou, R., and J. Tirole.** 2006. "Incentives and prosocial behavior." *American Economic Review*, 96(5): 1652–1678.

[33] **Cabrales, A., Clots-Figueras I. Hernan Gonzalez R., and P. Kujal.** 2020. "Institutions, opportunism and prosocial behavior: Some experimental evidence." *Discussion Papers 2020-09, The Centre for Decision Research and Experimental Economics, School of Economics, University of Nottingham.*

[34] **Camerer, C., and K. Weigelt.** 1988. "Experimental test of a sequential reputation game." *Econometrica*, 56(1): 1–36.

[35] **Campbell, N.D., and T.M. Rogers.** 2007. "Economic Freedom and Net Business Formation." *Cato Journal*, 27(1): 23–36.

[36] **Carlsson, F., and S. Lundstrom.** 2002. "Economic Freedom and Growth: Decomposing the Effects." *Public Choice*, 112(3-4): 335–44.

[37] **Chizmar, J.F., and A.L. Ostrosky.** 1998. "The One-Minute Paper: Some Empirical Findings." *The Journal of Economic Education*, 29(1).

[38] **Chou, W. B.** 2020. "Considering Emotion in COVID-19 Vaccine Communication: Addressing Vaccine Hesitancy and Fostering Vaccine Confidence." *Health Communication*, 35(14): 1718–1722.

[39] **Chuang, Y., & Schechter L.** 2015. "Stability of experimental and survey measures of risk, time, and social preferences: A review and some new results." *Journal of Development Economics*, 117.

[40] **Clarke, Damian, Joseph P. Romano, and Michael Wolf.** 2020. "The Romano-Wolf Multiple Hypothesis Correction in Stata." *IZA Discussion Paper No. 12845, Available at SSRN: https://ssrn.com/abstract=3513687 or http://dx.doi.org/10.2139/ssrn.3513687.*

[41] **Cohen, A.L., McMorrow M. Walaza S. Cohen C. Tempia S. Alexander-Scott M., and M.A. Widdowson.** 2015. "Potential impact of co-infections and co-morbidities prevalent in Africa on influenza severity and frequency: a systematic review." *PloS one*, 10(6): e0128580.

[42] **Couch R. B., Keitel W. A., Cate T. R. editors.** 1996. "Prevention of influenza virus infections by current inactivated influenza vaccines." *Options for the Control of Influenza III. Amsterdam, The Netherlands: Elsevier.*

[43] **Cox, J.C.** 2004. "How to identify trust and reciprocity." *Games and Economic Behavior*, 46(2): 260–281.

[44] **Cárdenas, J. C., Stranlund J., and C. Willis.** 2000. "Local Environmental Control and Institutional Crowding-Out." *World Development*, 28(10): 1719–1733.

[45] **De Haan, J., and J. Sturm.** 2000. "On the relationship between economic freedom and economic growth." *European Journal of Political Economy*, 16(2): 215–241.

[46] **De Haan, J., S. Lundström, and J. Sturm.** 2006. "Market-Oriented Institutions and Policies and Economic Growth: A Critical Survey." *Journal of Economic Surveys*, 20(2): 157–191.

[47] **Deslauriers, L., Schelew E. Wieman C.** 2011. "Improved learning in a large-enrollment physics class." *Science*, 332: 862–864.

[48] **Dickhaut, J., Hubbard J, and K. McCabe.** 1998. "Trust Reciprocity and Interpersonal History: Fool Me Once Shame on You Fool Me Twice Shame on Me." *SSRN.*

[49] **Dietrich, F.** 2014. "Anti-terrorism politics and the risk of provoking." *Journal of Theoretical Politics*, 26(3): 405–441.

[50] **Dillard, J. P., & Nabi R. L.** 2006. "The persuasive influence of emotion in cancer prevention and detection messages." *Journal of Communication*, 56(suppl$_1$) : $S123$–$S139$.

[51] **Dirks, K.T., and D.L. Ferrin.** 2002. "Trust in leadership: Meta-analytic findings and implications for research and practice." *Journal of Applied Psychology*, 87: 611–628.

[52] **Doucouliagos, C., and M.A. Ulubasoglu.** 2006. "Economic freedom and economic growth: Does specification make a difference?" *European Journal of Political Economy*, 22(1): 60–81.

[53] **Dreher, A., Kotsogiannis C., and S. McCorriston.** 2009. "How do institutions affect corruption and the shadow economy?" *International Tax and Public Finance*, 16: 773–796.

[54] **Engel, C.** 2011. "Dictator games: a meta study." *Experimental Economics : A Journal of the Economic Science Association*, 14(4): 583–610.

[55] **Espey, M.** 2012. "Team-based learning in economics: A pareto-improvement.In M. Sweet, L. K. Michaelson (Eds.), Team-based learning in the social studies and humanities: Group work that works to generate critical thinking and engagement." *Sterling: Stylus Publishing.*

[56] **Faareha A. Siddiqui, Zahra A. Padhani, Rehana A. Salam Razia Aliani-Zohra S. Lassi Jai K. Das Zulfiqar A. Bhutta.** May 2022. "Interventions to Improve Immunization Coverage Among Children and Adolescents: A Meta-analysis." *Pediatrics*, 149(Supplement 6).

[57] **Falk, A., and M. Kosfeld.** 2006*a*. "The Hidden Costs of Control." *The American Economic Review*, 96(5): 1611–1630.

[58] **Falk, A., and M. Kosfeld.** 2006*b*. "The hidden costs of control." *The American Economic Review*, 96(5): 1611–1630.

[59] **Falk, A., Becker A. Dohmen T. Enke B. Huffman D., and U. Sunde.** 2015. "The nature and predictive power of preferences: Global evidence." *Working paper.*

[60] **Farr, W.K., Lord R.A., and J.L. Wolfenbarger.** 1998. "Economic Freedom, Political Freedom, and Economic Well-Being: A Causality Analysis." *Cato Journal*, 18(2): 247–262.

[61] **Fehr, E.** 2009. "On the economics and biology of trust." *Journal of European Economic Association*, 2(2-3): 235–266.

[62] **Ferrer, R. A., & Ellis E. M.** 2019. "The persuasive influence of emotion in cancer prevention and detection messages. Moving beyond categorization to understand affective influences on real world health decisions." *Social and Personality Psychology Compass*, 13(11): 1–16.

[63] **Fiala, L., and S. Suetens.** 2017. "Transparency and Cooperation in Repeated Dilemma Games: A Meta Study." *Experimental Economics*, 20: 755–771.

[64] **Fies, C., Marshall J.** 2006. "Classroom response systems: A review of the literature." *Journal of Science Education and Technology*, 15(1).

[65] **Fisman, R., and R. Gatti.** 1999. "Decentralization and corruption: Cross-country and cross-state evidence." *The World Bank, Washington, D.C.*

[66] **Frank, R.H.** 1988. "Passion within reason: The strategic role of emotions." *New York, NY: W.W. Norton and Company, Inc.*

[67] **Freeman, S., Eddy S. L. McDonough M. Smith M. K. Okoroafor-N. Jordt H. Wenderoth M. P.** 2014. "Active learning increases student performance in science, engineering, and mathematics." *Proceedings of the national academy of sciences*, 111(23): 8410–8415.

[68] **Fuchs-Schundeln, N., and M. Schundeln.** 2015. "On the endogeneity of political preferences: Evidence from individual experience with democracy." *Science*, 347.

[69] **Gasmi F., Maingard A. A., Noumba Um P. P., and Virto L. R.** 2013. "The Privatization of the Fixed-Line Telecommunications Operator in OECD, Latin America, Asia, and Africa: One Size Does Not Fit All." *World Development*, 45: 189–208.

[70] **Gershoff, A., & Koehler J.** 2011. "Safety First? The Role of Emotion in Safety Product Betrayal Aversion." *Journal of Consumer Research*, 38: 140–150.

[71] **Gneezy, Uri, Andreas Leibbrandt, and John A List.** 2014. "Ode to the sea: Workplace Organizations and Norms of Cooperation." , (20234).

[72] **Graeff, P., and G. Mehlkop.** 2003. "The impact of economic freedom on corruption: different patterns for rich and poor countries." *European Journal of Political Economy*, 19(3): 605–620.

[73] **Greif, Avner, and Guido Tabellini.** 2010. "Cultural and Institutional Bifurcation: China and Europe Compared." *American Economic Review*, 100(2): 135–40.

[74] **Gross, J. J.** 2014. *Handbook of Emotion Regulation.* New York, NY:Guilford.

[75] **Gross, J. J.** 2015a. "Emotion regulation: current status and future prospects." *Psychol. Inquiry*, 26.

[76] **Gross, J. J.** 2015b. "The extended process model of emotion regulation: elaborations, applications, and future directions." *Psychol. Inquiry*, 26.

[77] **Gross, J., John. O.** 2003. "Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being." *Journal of Personality and Social Psychology*, 85: 348–362.

[78] **Guh A., Reed C., Gould L. H. et al.** 2011. "Transmission of 2009 pandemic influenza a (H1N1) at a public university—Delaware, April-May 2009." *Clinical Infectious Diseases*, 52(supplement 1).

[79] **Guiso, L., Sapienza P., and L. Zingales.** 2004. "The role of social capital in financial development." *American Economic Review*, 94(3): 526–556.

[80] **Gwartney, J., and R. Lawson.** 2002. "Economic Freedom of the World 2002, Annual Report." *The Fraser Institute, Vancouver.*

[81] **Gwartney, J.D., Holcombe .G., and R.A. Lawson.** 1999. "Economic Freedom and the Environment for Economic Growth." *Journal of Institutional and Theoretical Economics*, 155(4): 643–663.

[82] **Gwartney, J.D., Holcombe .G., and R.A. Lawson.** 2004. "Economic Freedom, Institutional Quality, and Cross-Country Differences in Income and Growth." *Cato Journal*, 24(3): 205–233.

[83] **Gwartney, J.D., Holcombe .G., and R.A. Lawson.** 2006. "Institutions and the Impact of Investment on Growth." *KYKLOS*, 59(2): 255–273.

[84] **Gwartney, J., Lawson R. Hall J., and R. Murphy.** 2021. "Economic Freedom of the World Annual Report 2021." *Fraser Institute.*

[85] **Handelsman, J., Ebert-May D. Beichner R. Bruns P. Chang A.-DeHaan R. Gentile J. Lauffer S. Stewart J. Tilghman S.M., and W.B. Wood.** 2004. "Scientific teaching." *Science*, 304(5670): 521–522.

[86] **Hanson II, J.R.** 2000. "Prosperity and Economic Freedom: A Virtuous Cycle." *The Independent Review*, 4(4): 525–531.

[87] **Heckelman, J.C.** 2000. "Economic Freedom and Economic Growth: A Short-run Causal Investigation." *Journal of Applied Economics*, 3: 71–91.

[88] **Heckelman, J.C., and M.D. Stroup.** 2005. "A comparison of aggregation methods for measures of economic freedom." *European Journal of Political Economy*, 21: 953–966.

[89] **Herrmann, Benedikt, Christian Thöni, and Simon Gächter.** 2008. "Antisocial Punishment Across Societies." *Science*, 319(5868): 1362–1367.

[90] **Hettler, P.** 2006. "The effectiveness of team-based learning in building content knowledge and problem solving skills in principles of macroeconomics, presented at the 2006 ASSA conference." *http://www.aeaweb.org/assa/2006/0107*$_1$430$_1$310*.pdf*.

[91] **Hettler, P.L.** 2015. "Active Learning in Economics: Increasing Student Engagement, Excitement and Success." *International Advances in Economic Research*, 21: 357–360.

[92] **Holm, S.** 1979. "A simple sequentially rejective multiple test procedure." *Scandinavian Journal of Statistics*, 6: 65–70.

[93] **Holmstrom, A.** 2015. "Emotional Appraisal/Reappraisal in Social Support." *In The International Encyclopedia of Interpersonal Communication , (eds C.R. Berger, M.E. Roloff, S.R. Wilson, J.P. Dillard, J. Caughlin and D. Solomon).*

[94] **Jamieson, K. H., Albarracin D.** 2020. "The Relation between Media Consumption and Misinformation at the Outset of the SARS-CoV-2 Pandemic in the US." *The Harvard Kennedy School (HKS) Misinformation Review*, 1(2).

[95] **Johnson, N.D., and A.A. Mislin.** 2011. "Trust Games: A meta-analysis." *Journal of Economic Psychology*, 32: 865–889.

[96] **Jonathan Gruber, Daniel M. Hungerman.** 2008. "The Church Versus the Mall: What Happens When Religion Faces Increased Secular Competition?" *The Quarterly Journal of Economics*, 123(2): 831–862.

[97] **Jungmann, S. M.** 2020. "Health anxiety, cyberchondria, and coping in the current COVID-19 pandemic: Which factors are related to coronavirus anxiety?" *Journal of Anxiety Disorders*, 73.

[98] **Kashdan, T.B.** 2010. "Psychological flexibility as a fundamental aspect of health." *Clin. Psychol. Rev.*, 30.

[99] **King-Casas, B., Sharp C. Lomax-Bream L. Lohrenz T. Fonag-y P. Montague P.R.** 2008. "The rupture and repair of cooperation in borderline personality disorder." *Science*, 321(5890): 806–810.

[100] **Knack, K., and P. Keefer.** 1997. "Does social capital have an economic payoff? A cross-country investigation." *Quarterly Journal of Economics*, 112: 1251–1288.

[101] **Koehler, J., & Gershoff A.** 2003. "Betrayal Aversion: When Agents of Protection Become Agents of Harm." *Organizational Behavior and Human Decision Processes*, 90.

[102] **Kremer, Michael, Jack Willis, and Yang You.** 2021. "Converging to convergence."

[103] **Lang, A., & Yegiyan N. S.** 2008. "Understanding the interactive effects of emotional appeal and claim strength in health messages." *Journal of Broadcasting and Electronic Media*, 52(3).

[104] **La Porta, R., Lopez-de-Silanes-F. Shleifer A., and R. Vishny.** 1997. "Trust in organizations." *American Economic Review Papers and Proceedings*, LXXXVII: 333–338.

[105] **La Porta, R., Lopez-de-Silanes-F. Shleifer A., and R.W. Vishny.** 1999. "The Quality of Government." *Journal of Law, Economics, and Organization*, 15: 222–279.

[106] **Larson, H. J.** 2014. "Understanding Vaccine Hesitancy around Vaccines and Vaccination from a Global Perspective: A Systematic Review of Published Literature, 2007–2012." *Vaccine*, 32.

[107] **Larson, H. J.** 2018. "State of Vaccine Confidence in the EU 2018." *Luxembourg: Publications Office of the European Union*, 10.

[108] **Larson, HJ.., de Figueiredo-A.-Xiahong-Z. Schulz W.S. Verger P.-Johnston I.G. Cook A.R. Jones N.S.** 2016. "The State of Vaccine Confidence 2016: Global Insights through a 67-Country Survey." *EBioMedicine*, 12.

[109] **Li, Q., Tang B.-Bragazzi-N.L.-Xiao Y., and J. Wu.** 2020. "Modeling the impact of mass influenza vaccination and public health interventions on COVID-19 epidemics with limited detection capability." *Mathematical biosciences*, 325: 108378.

[110] **List, J. S.** 2019. "Multiple hypothesis testing in experimental economics." *Exp Econ*, 22.

[111] **Loomba, S., de Figueiredo-A.-Piatek-S. de Graaf K. & Larson H.** 2021. "Measuring the Impact of COVID-19 Vaccine Misinformation on Vaccination Intent in the UK and USA." *Nature human behaviour*, 5.

[112] **Lowes, S., Nunn N.-Robinson-J.A., and J. Weigel.** 2017. "The evolution of culture and institutions: Evidence from the Kuba Kingdom." *Econometrica*, 85(4): 1065–1091.

[113] **Lwin, M. O., Lu-J.-Sheldenkar-A. Schulz P. J. Shin W. Gupta R. & & Yang Y.** 2020. "Global sentiments surrounding the COVID-19 pandemic on twitter: Analysis of twitter trends." *JMIR Public Health and Surveillance*, 6(2).

[114] **MacDonald, N.** 2015. "Vaccine Hesitancy: Definition, Scope and Determinants." *Vaccine*, 33.

[115] **Marín-Hernández, D., Schwartz R.E., and D.F. Nixon.** 2020. "Epidemiological evidence for association between higher influenza vaccine uptake in the elderly and lower COVID-19 deaths in Italy." *Journal of Medical Virology*.

[116] **Mengel, F.** 2018. "Risk and temptation: a meta-study on prisoner's dilemma games." *The Economic Journal*, 128(616): 3182–3209.

[117] **Michaelsen, L., Bauman Knight-A., and L. D. Fink.** 2003. "Team-based Learning: A Transformative Use of Small Groups in College Teaching." *Sterling: Stylus Publishing*.

[118] **Milkman, K., Patel M.-Gandhi-L.-Graci H. Gromet D. Ho H. . . . et al.** 2021. "A Megastudy of Text-Based Nudges Encouraging Patients to Get Vaccinated at an Upcoming Doctor's Appointment." *Proc Natl Acad Sci*, 118.

[119] **Millis, B. J., and P. G. Cottell Jr.** 2003. "A cooperative learning structure for large classes: Think-Pair-Share. In Small Group Instruction in higher education: Lessons from the past, visions of the future, ed. J. L. Cooper, P. Robinson and D. Ball." *Stillwater, OK: New Forums Press Inc.*

[120] **Morgul, E., Bener A.-Atak-M.-Akyel S. Aktaş S. Bhugra D. . . . Jordan T. R.** 2020. "COVID-19 pandemic and psychological fatigue in Turkey." *International Journal of Social Psychiatry, in press.*

[121] **Nichol K. L., D'Heilly S., Ehlinger E.** 2005. "Colds and influenza-like illnesses in university students: impact on health, academic and work performance, and health care use." *Clinical Infectious Diseases*, 40(9).

[122] **Nicola, M., Alsafi Z. Sohrabi C. Kerwan A. Al-Jabir A. Iosifidis C. . . . & Agha R.** 2020. "The socio-economic implications of the coronavirus pandemic (COVID-19): A review." *International Journal of Surgery*, 78.

[123] **Nyhan, B., Reifler J. Richey S. & Freed G.** 2005. "Effective Messages in Vaccine Promotion: A Randomized Trial." *Pediatrics*, 133.

[124] **Nyström, K.** 2008. "The institutions of economic freedom and entrepreneurship: evidence from panel data." *Public Choice*, 136(3): 269–282.

[125] **Ochsner, K., and J. Gross.** 2005. "The cognitive control of emotion." *Trends in Cognitive Sciences*, 9.

[126] **Odone, A., Ferrari A. Spagnoli F. Visciarelli S. Shefer-A. Pasquarella C. & Signorelli C.** 2015. "Effectiveness of Interventions That Apply New Media to Improve Vaccine Uptake and Vaccine Coverage: A Systematic Review." *Human vaccines & immunotherapeutics*, 11.

[127] **Oladejo, O., Allen K. Amin A. Frew P. Bednarczyk-R. & Omer S.** 2016. "Comparative Analysis of the Parent Attitudes about Childhood Vaccines (PACV) Short Scale and the Five Categories of Vaccine Acceptance Identified by Gust et Al." *Vaccine*, 34.

[128] **Oosterbeek, H., Sloof R., and G. van de Kuilen.** 2004. "Cultural differences in ultimatum game experiments: evidence from a meta-analysis." *Experimental Economics*, 7(2): 171–188.

[129] **Opel, D., Taylor J. Mangione-Smith R. Solomon C.-Zhao C. Catz S., and D. Martin.** 2011. "Validity and Reliability of a Survey to Identify Vaccine-Hesitant Parents." *Vaccine*, 29.

[130] **Opel, D., Taylor J. Zhou-C. Catz S. Myaing-M. & Mangione-Smith R.** 2013. "The Relationship between Parent Attitudes about Childhood Vaccines Survey Scores and Future Child Immunization Status: A Validation Study." *JAMA pediatrics*, 167.

[131] **Perugini, M., & Bagozzi R. P.** 2001. "The role of desires and anticipated emotions in goal-directed behaviours: Broadening and deepening the theory of planned behaviour." *British Journal of Social Psychology*, 40(1).

[132] **Pinotti, P.** 2012. "Trust, Regulation and Market Failures." *Review of Economics and Statistics*, 94: 650–658.

[133] **Poehling K. A., Blocker J., Ip E. H. Peters T. R. Wolfson M.** 2012. "2009-2010 seasonal influenza vaccination coverage among college students from 8 universities in North Carolina." *Journal of American College Health*, 60(8).

[134] **Polak, R.** 1976. "Interdependent preferences." *American Economic Review*, 66(3): 309–320.

[135] **Pons V. G., Canter J., Dolin R.** 1980. "Influenza A/USSR/77 (H1N1) on a university campus." *American Journal of Epidemiology*, 111(1).

[136] **Putnam, R.D.** 1993. "Making democracy work: Civic traditions in modern Italy." *Princeton: Princeton University Press.*

[137] **Quinn, S., Parmer J. Freimuth V. Hilyard K. Musa D. & Kim K.** 2013. "Exploring Communication, Trust in Government, and Vaccination Intention Later in the 2009 H1N1 Pandemic: Results of a National Survey." *Biosecurity and bioterrorism: biodefense strategy, practice, and science*, 11.

[138] **Rabin, M.** 1998. "Psychology and economics." *Journal of Economic Literature*, 36(1): 11–46.

[139] **Raymond Fisman, Pamela Jakiela, Shachar Kariv.** 2015. "How did distributional preferences change during the Great Recession?" *Journal of Public Economics*, 128: 84–95.

[140] **Romano, J. P., and M. Wolf.** 2016. "Efficient computation of adjusted p-values for resampling-based stepdown multiple testing." *Statistics and Probability Letters*, 113: 38–40.

[141] **Rosenthal, R.** 1979. "The file drawer problem and tolerance for null results." *Psychological Bulletin*, 86(3): 638–641.

[142] **Smith, Adam, 1723-1790.** 2000. "The Wealth of Nations / Adam Smith ; Introduction by Robert Reich ; Edited, with Notes, Marginal Summary, and Enlarged Index by Edwin Cannan." *New York :Modern Library.*

[143] **Smith, T.W., Marsden-P. Hout M., and J. Kim.** 1972-2014. "General Social Surveys, [machine-readable data file] /Principal Investigator, Tom W. Smith; Co-Principal Investigator, Peter V. Marsden; Co-Principal Investigator, Michael Hout; Sponsored by National Science Foundation." *NORC ed.- Chicago: NORC at the University of Chicago [producer and distributor].*

[144] **Soetaert, E.** 1998. "Quality in the Classroom: Classroom Assessment Techniques as TQM." *New Directions for Teaching and Learning*, 75.

[145] **Stains, M., Harshman-J. Barker M.K. Chasteen S.V. Cole R. DeChenne-Peters S.E. Eagan Jr M.K. Esson J.M. Knight J.K. Laski F.A., and M. Levis-Fitzgerald.** 2018. "Anatomy of STEM teaching in North American universities." *Science*, 359(6383): 1468–1470.

[146] **Stansel, D., Torra-J., and F. McMahon.** 2020. "Economic Freedom of North America 2021." *Fraser Institute*.

[147] **Stead, D.R.** 2005. "A Review of the One-Minute Paper." *Active Learning in Higher Education [online]*, 6(2).

[148] **Stigler, G., & Becker G.** 1977. "De Gustibus Non Est Disputandum." *The American Economic Review*, 67(2).

[149] **Sukhtankar, S.** 2017. "Replications in Development Economics†." *American Economic Review*, 107(5): 32–36.

[150] **Tabellini, G.** 2010. "Culture and institutions: economic development in the regions of Europe." *Journal of the European Economic Association*, 8(4): 677–716.

[151] **Taylor, S.** 2019. "The psychology of pandemics: Preparing for the next global outbreak of infectious disease." *Cambridge Scholars Publishing*.

[152] **Truong, J. B.** 2022. "What factors promote vaccine hesitancy or acceptance during pandemics? A systematic review and thematic analysis." *Health Promotion International*, 37(1).

[153] **Tyson, A.** 2020. "Republicans remain far less likely than Democrats to view COVID-19 as a major threat to public health." *Retrieved from Pew Research Center : https://www.pewresearch.org/fact-tank/2020/07/22/republicans-remain-far-less-likely-than-democrats-to-view-covid-19-as-a-major-threat-to-public-health/.*

[154] **Uchida M., Tsukahara T., Kaneko M. Washizuka S. Kawa S.** 2012. "How the H1N1 influenza epidemic spread among university students in Japan: experience from Shinshu University." *American Journal of Infection Control*, 40(3).

[155] **Uddin M., Cherkowski G. C., Liu G. Zhang J. Monto A. S. Aiello A. E.** 2010. "Demographic and socioeconomic determinants of influenza vaccination disparities among university students." *Journal of Epidemiology and Community Health*, 64(9).

[156] **van Binsbergen, J. H., and C. Opp.** 2020. "The Effectiveness of Life-Preserving Investments in Times of COVID-19." *NBER Working Paper*, No. w27382.

[157] **Vonderwell, S.** 2004. "Assessing Online Learning and Teaching: Adapting the Minute Paper." *TechTrends: Linking Research Practice to Improve Learning [online]*, 48(4).

[158] **Watkins, J., Mazur E.** 2013. "Retaining students in science, technology, engineering, and mathematics (STEM) majors." *Journal of College Science Teaching*, 42(5): 36–41.

[159] **Ziegert, A., and K. McGoldrick.** 2008. "When Service is Good for Economics: Linking the Classroom and Community through Service-Learning." *International Review of Economics Education*, 7(2).

Appendices

Appendix A

Appendix to Chapter 2

A.1 Summary Statistics

Table A.1: Standard Deviation of World EFI by Percentiles

Variables	p0-40	p40-60	p60-80	p80-90	p90-100	East Block
EFI Total	0.209	0.260	0.095	0.071	0.153	0.127
EFI Size of Gov't	0.301	0.426	0.220	0.285	0.343	0.144
EFI Property Rights	0.283	0.147	0.132	0.102	0.279	0.105
EFI Sound Money	0.362	0.562	0.152	0.116	0.098	0.239
EFI Trade	0.265	0.285	0.101	0.215	0.246	0.239
EFI Regulation	0.354	0.359	0.309	0.223	0.308	0.417
Observations	86	125	75	198	769	32

Table A.2: Standard Deviation of MSA-level EFI by Percentiles

Variables	p0-33	p33-67	p67-100
EFI Total	0.078	0.097	0.086
EFI Taxes	0.131	0.105	0.105
EFI Government Spending	0.124	0.136	0.175
EFI Labor Freedom	0.233	0.289	0.233
Observations	81	155	154

A.2 World EFI

Table A.3: Fraser World EFI, p90+

Variables	Pro-social		Nash	
	(1)	(2)	(3)	(4)
EFI Total	0.5916*		-0.5117**	
	(0.242)		(0.172)	
EFI Size of Gov't		-0.0015		-0.0385
		(0.184)		(0.068)
EFI Property Rights		-0.0200		0.0733
		(0.183)		(0.127)
EFI Sound Money		-0.3027		0.2460
		(0.241)		(0.267)
EFI Trade		0.2333**		-0.2352**
		(0.094)		(0.084)
EFI Regulation		0.7786***		-0.5211***
		(0.065)		(0.085)
Observations	605	605	737	737
R^2	0.050	0.084	0.045	0.067
Countries	7	7	10	10

Country-level fixed effects for Australia, Canada, Finland, Mongolia, New Zealand, Singapore, Switzerland, United Kingdom, and United States. Standard errors clustered by country. ***p<0.01, **p<0.05,*p<0.1.

Table A.4: Fraser World EFI, p80-90

Variables	Pro-social		Nash	
	(1)	(2)	(3)	(4)
EFI Total	-0.3564		-0.5232	
	(1.531)		(0.897)	
EFI Size of Gov't		-0.5691		0.0729
		(0.347)		(0.139)
EFI Property Rights		1.9214		-1.0246
		(2.139)		(1.047)
EFI Sound Money		0.6016		-0.0023
		(0.711)		(0.646)
EFI Trade		-0.3229		0.2343
		(0.925)		(0.389)
EFI Regulation		0.5045		-0.6709
		(0.497)		(0.451)
Observations	149	149	195	195
R^2	0.121	0.165	0.158	0.186
Countries	8	8	10	10

Country-level fixed effects for Austria, Chile, Denmark, Germany, Japan, Netherlands, Norway, Portugal, Rwanda, Spain, and Sweden. Standard errors clustered by country. ***p<0.01, **p<0.05,*p<0.1.

Table A.5: Fraser World EFI, p60-80

Variables	Pro-social		Nash	
	(1)	(2)	(3)	(4)
EFI Total	0.5123		-1.2796	
	(1.498)		(0.903)	
EFI Size of Gov't		-0.2318		-0.0057
		(0.192)		(0.456)
EFI Property Rights		0.4131		-0.7398
		(1.074)		(0.713)
EFI Sound Money		-2.3087***		-0.1005
		(0.643)		(0.497)
EFI Trade		0.2970		-0.5841
		(0.795)		(0.483)
EFI Regulation		0.2243		0.0340
		(0.407)		(0.167)
Observations	58	58	78	78
R^2	0.104	0.115	0.114	0.128
Countries	10	10	14	14

Country-level fixed effects for Belgium, Costa Rica, France, Guatemala, Iceland, Italy, Peru, South Korea, Uganda, and Uruguay. Standard errors clustered by country. ***p<0.01, **p<0.05,*p<0.1.

Table A.6: Fraser World EFI, p40-60

Variables	Pro-social		Nash	
	(1)	(2)	(3)	(4)
EFI Total	0.4126		0.0684	
	(0.813)		(0.402)	
EFI Size of Gov't		0.5208		0.2289
		(0.297)		(0.146)
EFI Property Rights		-1.5846**		-0.4752
		(0.555)		(0.315)
EFI Sound Money		-0.9957***		0.4385***
		(0.270)		(0.137)
EFI Trade		0.1062		-0.6257
		(0.446)		(0.441)
EFI Regulation		0.0488		-0.4373
		(0.761)		(0.729)
Observations	84	84	128	128
R^2	0.342	0.466	0.285	0.362
Countries	10	10	15	15

Country-level fixed effects for Columbia, Fiji, Ghana, Greece, Honduras, India, Israel, Kenya, Madagascar, Malaysia, Mexico, Morocco, Paraguay, South Africa, Tanzania, Thailand, and Turkey. Standard errors clustered by country. ***p<0.01, **p<0.05,*p<0.1.

Table A.7: Fraser World EFI, p0-40

Variables	Pro-social		Nash	
	(1)	(2)	(3)	(4)
EFI Total	-3.9603*		1.1080	
	(1.871)		(0.689)	
EFI Size of Gov't		-1.8732**		1.0321***
		(0.607)		(0.212)
EFI Property Rights		-3.0756		0.7452***
		(1.770)		(0.199)
EFI Sound Money		2.8389		0.4365***
		(2.210)		(0.092)
EFI Trade		-1.0931		-0.7394***
		(1.688)		(0.140)
EFI Regulation		1.6654		0.0563
		(1.009)		(0.190)
Observations	49	48	85	84
R^2	0.345	0.410	0.275	0.370
Countries	10	10	13	13

Country-level fixed effects for Argentina, Bangladesh, Bolivia, Brazil, China, Ecuador, Indonesia, Papua New Guinea, Vietnam; and p0-20 countries: Cameroon, Democratic Republic of Congo, Nigeria, and Zimbabwe. Standard errors clustered by country. ***p<0.01, **p<0.05,*p<0.1.

A.3 MSA EFI

Table A.8: MSA EFI, Top Tercile

Variables	Pro-social		Nash	
	(1)	(2)	(3)	(4)
EFI Total	-0.6229		0.9482	
	(0.666)		(0.570)	
EFI Taxes		2.9002**		-1.0987
		(1.290)		(0.716)
EFI Gov't Spending		0.4598		0.5048
		(0.541)		(0.300)
EFI Labor Freedom		0.0168		0.4590*
		(0.266)		(0.255)
Observations	133	133	150	150
R^2	0.288	0.315	0.307	0.320
Countries	12	12	13	13

Standard errors clustered by MSA. ***p<0.01, **p<0.05,*p<0.1.

Table A.9: MSA EFI, Middle Tercile

Variables	Pro-social		Nash	
	(1)	(2)	(3)	(4)
EFI Total	0.2560		-0.2335	
	(0.465)		(0.411)	
EFI Taxes		-2.0943		1.1461
		(1.224)		(1.012)
EFI Gov't Spending		-0.7299		-0.0208
		(0.928)		(0.522)
EFI Labor Freedom		0.7935		-0.6523
		(0.535)		(0.490)
Observations	137	137	152	152
R^2	0.160	0.188	0.171	0.186
Countries	16	16	18	18

Standard errors clustered by MSA. ***p<0.01, **p<0.05,*p<0.1.

Table A.10: MSA EFI, Bottom Tercile

Variables	Pro-social		Nash	
	(1)	(2)	(3)	(4)
EFI Total	-4.4899**		4.2252**	
	(1.738)		(1.750)	
EFI Taxes		-4.4354***		3.9945***
		(0.660)		(0.958)
EFI Gov't Spending		0.8955**		-0.6768
		(0.358)		(0.403)
EFI Labor Freedom		-2.1692***		1.9860***
		(0.190)		(0.355)
Observations	63	63	77	77
R^2	0.679	0.711	0.674	0.696
Countries	11	11	15	15

Standard errors clustered by MSA. ***p<0.01, **p<0.05,*p<0.1.

A.4 Eastern Block Countries

Table A.11: Fraser World EFI, East Block

Variables	Pro-social		Nash	
	(1)	(2)	(3)	(4)
EFI Total	0.7799		-0.8810	
	(1.822)		(0.869)	
EFI Size of Gov't		-27.1433***		4.5242**
		(0.616)		(1.379)
EFI Property Rights		-186.9892***		-2.9185
		(5.339)		(1.963)
EFI Sound Money		-24.3973***		-0.6069*
		(0.698)		(0.279)
EFI Trade		-26.0237***		1.0333**
		(0.679)		(0.328)
EFI Regulation				0.2363
				(0.781)
Observations	14	14	36	36
R^2	0.586	0.914	0.386	0.502
Countries	3	3	9	

Country-level fixed effects for p80-90 countries:Georgia, Lithuania, and Slovakia; p60-80 countries: Czech Republic, Hungary, and Poland; p40-60 country: Russia; and p0-20 country: Romania. Standard errors clustered by country. ***p<0.01, **p<0.05,*p<0.1.

A.5 Additional Analyses

When considering multiple simultaneous hypothesis, standard statistical techniques often lead to over-rejection of null hypotheses. One of the techniques that takes into account the multiplicity in hypothesis testing is the Romano-Wolf multiple hypothesis correction (Romano and Wolf, 2016).

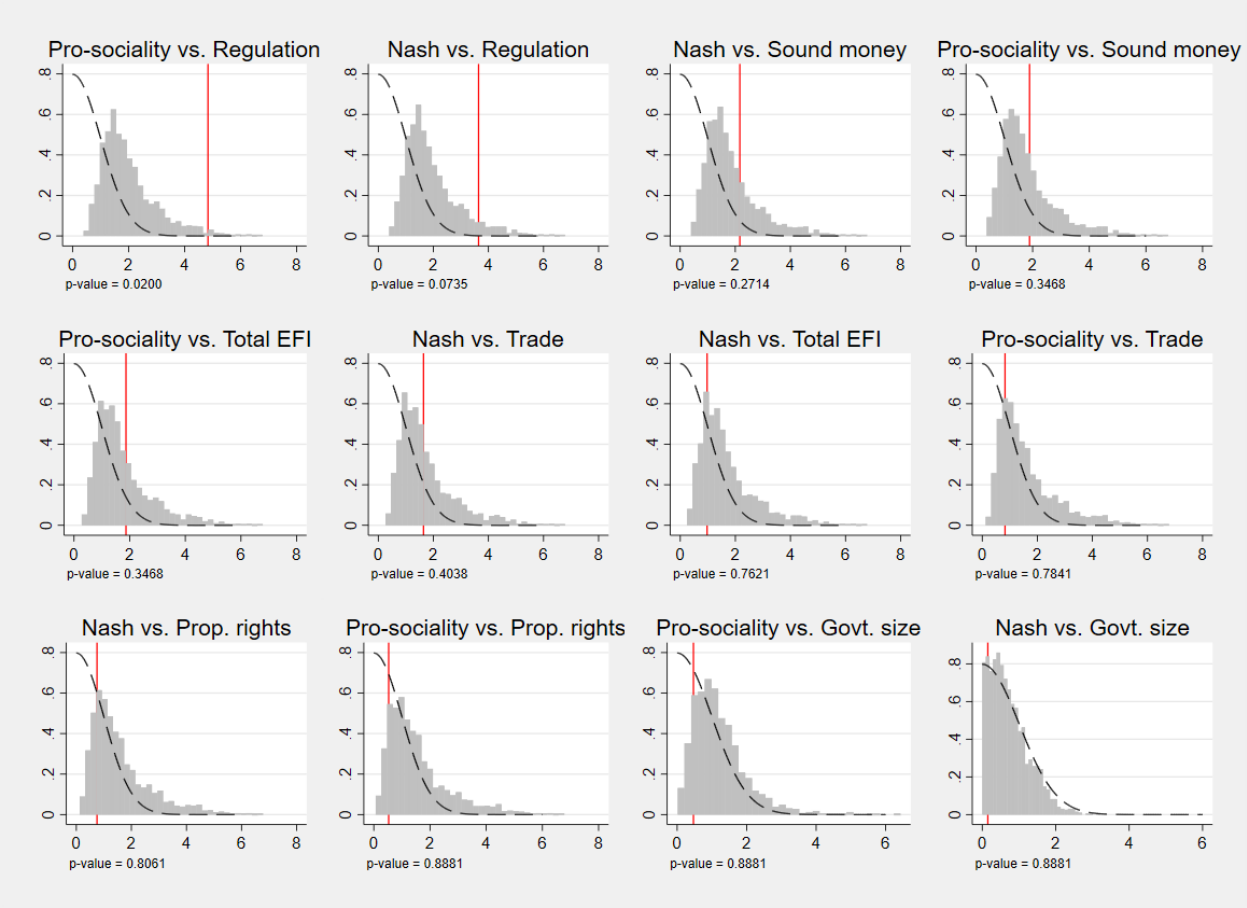
For the pre-specified null and alternate hypotheses, Table A.12 provides the corresponding Model, Resample, Romano-Wolf and Holm p-values respectively for outcomes corresponding to world EFI measures for the pooled sample.

Table A.12: Romano-Wolf step-down adjusted p-values

Outcome Variable	Independent Variable	Model p-value	Resample p-value	Romano-Wolf p-value	Holm p-value
Nash					
	Total EFI	0.3306	0.3248	0.7621	1.0000
Pro-sociality					
	Total EFI	0.0621	0.0725	0.3468	0.5797
Nash					
	EFI Govt. size	0.8791	0.8731	0.8881	0.8731
	EFI Property Rights	0.4524	0.3013	0.8061	1.0000
	EFI Sound Money	0.0304	0.0220	0.2714	0.2199
	EFI Trade	0.1010	0.0170	0.4038	0.1189
	EFI Regulation	0.0003	0.0060	0.0735	0.0660
Pro-sociality					
	EFI Govt. size	0.6393	0.6852	0.8881	1.0000
	EFI Property Rights	0.5968	0.6057	0.8881	1.0000
	EFI Sound Money	0.0590	0.0575	0.3468	0.5172
	EFI Trade	0.4087	0.1579	0.7841	0.7896
	EFI Regulation	0.0000	0.0005	0.0200	0.0060

Here, the "■Model p-value" gives the estimated original correlations; the "Resample p-value" (which is not corrected for multiple hypothesis testing) which consists of contrasting each of the original estimates with the null distribution; the "Romano-Wolf p-value", where the multiple hypothesis correction has been implemented as per Romano and Wolf (2016); and the Holm p-value, as per the Holm (1979) correction for multiple comparisons.

Figure A.1: Null distributions and original t-statistics



Notes to Figure A.1: Each panel shows the null distributions used to calculate the Romano-Wolf adjusted p-values for pairs of the two outcome variables (pro-sociality or Nash behavior) and the EFI measures. The histogram in each of the panels in the figure shows the step-down resampled null distribution. The dashed line signifies the theoretical half-normal, and the solid line represents the original t-statistic corresponding to each correlation.

Table A.13: Romano-Wolf step-down adjusted p-values

Outcome Variable	Independent Variable	p0-40 Model p-value	p0-40 Romano-Wolf p-value	p40-60 Model p-value	p40-60 Romano-Wolf p-value	p60-80 Model p-value	p60-80 Romano-Wolf p-value	p80-90 Model p-value	p80-90 Romano-Wolf p-value	p90 Model p-value	p90 Romano-Wolf p-value
Nash											
	Total EFI	0.076	0.135	0.847	0.996	0.285	0.478	0.536	0.934	0.019	0.178
Pro-sociality											
	Total EFI	0.043	0.135	0.824	0.996	0.798	0.906	0.697	0.943	0.006	0.168
Nash											
	EFI Govt. size	0.163	0.217	0.559	0.976	0.713	0.832	0.450	0.934	0.346	0.532
	EFI Property Rights	0.012	0.118	0.631	0.989	0.992	0.970	0.072	0.472	0.601	0.764
	EFI Sound Money	0.371	0.377	0.069	0.529	0.512	0.710	0.704	0.943	0.221	0.452
	EFI Trade	0.102	0.166	0.034	0.410	0.544	0.717	0.425	0.921	0.288	0.513
	EFI Regulation	0.377	0.377	0.698	0.996	0.844	0.926	0.328	0.882	0.001	0.098
Pro-sociality											
	EFI Govt. size	0.141	0.172	0.074	0.529	0.929	0.933	0.407	0.921	0.699	0.807
	EFI Property Rights	0.091	0.139	0.005	0.259	0.911	0.933	0.472	0.934	0.785	0.807
	EFI Sound Money	0.723	0.664	0.005	0.259	0.698	0.829	0.723	0.943	0.286	0.513
	EFI Trade	0.750	0.693	0.864	0.996	0.820	0.917	0.917	0.943	0.943	0.294
0.513											
	EFI Regulation	0.146	0.178	0.733	0.996	0.742	0.852	0.621	0.934	0.000	0.030

Table A.13 shows the model and Romano-Wolf p-values for the individual world EFI quintiles following our main analysis. Here, the "Model p-value" gives the estimated original correlations and the "Romano-Wolf p-value", gives the p-values when the multiple hypothesis correction has been implemented as per Romano and Wolf (2016). We find these two values for each of our quintile levels of world EFI for model specifications (1-4) in our analysis.

Similarly, Table A.14 provides the Model, Resampled, and Romano-Wolf and Holm p-values respectively for outcomes corresponding to the pooled MSA EFI sample.

Table A.14: Romano-Wolf step-down adjusted p-values

Outcome Variable	Independent Variable	Model p-value	Resample p-value	Romano-Wolf p-value	Holm p-value
Nash					
	Total MSA EFI	0.2969	0.3653	0.8031	1.0000
Pro-sociality					
	Total MSA EFI	0.9711	0.9590	0.9965	0.9590
Nash					
	EFI Taxes	0.5443	0.6762	0.9465	1.0000
	EFI Govt. Spending	0.5541	0.4863	0.9465	1.0000
	EFI Labor Freedom	0.4292	0.4218	0.9135	1.0000
Pro-sociality					
	EFI Taxes	0.9450	0.9570	0.9965	1.0000
	EFI Govt. Spending	0.6019	0.4858	0.9465	1.0000
	EFI Labor Freedom	0.7200	0.7266	0.9600	1.0000

Here, the "Model p-value" gives the estimated original correlations; the "Resample p-value" (which is not corrected for multiple hypothesis testing) consists of comparing each original estimate with the null distribution; the "Romano-Wolf p-value", where the multiple hypothesis correction has been implemented as per Romano and Wolf (2016); and the Holm p-value, as per the Holm (1979) correction for multiple comparisons.

Figure A.2: Null distributions and original t-statistics

Notes to Figure A.2: Each panel shows the null distributions used to generate the Romano-Wolf adjusted p-values for pairs of the two outcome variables (pro-sociality or Nash behavior) and the MSA EFI measures. The histogram in each of the panels in the figure shows the step-down re-sampled null distribution. The dashed line signifies the theoretical half-normal, and the solid line represents the original t-statistic corresponding to each correlation.

Table A.15 shows the Romano-Wolf corrections for the MSA EFI tercile level analyses. We look into the individual tercile level multiple hypothesis corrections and compare them with the Model p-values to get an understanding of the robustness of our results.

Table A.15: Romano-Wolf step-down adjusted p-values

		Bottom Terciles		Middle Tercile		Top Tercile	
Outcome Variable	Independent Variable	Model p-value	Romano-Wolf p-value	Model p-value	Romano-Wolf p-value	Model p-value	Romano-Wolf p-value
Nash							
	Total EFI	0.103	0.230	0.479	0.851	0.264	0.390
Pro-sociality							
	Total EFI	0.094	0.230	0.806	0.964	0.709	0.822
Nash							
	EFI Taxese	0.000	0.024	0.154	0.649	0.085	0.280
	EFI Govt. Spending	0.000	0.027	0.870	0.964	0.321	0.440
	EFI Labor Freedom	0.001	0.029	0.107	0.590	0.088	0.280
Pro-sociality							
	EFI Taxese	0.006	.048	0.189	0.671	0.044	0.274
	EFI Govt. Spending	0.066	0.230	0.550	0.851	0.817	0.854
	EFI Labor Freedom	0.083	0.230	0.346	0.826	0.895	0.854

Here, the "Model p-value" gives the estimated original correlations and the "Romano-Wolf p-value" reports the p-values after the multiple hypothesis correction has been implemented as per Romano and Wolf (2016) for each of the MSA terciles.

A.6 Replications of Meta-analyses

A.6.1 Dictator Game

In line with the analyses performed in Engel (2011), we report the results for the complete meta-regression model. Here, the regression model we use, similar to Engel (2011), uses weighted study means as the dependent variable. Similar to Engel (2011), our analysis also explains almost half of the variance. We report only the result of the meta-regression model here, as opposed to the multiple models reported in Engel (2011). The meta-regression gives us the Residual Maximum Likelihood (REML) estimate of the betweeen-study variance, which denotes the proportion of between-study variance explained by the model.

Table A.16: Meta-regression results Dictator Game

Variables	**Mean**
Limited action space	-0.063*
	(0.033)
Degree of uncertainty	-0.035
	(0.182)
Incentive	-0.015
	(0.019)
Repeated game	-0.066***
	(0.024)
Group decision	-0.054*
	(0.030)
Identification	0.042
	(0.026)
Social cue	0.004
	(0.032)
Concealment	-0.065**
	(0.033)
Double bind	-0.017
	(0.019)
Take option	0.067
	(0.090)
Deserving recipient	0.083***
	(0.019)
Recipient earned	0.129**

Table A.16: (continued)

Variables	**Mean**
	(0.053)
Efficiency recipient	0.024*
	(0.013)
Multiple recipients	0.151***
	(0.044)
Recipient endowment	-0.178***
	(0.048)
Dictator earned	-0.178***
	(0.032)
Real money	0.021
	(0.021)
Degree of social proximity	-0.054***
	(0.013)
Student	-0.103***
	(0.035)
Child	0.116**
	(0.050)
Middle age	0.461***
	(0.068)
Old age	0.117***
	(0.043)
Developing country	0.017
	(0.032)
Indigenous society	-0.007
	(0.048)
Constant	0.313***
	(0.051)
Observations	616
adj. R^2	0.483

Standard errors are in parentheses. Significance at the 1, 5, and 10 percent level is denoted by ***, **, and *, respectively.

A.6.2 Lying

We replicate the analyses of Abeler et al. (2019), where they look into the factors that might impact lying behavior across populations. In line with Abeler et al. (2019), we find that there exists significant gender differences on reporting lying behavior and that age also has an impact. The results reported here in table A.17 are only for repeated reports as opossed to one-shot reports. Thus, the number of rounds also has an impact on the reported behavior, as also found in Abeler et al. (2019).

Table A.17: Regression results Lying

Dependent variable: Standardized report					
	(1)	(2)	(3)	(4)	(5)
Round	0.001**				
	(0.000)				
1 if female		-0.057***			
		(0.009)			
Age			-0.002***	-0.004	
			(0.001)	(0.003)	
Age squared				0.000	
				(0.000)	
1 if economics/management student					0.003
					(0.022)
1 if psychology student					-0.054
					(0.078)
Treatment FE	Yes	Yes	Yes	Yes	Yes
# Decisions					
# Subjects					
# Treatments					
# Studies					
# Clusters	4806	22116	15472	15472	4655

Notes: OLS regressions. Robust standard errors clustered on individual subjects are in parentheses. The sample in each specification is restricted to those treatments in which the independent variable(s) vary. Significance at the 1, 5, and 10 percent level is denoted by ***, **, and *, respectively.

A.6.3 Oligopoly

We replicate the analyses performed in the Fiala and Suetens (2017) paper for the Oligopoly games in line with the various specifications they use in their paper. Tables A.18 and A.19 give the impact of the variables under study on the degree of collusion reported in the underlying experiments collated in the meta-analysis.

Table A.18: Regression results Oligopoly

Dependant variable: Degree of collusion								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
F.indichoice	-0.188				0.556***	0.499***	0.156	0.491***
	(0.122)				(0.176)	(0.160)	(0.195)	(0.160)
F.aggchoice		0.306**			0.335**	0.404***	0.358***	0.414***
		(0.122)			(0.133)	(0.123)	(0.121)	(0.123)
F.indipayoffs			-		-	-	-0.398**	-
			0.481***		0.782***	0.643***		0.639***
			(0.119)		(0.168)	(0.158)	(0.173)	(0.158)
F.ownpayoff				-0.132	-0.026	-0.101	0.594	-0.063
				(0.493)	(0.396)	(0.359)	(0.448)	(0.361)
Complements						0.374***	0.459***	0.374***
						(0.113)	(0.120)	(0.113)
'Friedman' index							0.307**	
							(0.128)	
Group size								-0.053
								(0.057)
Constant	-0.117	-	-0.061	-0.060	-0.395	-0.464	-1.339**	-0.313
		0.395***						
	(0.076)	(0.100)	(0.062)	(0.489)	(0.413)	(0.374)	(0.507)	(0.408)
Observations	50	50	50	50	50	50	46	50
R-squared	0.047	0.116	0.255	0.001	0.403	0.522	0.567	0.532

Table A.18 shows the results of the multiple linear regressions using data from the oligopoly experiments in Fiala and Suetens (2017) study. We use the number of observations divided by the unit of observation as weights for the treatments. F.aggchoice represents the aggre-

gate feedback about choices within the group, F.indichoice represents the feedback about each group member's choice within the group, F.indipayoffs represents the feedback about each group member's payoff, and F.ownpayoff represents the feedback about an individual's payoff.

***, ** or * indicate statistical significant at the 1, 5 or 10 percent level, respectively.

Table A.19: Regression results Oligopoly (reduced sample)

Dependant variable: Degree of collusion		
	(1)	(2)
F.aggchoice	-0.070	-0.359**
	(0.264)	(0.166)
F.indipayoffs	-0.584**	-0.861***
	(0.265)	(0.184)
F.ownpayoff	0.227	-0.114
	(0.702)	(0.197)
Complements	0.228	0.187
	(0.147)	(0.141)
'Friedman' index	0.141	
	(0.293)	
Group size		0.013
		(0.036)
Constant	-0.413	0.260
	(1.115)	(0.269)
Observations	24	28
R-squared	0.823	0.800

Table A.19 reports results from linear regressions based on results from oligopoly experiments which has no treatment variation in one of the feedback variables. The dependent variable is degree of collusion. We use the number of observations divided by the unit of observation as weights for the treatments. F.aggchoice represents the aggregate feedback about choices within the group, F.indichoice represents the feedback about each group member's choice within the group, F.indipayoffs represents the feedback about each group member's payoff, and F.ownpayoff represents the feedback about an individual's payoff.

***, ** or * indicate statistical significant at the 1, 5 or 10 percent level, respectively.

A.6.4 Voluntary Contribution Mechanism

Similar to the Oligopoly experiments, we replicate the model specifications used in the Fiala and Suetens (2017) paper for the public goods experiments for our data on voluntary contribution mechanism. Tables A.20- A.22 report the analysis results of the choice variables on share of endowment contributed in the experiments enlisted in the meta-analysis.

Table A.20: Regression results Public Goods

Dependant variable: Share of endowment contributed								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
F.indichoice	0.030				0.042	0.056**	0.046	0.061**
	(0.026)				(0.029)	(0.027)	(0.030)	(0.028)
F.aggchoice		-0.007			-0.014	-0.015	-0.015	-0.016
		(0.033)			(0.040)	(0.037)	(0.040)	(0.037)
F.indipayoffs			-0.048		-0.073	-0.120**	-0.075	-0.123**
			(0.043)		(0.049)	(0.048)	(0.050)	(0.048)
F.ownpayoff				-0.002	0.004	0.032	0.010	0.039
				(0.046)	(0.048)	(0.046)	(0.049)	(0.046)
MPCR						0.446***		0.450***
						(0.109)		(0.109)
Group size							0.004	0.004
							(0.005)	(0.005)
Constant	0.404***	0.426***	0.425***	0.419***	0.411***	0.174**	0.389***	0.145*
	(0.019)	(0.029)	(0.014)	(0.044)	(0.053)	(0.076)	(0.062)	(0.083)
Observations	116	115	116	114	113	113	113	113
R-squared	0.011	0.000	0.011	0.000	0.035	0.165	0.040	0.172

Table A.20 shows the results of multiple linear regressions based on studies on public goods experiments collated in the Fiala and Suetens (2017). We use the number of observations divided by the unit of observation as weights for the treatments. F.aggchoice represents the aggregate feedback about choices within the group, F.indichoice represents the feedback about each group member's choice within the group, F.indipayoffs represents the feedback about each group member's payoff, and F.ownpayoff represents the feedback about an individual's payoff.

***, ** or * indicate statistical significant at the 1, 5 or 10 percent level, respectively.

Table A.21: Regression results Public Goods with MPCR<0.7

Dependant variable: Share of endowment contributed								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
F.indichoice	0.024				0.051*	0.053*	0.054*	0.057*
	(0.028)				(0.029)	(0.029)	(0.030)	(0.029)
F.aggchoice		0.028			0.019	0.006	0.018	0.004
		(0.037)			(0.040)	(0.040)	(0.040)	(0.040)
F.indipayoffs			-		-	-	-	-
			0.173***		0.181***	0.180***	0.182***	0.181***
			(0.052)		(0.055)	(0.055)	(0.055)	(0.055)
F.ownpayoff				-0.015	-0.009	0.012	-0.004	0.020
				(0.049)	(0.048)	(0.049)	(0.049)	(0.050)
MPCR						0.300*		0.317*
						(0.164)		(0.165)
Group size							0.003	0.004
							(0.005)	(0.005)
Constant	0.397***	0.387***	0.421***	0.421***	0.386***	0.244**	0.367***	0.210**
	(0.020)	(0.034)	(0.014)	(0.047)	(0.055)	(0.095)	(0.064)	(0.103)
Observations	104	103	104	102	101	101	101	101
R-squared	0.007	0.005	0.098	0.001	0.125	0.155	0.128	0.161

Table A.21 show the results of multiple linear regressions based on studies on public goods experiments collated in the Fiala and Suetens (2017). We use the number of observations divided by the unit of observation as weights for the treatments. F.aggchoice represents the aggregate feedback about choices within the group, F.indichoice represents the feedback about each group member's choice within the group, F.indipayoffs represents the feedback about each group member's payoff, and F.ownpayoff represents the feedback about an individual's payoff.

***, ** or * indicate statistical significant at the 1, 5 or 10 percent level, respectively.

Table A.22: Regression results Public Goods (reduced sample)

Dependant variable: Share of endowment contributed	
F.indichoice	0.062**
	(0.029)
F.aggchoice	-0.006
	(0.040)
F.indipayoffs	-0.114**
	(0.055)
F.ownpayoff	0.036
	(0.047)
MPCR	0.450***
	(0.112)
Group size	0.004
	(0.005)
Constant	0.142*
	(0.084)
Observations	107
R-squared	0.163

Table A.22 shows results from multiple linear regressions based on studies on public goods experiments collated in the Fiala and Suetens (2017) that contain no treatment variation in one of the feedback variables. We use the number of observations divided by the unit of observation as weights for the treatments. F.aggchoice represents the aggregate feedback about choices within the group, F.indichoice represents the feedback about each group member's choice within the group, F.indipayoffs represents the feedback about each group member's payoff, and F.ownpayoff represents the feedback about an individual's payoff.

***, ** or * indicate statistical significant at the 1, 5 or 10 percent level, respectively.

A.6.5 Prisoner's Dilemma

We replicate the analyses done in Mengel (2018), where they look at the role of 'risk' (to co-operate unilaterally) and 'temptation' (to defect against a co-operator) in one-shot and finite horizon repeated games of the prisoner's dilemma.

In line with Mengel(2018), we find that risk and efficiency play a significant role in one-shot games, while temptation plays a significant role in repeated games. Here, we report results of the average rate of cooperation regressed on the variables of interest while keeping the number of stages/matches and interactions fixed .

Table A.23: Regression results Prisoner's Dilemma

	One-shot/ stranger			Repeated game					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Risk	-0.255***	-0.266***	-0.260***	0.009	0.008	-0.008	-0.016	0.164	0.003
	(0.061)	(0.053)	(0.072)	(0.111)	(0.103)	(0.123)	(0.127)	(0.655)	(0.116)
Tempt	0.003	-0.093	0.116	-0.104	-0.299***	-0.087	-0.299**	0.057	-0.038
	(0.080)	(0.071)	(0.087)	(0.107)	(0.094)	(0.117)	(0.098)	(0.234)	(0.326)
Efficiency	0.291***	0.346***	0.370***	0.320**	-0.005	0.313**	-0.047	0.442	0.462***
	(0.089)	(0.082)	(0.105)	(0.114)	(0.164)	(0.123)	(0.211)	(0.447)	(0.151)
Matches/ stages			0.013					0.045	0.082
			(0.015)					(0.072)	(0.143)
Matches/stages X Risk			0.004					-0.019	-0.213
			(0.010)					(0.066)	(0.125)
Matches/stages X Tempt			-0.038***					-0.017	0.060
			(0.011)					(0.020)	(0.279)

Table A.23: (continued)

	One-shot/ stranger			Repeated game					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Matches/stages X Efficiency			-0.016					-0.022	-0.082
			(0.015)					(0.038)	(0.071)
Constant	0.370***	0.451***	0.322***	0.189	0.496**	0.191	0.521**	-0.159	0.066
	(0.084)	(0.077)	(0.102)	(0.141)	(0.166)	(0.151)	(0.187)	(0.748)	(0.213)
Observations	73	73	73	23	23	23	23	23	23
R-squared	0.377	0.607	0.513	0.353	0.822	0.363	0.824	0.516	0.467

Standard errors in parentheses. *** indicates statistical significance at 1 percent level, ** indicates statistical significance at 5 percent level, * indicates statistical significance at 10 percent level.

A.6.6 Trust Game

Table A.24: Regression results Trust Game

Variable	Trust (sent fraction)			Trustworthiness (returned fraction)		
	(1)OLS	(2)OLS	(3)Robust	(4)OLS	(5)OLS	(6)Robust
Sender end	0.001	0.001	-0.001	0.000	-0.000	-0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
Receiver end	-0.107	-0.105	-0.279***	-0.021	-0.014	0.000
	(0.133)	(0.116)	(0.102)	(0.125)	(0.116)	(0.089)
Anonymous	-0.289	-0.372*	-0.309	0.461	0.508	0.381**
	(0.199)	(0.191)	(0.205)	(0.292)	(0.316)	(0.166)
Rate of ret	0.141	0.082	-0.015	-0.608***	-0.548***	-0.593***
	(0.212)	(0.188)	(0.188)	(0.150)	(0.133)	(0.142)
Double blind	0.131	0.129	0.097	0.072	-0.032	-0.032
	(0.143)	(0.132)	(0.119)	(0.120)	(0.104)	(0.091)
Student	0.093	-0.128	0.215	-0.276**	-0.269**	-0.281***
	(0.131)	(0.152)	(0.132)	(0.128)	(0.109)	(0.106)
Strategy method	0.175	0.107	-0.039	0.034	0.016	0.113
	(0.138)	(0.114)	(0.105)	(0.128)	(0.121)	(0.089)
Both roles	0.213	0.206	-0.084	-0.192	-0.236*	-0.284***
	(0.208)	(0.182)	(0.124)	(0.151)	(0.132)	(0.099)
Random pay	-0.608***	-0.650***	-0.280**	0.060	0.067	-0.008
	(0.187)	(0.180)	(0.133)	(0.192)	(0.172)	(0.110)
Real person	0.341*	0.377**	0.405*			
	(0.176)	(0.181)	(0.219)			
Trust				0.316***	0.292***	0.228***
				(0.096)	(0.102)	(0.068)
Europe		- 0.110	-0.211*		0.122	0.035
		(0.137)	(0.109)		(0.131)	(0.088)
Asia		-0.496**	-0.188		0.272**	0.058
		(0.193)	(0.155)		(0.132)	(0.137)
S. America		-0.396*	-0.186		0.071	-0.082
		(0.204)	(0.222)		(0.168)	(0.168)
Africa		-0.557**	-0.317*		-0.267*	-0.220
		(0.220)	(0.192)		(0.155)	(0.147)
Observations	161	161	161	137	137	137
F-stat	3.26	3.12	2.04	7.72	10.27	4.07
R-square	0.186	0.274	0.163	0.368	0.434	0.319

Notes: Huber-white robust standard errors are reported in parenthesis for specifications (1), (2), (3), (4), (5) and (6).

*Significant at 10-percent, **Significant at 5-percent, ***Significant at 1-percent level

We replicate the analyses done in Johnson and Mislin (2011), where they look into the effect of the experimental protocols and the geographic variations on measures of trust and trustworthiness. In Table A.24, models (1),(2), and (3) have Trust as the dependant variable. Random payment has a significant negative impact on trust while playing with a real person has a positive significant impact on trust. On the other hand, we see mixed results of anonymous partner and whether receiver was given an endowment. We also see robust negative significant impact of the Africa regional dummy.
Models (4), (5), and (6) uses Trustworthiness as a dependant variable. Here we see rate of return and student have significant and robust negative impact on trustworthiness while trust has significant and robust positive impact. We also see mixed results for anonymous partner, and whether subjects played both roles.
The results are a perfect replication of the the analysis in Johnson and Mislin (2011).

A.6.7 Ultimatum Game

We replicate the analyses performed in Oosterbeek et al. (2004), where they investigate differences in bargaining behavior in ultimatum games across countries.

Table A.25: Determinants of offered share Ultimatum Game

	(1)	(2)	(3)	(4)	(5)	(6)
Year	-0.153	-0.146	-0.167	-0.114	-0.169	-0.252
	(0.158)	(0.162)	(0.154)	(0.168)	(0.159)	(0.175)
100*Pie/ GDP per capita	-0.329**	-0.484**	-0.326*	-0.303**	-0.292**	-0.434**
	(0.161)	(0.216)	(0.164)	(0.142)	(0.144)	(0.195)
Strategy method	2.289*	3.144**	2.029	2.837**	2.325*	2.676*
	(1.232)	(1.518)	(1.312)	(1.191)	(1.307)	(1.367)
First/ single round	2.872*	3.487**	2.930*	3.735**	2.688	2.505
	(1.478)	(1.493)	(1.535)	(1.411)	(2.042)	(1.631)
Economics students	-0.464	1.147	-0.213	-0.592	-0.576	1.447
	(1.346)	(1.699)	(1.583)	(1.259)	(1.368)	(1.373)
IDV				0.006		
				(0.031)		
PDI				0.034		
				(0.040)		
AUTH					-1.562**	
					(0.743)	
TRUST						1.504
						(8.151)
COMP						0.474
						(1.248)
GDP per capita/ 100						-0.015
						(0.010)
GINI Index						0.093
						(0.088)
Constant	40.958**	37.851**	39.055**	40.389**	39.148**	39.512**
	(3.164)	(3.596)	(4.380)	(3.170)	(5.522)	(3.931)
Observations	75	75	75	75	75	75
R-squared	0.142	0.209	0.148	0.183	0.144	0.181

Note: Robust standard deviations in parentheses; *** indicates statistical significance at 1 percent level, ** indicates statistical significance at 5 percent level, * indicates statistical significance at 10 percent level.

Table A.26: Determinants of rejection rates Ultimatum Game

	(1)	(2)	(3)	(4)	(5)	(6)
Year	-0.507	-0.257	-0.236	-0.384	-0.412	-0.343
	(0.373)	(0.349)	(0.309)	(0.311)	(0.343)	(0.312)
100* Pie/ GDP per capita	-1.019***	-0.759***	-0.870***	-0.846***	-0.820***	-0.959***
	(0.239)	(0.189)	(0.204)	(0.202)	(0.196)	(0.216)
Strategy method	12.611***	12.123***	10.659***	11.244***	11.337***	11.130***
	(3.422)	(4.070)	(3.894)	(3.802)	(3.928)	(3.933)
First/single round	-2.562	-3.746	-3.816	-4.189	-4.436	-3.545
	(2.498)	(3.562)	(2.793)	(2.750)	(3.333)	(3.209)
Economics students	1.345	6.874	5.615	1.843	1.671	4.353
	(3.036)	(6.562)	(4.518)	(2.941)	(3.516)	(4.587)
IDV			-0.074			
			(0.079)			
PDI			0.042			
			(0.096)			
AUTH				-0.138		
				(1.387)		
TRUST					1.442	
					(12.650)	
COMP					0.454	
					(2.082)	
GDP per capita/100						-0.022
						(0.025)
GINI index						0.027
						(0.161)
Constant	44.070**	35.731**	40.140**	44.286**	42.401**	44.945**
	(13.802)	(15.735)	(14.044)	(14.256)	(14.321)	(13.806)
Observations	66	66	66	66	66	66
R-squared	0.341	0.426	0.315	0.290	0.291	0.300

Note: Robust standard deviations in parentheses; *** , ** , * indicates statistical significance at 1 percent level, 5 percent level, and 10 percent level respectively.

Tables A.25 and A.26 represents results for offered shares and rejection rates respectively. We do not report the region specific dummies here, though we do replicate the result in Oosterbeek et al.(2004) when including the regional dummies. In line with Oosterbeek et al. (2004), we find that the share offered is smaller for larger sized pies as well as larger when either subjects are inexperienced or a strategy method is used. The rate of rejection is also lower for larger sized pie and larger offered shares.

Appendix B

Appendix to Chapter 3

B.1 Additional information on methods

The survey we use for our vignette experiment is a modified version of the survey used to study vaccine hesitancy and betrayal aversion by Alsharawy et al., 2021. We have modified the interventions used in the Alsharawy et al., 2021 study and incorporated our messaging interventions here. The experiment design and the survey questions used in this study are a modification of those used in Alsharawy et al., 2021.

B.1.1 Exclusion criteria and data collection

Our inclusion criteria for the MTurk responders were to be a United States resident with 97% and higher HIT (Human Intelligence Tasks) approval rating and at least 5000 HITs approved. We provide summary statistics for sample characteristics in this appendix document (Appendix Table B.1). Data was collected using Qualtrics surveys, and Stata (version 16) was used for the statistical analyses.

B.1.2 PACV and VCI Scoring

To calculate the PACV score that was used in our regression analysis, we gave a hesitant response a value of 2, a don't know response a value of 1 and a non-hesitant response a value of 0. We next took the average across the four VCI survey responses before multiplying it by -1 such that a higher number denoted higher hesitancy.

B.1.3 SAM Scale

The Self Assessment Manikin (SAM) scale is an emotion assessment tool which uses graphic scales to measure elements of pleasure, arousal, and dominance. Sets of five figures, providing a total of nine options (including in-between figure options) are used for each individual emotion element to calculate the SAM measure of that element. For our paper, we use pre and post messaging treatment SAM scale measures to identify changes in emotion elements.

B.1.4 ERQ Measures

The Emotion Regulation Questionnaire (ERQ) assesses individual differences in habitual use of emotion regulation through two strategies: cognitive reappraisal and expressive suppression. The ten questions in the questionnaire are divided into six reappraisal items and four suppression items. The answers to these questions are in the 7-point Likert scale, which are averaged on the two item dimensions to give the final individual level score of ERQ reappraisal and ERQ suppression.

B.1.5 Controlling for individual characteristics

To establish the robustness of our findings, we control for individual and socioeconomic characteristics. We control for gender, age, ethnicity, race, education, and political orientation. Controlling our comprehensive set of controls help in isolating the effects of our key variables of interest. Most of our survey responses were recorded on a 7-point Likert scale, with the exception of the PACV (5-point Likert scale) and some binary questions (related to current vaccination, demographics etc.). We also used the participants ZIP code numbers that was collected through the survey to identify their geographic location. These ZIP codes were then matched to counties and states using a publicly available ZIP code database (www.unitedstateszipcodes.org/zip-code-database). We used the Bureau of Economic Analysis (BEA) region classification that is widely used by economists to group states into one of 8 regions: New England, Mideast, Great Lakes, Plains, Southeast, Southwest, Rocky Mountain, and Far West 2.

B.2 Supplementary Tables

Table B.1: Summary statistics of variables of interest

Variable	Mean
Woman, %	50.97
Man, %	48.53
Non-binary, %	0.42
Age, Mean (SD)	41.92 (12.34)
Hispanic, %	7.49
Caucasian, %	81.58
Education:	
High School and Less, %	11.35
Some college, %	27.84
Bachelor, %	44.49
Masters or above, %	16.32
Work full time, %	69.55
Political Orientation:	
Independent, %	27.33
Republican, %	22.88
Democrat, %	49.79
Bureau of Economic Analysis (BEA) Regions:	
Far West, %	12.54
Great Lakes, %	16.78
Mideast, %	17.03
New England, %	4.66
Plains, %	6.10
Rocky Mountain, %	3.31
Southeast, %	28.73
Southwest, %	10.85
Total number of responses	1207
Unmatched ZIP code	9
Failed check question criteria	6
Sample used in analysis after exclusions:	1189

Table B.2: Betrayal aversion to active betrayal and pooled message treatments (Fixed effect linear regressions)

Dependent Variable:	(1) Betrayal Aversion	(2) Betrayal Aversion
Message	-.05***	-.05***
	(.011)	(.012)
Non-Betrayal scenario first	.046***	.045***
	(.007)	(.006)
Woman	.017	.017
	(.015)	(.015)
Age/100	.036	.04
	(.084)	(.084)
Hispanic	.063**	.063**
	(.025)	(.027)
Caucasian	.009	.009
	(.022)	(.021)
Education (Base: high school or less)		
Some college	-.029**	-.03**
	(.009)	(.009)
Bachelor	-.015	-.014
	(.012)	(.011)
Masters or above	-.032	-.032*
	(.018)	(.017)
Work full time	.008	.008
	(.032)	(.033)
Political orientation (Base: Democrat)		
Independent	-.017	-.018
	(.021)	(.021)
Republican	-.007	-.006
	(.019)	(.017)
PACV	-.002	-
	(.004)	
ERQ Reappraisal	-.001	0
	(.002)	(.002)
ERQ Suppression	0	.001
	(.001)	(.001)
VCI (average)	-	-.075
		(.086)
Constant	.088	.062
	(.053)	(.045)
Region (BEA) fixed effects	Yes	Yes

Observations	592	592
R-squared	.05	.053

Standard errors (clustered at the region level) are in parentheses. Likert-scale (7-point) measures are standardized at the individual level (z-score). Dependent variable is constructed by taking the difference between the z-scored willingness to get the vaccine across the non-betrayal and active betrayal conditions. A more positive score on PACV or VCI denotes higher hesitancy. $***p < .01, **p < .05, *p < .1$

Table B.3: Betrayal aversion across different reappraisal messaging conditions (Fixed effect linear regressions)

Dependent Variable:	(1) Betrayal Aversion	(2) Betrayal Aversion
Messaging condition (Base: No Message)		
Neutral Reappraisal Message	-.046***	-.045**
	(.013)	(.014)
Embrace Emotions Ambiguous Reappraisal Message	-.065***	-.065**
	(.017)	(.019)
Embrace Negative Emotions Reappraisal Message	-.038	-.038
	(.023)	(.024)
Embrace Positive Emotions Reappraisal Message	-.059***	-.059***
	(.01)	(.01)
Betrayal Aversion Message	-.043*	-.042
	(.022)	(.022)
Non-Betrayal scenario first	.046***	.045***
	(.006)	(.006)
Woman	.017	.016
	(.016)	(.016)
Age/100	.041	.046
	(.084)	(.084)
Hispanic	.064**	.063*
	(.025)	(.027)
Caucasian	.008	.007
	(.023)	(.023)
Education (Base: high school or less)		
Some college	-.028***	-.029**

	(.008)	(.009)
Bachelor	-.014	-.013
	(.012)	(.011)
Masters or above	-.031	-.031
	(.018)	(.017)
Work full time	.008	.009
	(.032)	(.033)
Political orientation (Base: Democrat)		
Independent	-.018	-.018
	(.021)	(.021)
Republican	-.008	-.007
	(.018)	(.016)
PACV	-.001	-
	(.004)	
ERQ Reappraisal	-.001	0
	(.002)	(.002)
ERQ Suppression	0	.001
	(.001)	(.001)
VCI (average)	-	-.072
		(.091)
Constant	.083	.06
	(.056)	(.049)
Region (BEA) fixed effects	Yes	Yes
Observations	592	592
R-squared	.052	.056

Standard errors (clustered at the region level) are in parentheses. Likert-scale (7-point) measures are standardized at the individual level (z-score). Dependent variable is constructed by taking the difference between the z-scored willingness to get the vaccine across the non-betrayal and active betrayal conditions. A more positive score on PACV or VCI denotes higher hesitancy. $***p < .01, **p < .05, *p < .1$

Table B.4: Willingness to get the vaccine across different reappraisal messaging conditions (Fixed effect linear regressions))

Dependent variable: Willingness to vaccinate	(1) Non Betrayal	(2) Non Betrayal	(3) Active Betrayal	(4) Active Betrayal
Messaging condition (Base: No Message)				
Neutral Reappraisal Message	-.039	-.04	.007	.006
	(.038)	(.038)	(.036)	(.035)
Embrace Emotions Ambiguous Reappraisal Message	-.018	-.026	.047	.039
	(.026)	(.024)	(.032)	(.028)
Embrace Negative Emotions Reappraisal Message	0	.006	.038	.044
	(.016)	(.025)	(.029)	(.033)
Embrace Positive Emotions Reappraisal Message	.009	.011	.068	.07
	(.032)	(.038)	(.039)	(.044)
Betrayal Aversion Message	-.021	-.012	.022	.03
	(.032)	(.025)	(.046)	(.042)
Non-Betrayal scenario first	-.014	-.014	-.06**	-.059**
	(.021)	(.019)	(.022)	(.02)
Woman	.005	.007	-.012	-.009
	(.023)	(.026)	(.026)	(.028)
Age/100	.059	.064	.018	.018
	(.056)	(.065)	(.035)	(.037)
Hispanic	.064*	.067*	0	.004
	(.028)	(.034)	(.036)	(.041)
Caucasian	.025	.027	.017	.02
	(.034)	(.034)	(.02)	(.021)
Education (Base: high school or less)				
Some college	0	-.005	.028	.024
	(.028)	(.04)	(.028)	(.039)
Bachelor	.032*	.039	.045*	.052
	(.016)	(.025)	(.02)	(.03)
Masters or above	.037**	.04*	.067***	.071**
	(.015)	(.02)	(.015)	(.022)
Work full time	.019	.011	.011	.002
	(.014)	(.014)	(.031)	(.028)
Political orientation (Base: Democrat)				
Independent	-.05	-.075**	-.032	-.057
	(.036)	(.029)	(.054)	(.047)

Republican	-.108**	-.141***	-.1*	-.134***
	(.037)	(.033)	(.043)	(.036)
PACV	-.041***		-.04***	
	(.006)		(.005)	
ERQ Reappraisal	-.006**	-.003	-.005***	-.003*
	(.002)	(.002)	(.001)	(.001)
ERQ Suppression	-.002	-.001	-.003**	-.002**
	(.002)	(.002)	(.001)	(.001)
VCI (average)		-.462***		-.39***
		(.069)		(.053)
Constant	.163*	-.049	.08	-.108
	(.08)	(.091)	(.077)	(.091)
Region (BEA) fixed effects	Yes	Yes	Yes	Yes
Observations	592	592	592	592
R-squared	.219	.197	.179	.147

Standard errors (clustered at the region level) are in parentheses. Likert-scale (7-point) measures, including dependent variable, are standardized at the individual level (z-score). A more positive score on PACV or VCI denotes higher hesitancy. $***p < .01, **p < .05, *p < .1$

Table B.5: Willingness to get the vaccine disassociated by motivation, across reappraisal messaging treatments, controlling for PACV (Fixed effect linear regressions)

Dependent variable: Willingness to vaccinate	(1) Benchmark	(2) To protect oneself	(3) To protect others	(4) Wait and see	(5) Only if required
Messaging condition (Base: No Message)					
Neutral Reappraisal Message	-.119	-.152	.015	-.018	-.031
	(.28)	(.309)	(.047)	(.045)	(.04)
Embrace Emotions Ambiguous Reappraisal Message	-.091	-.052	-.018	-.004	-.002
	(.232)	(.261)	(.043)	(.05)	(.047)
Embrace Negative Emotions Reappraisal Message	-.13	-.119	-.019	.035	.029
	(.221)	(.202)	(.029)	(.046)	(.042)
Embrace Positive Emotions Reappraisal Message	.296	.279	.052	-.09	-.021
	(.238)	(.237)	(.033)	(.048)	(.057)
Betrayal Aversion Message	.027	.072	.045	.002	.026
	(.185)	(.204)	(.053)	(.045)	(.038)
Woman	-.141	-.145	-.002	.034	-.042
	(.129)	(.149)	(.029)	(.041)	(.03)
Age/100	.214	.417	.025	-.257**	-.36***
	(.519)	(.655)	(.126)	(.081)	(.075)
Hispanic	.144	-.117	-.023	.078	.021
	(.369)	(.389)	(.048)	(.058)	(.071)
Caucasian	.252	.153	.05*	-.051	-.009
	(.155)	(.091)	(.026)	(.036)	(.026)
Education (Base: high school or less)					
Some college	-.233	-.459**	-.068*	.046	-.027
	(.191)	(.176)	(.031)	(.057)	(.057)
Bachelor	.271	.051	-.004	-.037	-.073
	(.319)	(.331)	(.041)	(.07)	(.068)
Masters or above	.495	.323	.004	-.095**	-.101*
	(.271)	(.286)	(.06)	(.039)	(.048)
Work full time	.139	.18	.026	-.014	-.038
	(.149)	(.181)	(.022)	(.031)	(.034)
Political orientation (Base: Democrat)					
Independent	-.564**	-.572**	-.065	.139**	.04
	(.173)	(.174)	(.039)	(.052)	(.036)
Republican	-.764***	-.715***	-.09***	.206***	.095**

	(.109)	(.137)	(.015)	(.023)	(.039)
PACV	-.495***	-.498***	-.058***	.105***	.101***
	(.027)	(.021)	(.005)	(.006)	(.007)
ERQ Reappraisal	.017*	.021*	-.003	.004	.012***
	(.008)	(.009)	(.002)	(.003)	(.001)
ERQ Suppression	.024	.028	-.001	-.001	.004
	(.019)	(.02)	(.003)	(.003)	(.003)
Constant	6.158***	6.225***	.159	-.866***	-1.264***
	(1.023)	(.943)	(.116)	(.149)	(.099)
Region (BEA) fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	583	583	583	583	583
R-squared	.384	.38	.281	.363	.361

Standard errors (clustered at the region level) are in parentheses. Likert-scale (7-point) measures, including dependent variable, are standardized at the individual level (z-score). A more positive score on PACV or VCI denotes higher hesitancy. $***p < .01, **p < .05, *p < .1$

Table B.6: Willingness to get the vaccine disassociated by motivation, across reappraisal messaging treatments, controlling for VCI (average of four z-scored measures) (Fixed effect linear regressions)

Dependent variable: Willingness to vaccinate	(1) Benchmark (Unconditional)	(2) To protect oneself	(3) To protect others	(4) Wait and see	(5) Only if required
Messaging condition (Base: No Message)					
Neutral Reappraisal Message	-.173	-.208	.008	-.006	-.019
	(.283)	(.306)	(.041)	(.053)	(.043)
Embrace Emotions Ambiguous Reappraisal Message	-.18	-.138	-.027	.014	.013
	(.291)	(.316)	(.041)	(.047)	(.046)
Embrace Negative Emotions Reappraisal Message	-.219	-.207	-.029	.053	.046
	(.254)	(.26)	(.031)	(.036)	(.048)
Embrace Positive Emotions Reappraisal Message	.057	.038	.023	-.039	.028
	(.348)	(.316)	(.036)	(.066)	(.07)
Betrayal Aversion Message	-.224	-.18	.016	.055	.076*
	(.184)	(.169)	(.05)	(.037)	(.04)
Woman	-.129	-.126	.002	.029	-.049*
	(.106)	(.128)	(.027)	(.035)	(.026)

Age/100	.462	.662	.053	-.309***	-.407***
	(.442)	(.558)	(.114)	(.068)	(.074)
Hispanic	.123	-.128	-.022	.08	.018
	(.384)	(.416)	(.054)	(.069)	(.085)
Caucasian	.343	.246	.061*	-.07	-.029
	(.221)	(.14)	(.026)	(.053)	(.029)
Education (Base: high school or less)					
Some college	-.207	-.422**	-.061*	.037	-.04
	(.165)	(.148)	(.027)	(.047)	(.046)
Bachelor	.175	-.043	-.014	-.017	-.056
	(.306)	(.316)	(.035)	(.074)	(.06)
Masters or above	.352	.177	-.014	-.064	-.071
	(.234)	(.253)	(.051)	(.039)	(.043)
Work full time	.191	.233	.033	-.026	-.049*
	(.165)	(.2)	(.018)	(.02)	(.026)
Political orientation (Base: Democrat)					
Independent	-.814***	-.813***	-.091**	.189***	.083**
	(.177)	(.16)	(.038)	(.037)	(.025)
Republican	-1.085***	-1.025***	-.123***	.27***	.152***
	(.115)	(.141)	(.021)	(.035)	(.043)
VCI (average)	-4.479***	-4.754***	-.609***	1.03***	1.093***
	(.22)	(.191)	(.079)	(.08)	(.134)
ERQ Reappraisal	.034**	.04***	0	0	.008***
	(.011)	(.009)	(.002)	(.004)	(.002)
ERQ Suppression	.036	.042*	.001	-.004	0
	(.023)	(.021)	(.003)	(.004)	(.003)
Constant	3.841**	3.831***	-.133	-.354	-.746***
	(1.211)	(1.092)	(.131)	(.195)	(.115)
Region (BEA) fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	583	583	583	583	583
R-squared	.286	.298	.245	.298	.323

Standard errors (clustered at the region level) are in parentheses. Likert-scale (7-point) measures, including dependent variable, are standardized at the individual level (z-score). A more positive score on PACV or VCI denotes higher hesitancy. $***p < .01, **p < .05, *p < .1$

Table B.7: Comparing multiple Reappraisal Message conditions (Treatment groups) with No Message condition (Control group)

Treatment/Control group	DI	Unadjusted p-value	Multiplicity adjusted p-values List et al.	Bonf.	Holm
Control vs. Neutral Reappraisal Message	.045	.052*	.128	.312	.156
Control vs. Embrace Emotions Ambiguous Reappraisal Message	.069	.003***	.009***	.016**	.013**
Control vs. Embrace Negative Emotions Reappraisal Message	.039	.137	.241	.824	.245
Control vs. Embrace Positive Emotions Reappraisal Message	.053	.019**	.064*	.116	.077*
Control vs. Betrayal Aversion Message	.038	.186	.186	1	.186

DI refers to difference in means. $***p < .01, **p < .05, *p < .1$

B.3 Administered survey

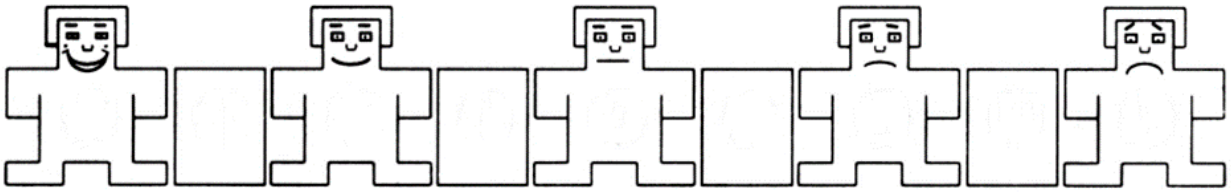
Survey [everything that is underlined and/or in square brackets is not shown to participants]

[Self Assessment Manikin (SAM): Emotion assessment tool using graphic scales to express the three elements of pleasure, arousal, and dominance]

Here, you will see 3 sets of 5 figures, each arranged along a continuum. We call this set of figures SAM, and you will be using these figures to rate how you currently feel. SAM shows three different kinds of feelings: Happy vs. Unhappy, Excited vs. Calm, and Controlled vs. In-control. Please select the option that best represents how you currently feel from each of the three scales below.

1. The first SAM scale is the happy-unhappy scale, which ranges from a smile to a frown. At one extreme of the happy vs. unhappy scale, you feel happy, pleased, satisfied, contented, hopeful. If you feel completely happy currently, you can indicate this by selecting the figure at the left. The other end of the scale is if you feel completely unhappy, annoyed, unsatisfied, melancholic, despaired, bored. You can indicate feeling completely unhappy by selecting the figure at the right. The figures also allow you to describe intermediate feelings of pleasure, by selecting any of the other pictures. If you felt completely neutral, neither happy nor unhappy, select the figure in the middle. If, in your judgment, your feeling of pleasure or displeasure falls between two of the pictures, then select the space option between the figures. This permits you to make more finely graded ratings of how you feel currently.

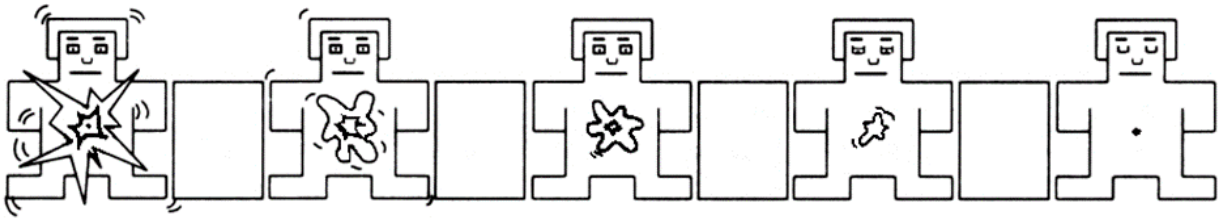
Please select the option that best describes your current emotional state on the happy-unhappy scale.



2. The excited vs. calm dimension is the second type of feeling displayed here. At one extreme of the scale you feel stimulated, excited, frenzied, jittery, wide-awake, aroused. If you felt completely aroused currently, select the figure at the left of the row. On the other hand, at the other end of the scale, you feel completely relaxed, calm, sluggish, dull, sleepy, unaroused. You can indicate you feel completely calm by selecting the figure at the right of

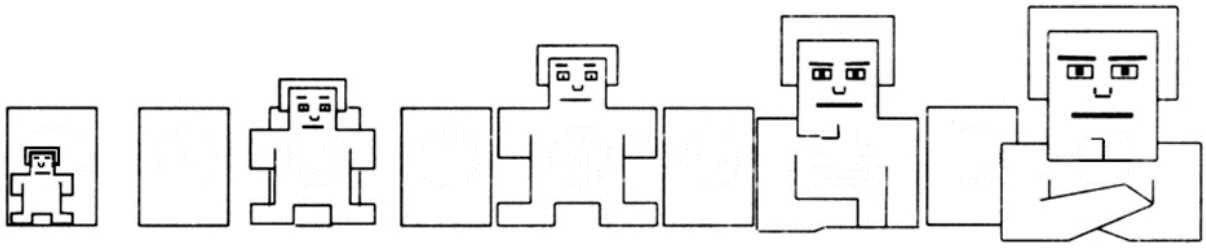
the row. As with the happy-unhappy scale, you can represent intermediate levels by selecting any of the other figures. If you are not at all excited nor at all calm, select the figure in the middle of the row. Again, if you wish to make a more finely tuned rating of how excited or calm you feel, select the gap between the pictures.

Please select the option that best describes your current emotional state on the excited vs. calm scale.



3. The last scale of feeling that you will rate is the dimension of controlled vs. in-control. At one end of the scale you have feelings characterized as completely controlled, influenced, cared for, awed, submissive, guided. Please indicate feeling controlled by selecting the figure at the left. At the other extreme of this scale, you feel completely controlling, influential, in control, important, dominant, autonomous. You can indicate that you felt dominant by selecting the figure at the right of the row. Note that when the figure is large, you feel important and influential, and that it will be very small when you feel controlled and guided. If you feel neither in control nor controlled you should select the middle picture. Remember you can also represent your feelings between these endpoints. Either select any of the intermediate figures, or the space between them.

Please select the option that best describes your current emotional state on the controlled vs. in-control scale.



[next page- hypothetical scenarios]
Please answer the following questions about the following hypothetical scenario.

[For treatment 1,1']
In today's study, you will be asked to complete two tasks involving hypothetical scenarios. After you complete both tasks, you will be asked to answer survey questions about real world experiences and demographic characteristics.

Please proceed to the next page to begin the first task. Note the highlighted bold text in each hypothetical scenario, which reflects some differences between the two scenarios. Please make sure to read each scenario carefully before selecting your choices.

[next page – non-betrayal; order randomized between groups 1 and 1']

Please answer the question based on the following hypothetical scenario:

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

You are also informed that scientific tests indicate that there is a 2% chance that people like you, who are not treated with the vaccine, will contract the virus and die as a result. Scientific tests also indicate that there is a 1% chance that people treated with the vaccine will contract the virus and die as a result. However, some people who are treated with the vaccine, and who would not have died if they did not get the vaccine, may die in another way.

Specifically, some people that get the vaccine may die due to problems unrelated to the vaccine. Medical tests indicate that there is an additional one chance in 10,000 (0.01%) that someone who is treated with the vaccine will die due to problems unrelated to the vaccine.

1. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)
c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)
e. Unsure, but leaning towards accept (5)
f. Accept (6)
g. Definitely accept (7)

[next page – active betrayal; order randomized between groups 1 and 1']

Please answer the question based on the following hypothetical scenario:

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

You are also informed that scientific tests indicate that there is a 2% chance that people like you, who are not treated with the vaccine, will contract the virus and die as a result. Scientific tests also indicate that there is a 1% chance that people treated with the vaccine will contract the virus and die as a result. However, some people who are treated with the vaccine, and who would not have died if they did not get the vaccine, may die in another way.

Specifically, some people that get the vaccine may die due to vaccine-induced complications (side effects). Medical tests indicate that there is an additional one chance in 10,000 (0.01%) that someone who is treated with the vaccine will die due to vaccine-induced complications (side effects).

2. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)
c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)
e. Unsure, but leaning towards accept (5)
f. Accept (6)
g. Definitely accept (7)

[For treatment 1pa,1pa']
In today's study, you will be asked to complete two tasks involving hypothetical scenarios. After you complete both tasks, you will be asked to answer survey questions about real world experiences and demographic characteristics.

Please proceed to the next page to begin the first task. Note the highlighted bold text in

each hypothetical scenario, which reflects some differences between the two scenarios. Please make sure to read each scenario carefully before selecting your choices.

[next page – non-betrayal; order randomized between groups 1pa and 1pa']

Please answer the question based on the following hypothetical scenario:

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

[message condition- Neutral reappraisal / Self-regulate from a Hot State to a Cold State]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. Sometimes, people do not make their best decisions when they are feeling emotional; that is why it's good to plan ahead. For the medical decision here, adopt a neutral attitude by thinking objectively and analytically rather than in an emotional way. Register today to get the vaccine at an opportune time. "

You are also informed that scientific tests indicate that there is a 2% chance that people like you, who are not treated with the vaccine, will contract the virus and die as a result. Scientific tests also indicate that there is a 1% chance that people treated with the vaccine will contract the virus and die as a result. However, some people who are treated with the vaccine, and who would not have died if they did not get the vaccine, may die in another way.

Specifically, some people that get the vaccine may die due to problems unrelated to the vaccine. Medical tests indicate that there is an additional one chance in 10,000 (0.01%) that someone who is treated with the vaccine will die due to problems unrelated to the vaccine.

3. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)
c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)

e. Unsure, but leaning towards accept (5)
f. Accept (6)
g. Definitely accept (7)

[next page – active betrayal; order randomized between groups 1pa and 1pa']

Please answer the question based on the following hypothetical scenario:

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

[message condition- Neutral reappraisal / Self-regulate from a Hot State to a Cold State]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. Sometimes, people do not make their best decisions when they are feeling emotional; that is why it's good to plan ahead. For the medical decision here, adopt a neutral attitude by thinking objectively and analytically rather than in an emotional way. Register today to get the vaccine at an opportune time. "

You are also informed that scientific tests indicate that there is a 2% chance that people like you, who are not treated with the vaccine, will contract the virus and die as a result. Scientific tests also indicate that there is a 1% chance that people treated with the vaccine will contract the virus and die as a result. However, some people who are treated with the vaccine, and who would not have died if they did not get the vaccine, may die in another way.

Specifically, some people that get the vaccine may die due to vaccine-induced complications (side effects). Medical tests indicate that there is an additional one chance in 10,000 (0.01%) that someone who is treated with the vaccine will die due to vaccine-induced complications (side effects).

4. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)

c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)
e. Unsure, but leaning towards accept (5)
f. Accept (6)
g. Definitely accept (7)

[For treatment 1pb,1pb']
In today's study, you will be asked to complete two tasks involving hypothetical scenarios. After you complete both tasks, you will be asked to answer survey questions about real world experiences and demographic characteristics.

Please proceed to the next page to begin the first task. Note the highlighted bold text in each hypothetical scenario, which reflects some differences between the two scenarios. Please make sure to read each scenario carefully before selecting your choices.

[next page – non-betrayal; order randomized between groups 1pb and 1pb']

Please answer the question based on the following hypothetical scenario:

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

[message condition- Embrace Emotions Ambiguous Reappraisal / Use the emotions to make a better decision (focus on emotions)]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. Sometimes, people make their best decisions when they are feeling emotional; that is why it's good to plan ahead. For the medical decision here, really focus on using your emotions to help you make a good decision. Register today to get the vaccine at an opportune time. "

You are also informed that scientific tests indicate that there is a 2% chance that people like you, who are not treated with the vaccine, will contract the virus and die as a result. Scientific tests also indicate that there is a 1% chance that people treated with the vaccine

will contract the virus and die as a result. However, some people who are treated with the vaccine, and who would not have died if they did not get the vaccine, may die in another way.

Specifically, some people that get the vaccine may die due to problems unrelated to the vaccine. Medical tests indicate that there is an additional one chance in 10,000 (0.01%) that someone who is treated with the vaccine will die due to problems unrelated to the vaccine.

1. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)
c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)
e. Unsure, but leaning towards accept (5)
f. Accept (6)
g. Definitely accept (7)

[next page – active betrayal; order randomized between groups 1pb and 1pb']

Please answer the question based on the following hypothetical scenario:

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

[message condition- Embrace Emotions Ambiguous Reappraisal / Use the emotions to make a better decision (focus on emotions)]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. Sometimes, people make their best decisions when they are feeling emotional; that is why it's good to plan ahead. For the medical decision here, really focus on using your emotions to help you make a good decision. Register today to get the vaccine at an opportune time. "

You are also informed that scientific tests indicate that there is a 2% chance that people like you, who are not treated with the vaccine, will contract the virus and die as a result.

Scientific tests also indicate that there is a 1% chance that people treated with the vaccine will contract the virus and die as a result. However, some people who are treated with the vaccine, and who would not have died if they did not get the vaccine, may die in another way.

Specifically, some people that get the vaccine may die due to vaccine-induced complications (side effects). Medical tests indicate that there is an additional one chance in 10,000 (0.01%) that someone who is treated with the vaccine will die due to vaccine-induced complications (side effects).

2. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)
c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)
e. Unsure, but leaning towards accept (5)
f. Accept (6)
g. Definitely accept (7)

[For treatment 1pc,1pc']
In today's study, you will be asked to complete two tasks involving hypothetical scenarios. After you complete both tasks, you will be asked to answer survey questions about real world experiences and demographic characteristics.

Please proceed to the next page to begin the first task. Note the highlighted bold text in each hypothetical scenario, which reflects some differences between the two scenarios. Please make sure to read each scenario carefully before selecting your choices.

[next page – non-betrayal; order randomized between groups 1pc and 1pc']

Please answer the question based on the following hypothetical scenario:

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

[message condition- Embrace Negative Emotions Reappraisal/ Use the negative emotions to make a better decision (Self-regulate from a Hot State to a different Hot State)]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. For the medical decision here, really focus on the emotions associated with how bad you would feel if you experienced the negative effects of getting the disease if you chose to not get vaccinated. Register today to get the vaccine at an opportune time."

You are also informed that scientific tests indicate that there is a 2% chance that people like you, who are not treated with the vaccine, will contract the virus and die as a result. Scientific tests also indicate that there is a 1% chance that people treated with the vaccine will contract the virus and die as a result. However, some people who are treated with the vaccine, and who would not have died if they did not get the vaccine, may die in another way.

Specifically, some people that get the vaccine may die due to problems unrelated to the vaccine. Medical tests indicate that there is an additional one chance in 10,000 (0.01%) that someone who is treated with the vaccine will die due to problems unrelated to the vaccine.

1. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)
c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)
e. Unsure, but leaning towards accept (5)
f. Accept (6)
g. Definitely accept (7)

[next page – active betrayal; order randomized between groups 1pc and 1pc']

Please answer the question based on the following hypothetical scenario:

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

[message condition- Embrace Negative Emotions Reappraisal/ Use the negative emotions to make a better decision (Self-regulate from a Hot State to a different Hot State)]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. For the medical decision here, really focus on the emotions associated with how bad you would feel if you experienced the negative effects of getting the disease if you chose to not get vaccinated. Register today to get the vaccine at an opportune time."

You are also informed that scientific tests indicate that there is a 2% chance that people like you, who are not treated with the vaccine, will contract the virus and die as a result. Scientific tests also indicate that there is a 1% chance that people treated with the vaccine will contract the virus and die as a result. However, some people who are treated with the vaccine, and who would not have died if they did not get the vaccine, may die in another way.

Specifically, some people that get the vaccine may die due to vaccine-induced complications (side effects). Medical tests indicate that there is an additional one chance in 10,000 (0.01%) that someone who is treated with the vaccine will die due to vaccine-induced complications (side effects).

2. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)
c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)
e. Unsure, but leaning towards accept (5)
f. Accept (6)
g. Definitely accept (7)

[For treatment 1pd,1pd']
In today's study, you will be asked to complete two tasks involving hypothetical scenarios. After you complete both tasks, you will be asked to answer survey questions about real world experiences and demographic characteristics.

Please proceed to the next page to begin the first task. Note the highlighted bold text in each hypothetical scenario, which reflects some differences between the two scenarios. Please make sure to read each scenario carefully before selecting your choices.

[next page – non-betrayal; order randomized between groups 1pd and 1pd']

Please answer the question based on the following hypothetical scenario:

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

[message condition- Embrace Positive Emotions Reappraisal / Use the positive emotions to make a better decision (Self-regulate from a Hot State to a different Hot State)]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. For the medical decision here, really focus on the emotions associated with how good you would feel if you experienced the positive effects of receiving the additional protection against the disease if you chose to get vaccinated. Register today to get the vaccine at an opportune time."

You are also informed that scientific tests indicate that there is a 2% chance that people like you, who are not treated with the vaccine, will contract the virus and die as a result. Scientific tests also indicate that there is a 1% chance that people treated with the vaccine will contract the virus and die as a result. However, some people who are treated with the vaccine, and who would not have died if they did not get the vaccine, may die in another way.

Specifically, some people that get the vaccine may die due to problems unrelated to the vaccine. Medical tests indicate that there is an additional one chance in 10,000 (0.01%) that someone who is treated with the vaccine will die due to problems unrelated to the vaccine.

1. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)
c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)
e. Unsure, but leaning towards accept (5)
f. Accept (6)
g. Definitely accept (7)

[next page – active betrayal; order randomized between groups 1pd and 1pd']

Please answer the question based on the following hypothetical scenario:

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

[message condition- Embrace Positive Emotions Reappraisal / Use the positive emotions to make a better decision (Self-regulate from a Hot State to a different Hot State)]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. For the medical decision here, really focus on the emotions associated with how good you would feel if you experienced the positive effects of receiving the additional protection against the disease if you chose to get vaccinated. Register today to get the vaccine at an opportune time."

You are also informed that scientific tests indicate that there is a 2% chance that people like you, who are not treated with the vaccine, will contract the virus and die as a result. Scientific tests also indicate that there is a 1% chance that people treated with the vaccine will contract the virus and die as a result. However, some people who are treated with the vaccine, and who would not have died if they did not get the vaccine, may die in another way.

Specifically, some people that get the vaccine may die due to vaccine-induced complications (side effects). Medical tests indicate that there is an additional one chance in 10,000 (0.01%) that someone who is treated with the vaccine will die due to vaccine-induced complications (side effects).

2. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)
c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)
e. Unsure, but leaning towards accept (5)

f. Accept (6)
g. Definitely accept (7)

[For treatment 1pe,1pe']
In today's study, you will be asked to complete two tasks involving hypothetical scenarios. After you complete both tasks, you will be asked to answer survey questions about real world experiences and demographic characteristics.

Please proceed to the next page to begin the first task. Note the highlighted bold text in each hypothetical scenario, which reflects some differences between the two scenarios. Please make sure to read each scenario carefully before selecting your choices.

[next page – non-betrayal; order randomized between groups 1pe and 1pe']

Please answer the question based on the following hypothetical scenario:

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

[message condition- Betrayal Aversion message]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. Specifically, negative emotions associated with a fear of the procedure itself causing harm is known as 'betrayal aversion'. While this response can be helpful for avoiding certain dangerous situations, we do not want betrayal aversion to prevent us from receiving safe and effective protection against the virus. For the medical decision here, try to avoid letting any feelings of betrayal aversion prevent you from getting your vaccine. Register today to get the vaccine at an opportune time."

You are also informed that scientific tests indicate that there is a 2% chance that people like you, who are not treated with the vaccine, will contract the virus and die as a result. Scientific tests also indicate that there is a 1% chance that people treated with the vaccine will contract the virus and die as a result. However, some people who are treated with the

vaccine, and who would not have died if they did not get the vaccine, may die in another way.

Specifically, some people that get the vaccine may die due to problems unrelated to the vaccine. Medical tests indicate that there is an additional one chance in 10,000 (0.01%) that someone who is treated with the vaccine will die due to problems unrelated to the vaccine.

1. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)
c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)
e. Unsure, but leaning towards accept (5)
f. Accept (6)
g. Definitely accept (7)

[next page – active betrayal; order randomized between groups 1pe and 1pe']

Please answer the question based on the following hypothetical scenario:

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

[message condition- Betrayal Aversion message]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. Specifically, negative emotions associated with a fear of the procedure itself causing harm is known as 'betrayal aversion'. While this response can be helpful for avoiding certain dangerous situations, we do not want betrayal aversion to prevent us from receiving safe and effective protection against the virus. For the medical decision here, try to avoid letting any feelings of betrayal aversion prevent you from getting your vaccine. Register today to get the vaccine at an opportune time."

You are also informed that scientific tests indicate that there is a 2% chance that people

like you, who are not treated with the vaccine, will contract the virus and die as a result. Scientific tests also indicate that there is a 1% chance that people treated with the vaccine will contract the virus and die as a result. However, some people who are treated with the vaccine, and who would not have died if they did not get the vaccine, may die in another way.

Specifically, some people that get the vaccine may die due to vaccine-induced complications (side effects). Medical tests indicate that there is an additional one chance in 10,000 (0.01%) that someone who is treated with the vaccine will die due to vaccine-induced complications (side effects).

2. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)
c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)
e. Unsure, but leaning towards accept (5)
f. Accept (6)
g. Definitely accept (7)

[For treatment 6,6pa,6pb,6pc, 6pd, 6pe]

Instructions

In today's study, you will be asked to complete one task involving a hypothetical scenario. After you complete the task, you will be asked to answer survey questions about real world experiences and demographic characteristics.

Please proceed to the next page to begin the task. Please make sure to read the scenario carefully before selecting your choices.

[next page – no risk; get either 6 or 6pa or 6pb or 6pc or 6pd or 6pe]

In the future, a new deadly, highly infectious disease has been spreading across the world. In response, a vaccine has been developed by the scientific community to prevent the spread of the disease.

Suppose you are given the opportunity to get the free vaccine for the highly infectious deadly virus (via an easy-to-take pill) at a convenient location.

[message conditions (shown only in message treatments) -one of the following five messages (6pa, 6pb, 6pc, 6pd,6pe) shown]

[message condition 6pa- Neutral reappraisal / Self-regulate from a Hot State to a Cold State]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. Sometimes, people do not make their best decisions when they are feeling emotional; that is why it's good to plan ahead. For the medical decision here, adopt a neutral attitude by thinking objectively and analytically rather than in an emotional way. Register today to get the vaccine at an opportune time. "

[message condition 6pb- Embrace Emotions Ambiguous Reappraisal / Use the emotions to make a better decision (focus on emotions)]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. Sometimes, people make their best decisions when they are feeling emotional; that is why it's good to plan ahead. For the medical decision here, really focus on using your emotions to help you make a good decision. Register today to get the vaccine at an opportune time. "

[message condition 6pc- Embrace Negative Emotions Reappraisal/ Use the negative emotions to make a better decision (Self-regulate from a Hot State to a different Hot State)]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. For the medical decision here, really focus on the emotions associated with how bad you would feel if you experienced the negative effects of getting the disease if you chose to not get vaccinated. Register today to get the vaccine at an opportune time."

[message condition 6pd- Embrace Positive Emotions Reappraisal / Use the positive emotions to make a better decision (Self-regulate from a Hot State to a different Hot State)]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. For the medical decision here, really focus on the emotions associated with how good you would feel if you experienced the positive effects of receiving the additional protection against the disease if

you chose to get vaccinated. Register today to get the vaccine at an opportune time."

[message condition 6pe- Betrayal Aversion message]

The following statement has been circulated to the public: " Health is very personal, so people often have emotional reactions associated with medical procedures. Specifically, negative emotions associated with a fear of the procedure itself causing harm is known as 'betrayal aversion'. While this response can be helpful for avoiding certain dangerous situations, we do not want betrayal aversion to prevent us from receiving safe and effective protection against the virus. For the medical decision here, try to avoid letting any feelings of betrayal aversion prevent you from getting your vaccine. Register today to get the vaccine at an opportune time."

You are also informed that scientific tests indicate that there is a 2% chance that people like you, who are not treated with the vaccine, will contract the virus and die as a result. Scientific tests also indicate that there is a 1.01% chance that people treated with the vaccine will contract the virus and die as a result.

1. Would you accept or reject getting the vaccine?
a. Definitely reject (1)
b. Reject (2)
c. Unsure, but leaning towards reject (3)
d. Indifferent between accepting and rejecting (4)
e. Unsure, but leaning towards accept (5)
f. Accept (6)
g. Definitely accept (7)

[DR/R/UR/ID/UA/A/DA]

Please indicate the extent by which you agree or disagree with the following statements.
2. I will accept getting the vaccine to protect myself
3. I will accept getting the vaccine to protect friends, family, and at-risk groups.
4. I will wait and see how the vaccine is working before getting it.
5. I will only get the vaccine if it was required by my work or school.
a. Strongly disagree (1)
b. Disagree (2)
c. Mildly disagree (3)
d. Neither agree nor disagree (4)
e. Mildly agree (5)

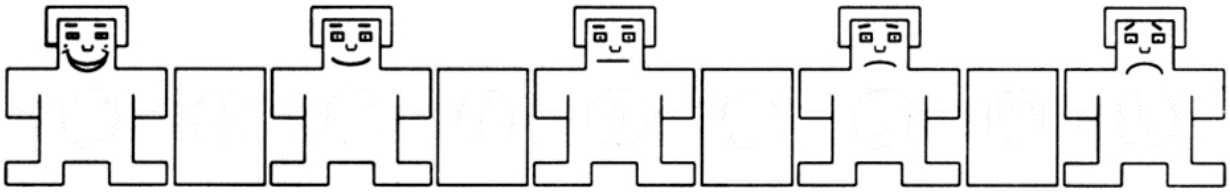
f. Agree (6)
g. Strongly agree (7)

[SD/D/MD/NAD/MA/A/SA]

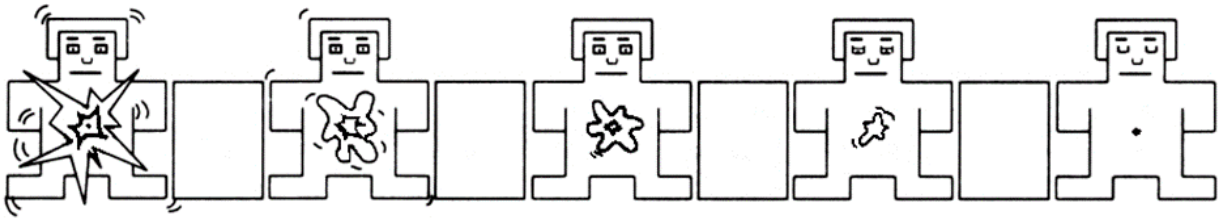
[next page- Self Assessment Manikin (SAM): Emotion assessment tool using graphic scales to express the three elements of pleasure, arousal, and dominance]

Now that you have completed the task(s), we will once again ask you to indicate how you currently feel using the SAM scales.

1. Please select the option that best describes your current emotional state on the happy-unhappy scale.



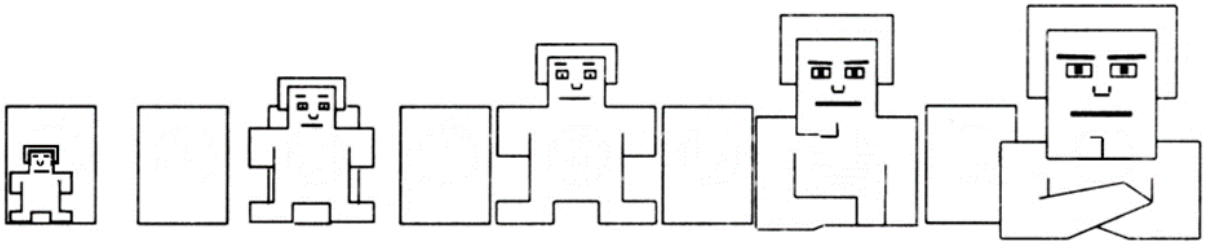
2. Please select the option that best describes your current emotional state on the excited vs. calm scale.



3. Please select the option that best describes your current emotional state on the controlled vs. in-control scale.

[next page – real world experiences and demographic characteristics]

Next, you will be asked to answer non-hypothetical survey questions about real world experiences and demographic characteristics.



Please proceed to the next page to begin the survey.

Part 3: Vaccination History [U.S. specific]

Please answer the following survey questions on your own experiences:

6. Are you up to date on vaccines? [Y/N]

7. Did you get a flu vaccine during last year's flu season? [yes/no]

8. In the last 5 years (not including the current flu season), how many times have you got the seasonal flu vaccine? [numeric]

9. As new effective vaccines come out in the future, do you plan on remaining up to date with vaccinations? [Y/N]

10. If you were travelling to a country and your doctor says that its recommended but not mandatory to get a vaccine while traveling (such as for Malaria or for Yellow Fever), would you get the vaccine? [Y/N]

Global Vaccine Confidence Index

Please evaluate how much you agree or disagree with the following statements: [SD/D/MD/-NAD/MA/A/SA]

11. It is important for individuals to get vaccinated

12. Overall, I think the vaccines currently available are safe

13. Overall, I think the vaccines currently available are effective

14. Vaccines are compatible with my religious belief

PACV [5-POINT Likert]

15. I trust the information I receive about vaccines. [SA/A/NS/D/SD]

16. It is better for my child to develop immunity by getting sick than to get a vaccine (if you do not have children, consider children in general). [SA/A/NS/D/SD]

17. It is better for children to get fewer vaccines at the same time. [SA/A/NS/D/SD]

18. Children get more vaccines than are good for them. [SA/A/NS/D/SD]

19. Overall, how hesitant about childhood vaccines would you consider yourself to be? [NAH/NTH/NS/SH/VH]

Part 4: COVID Vaccine history questions

20. Have you been vaccinated for COVID-19? [yes, partially, no]

21. [If No in 1] If you have not gotten (nor plan to be) vaccinated, why did you not get (nor plan on getting) the vaccine? [check all that apply]
a. The long-term effects of the COVID-19 vaccines are unknown
b. They might experience serious side effects from COVID-19 vaccine
c. The COVID-19 vaccines are not as safe as they are said to be
d. The COVID-19 vaccines are not as effective as they are said to be
e. Do not trust the healthcare system
f. Do not have time to go get vaccinated or deal with possible side effects
g. Due to an existing health condition
h. Have young children at home and do not have childcare
i. Do not have a reliable way to get to a vaccination site
j. Already have been infected with COVID-19
k. Other [please explain]

[Questions taken from: https://www.prri.org/research/religious-vaccines-covid-vaccination/]

22. If you have been (or plan to be) vaccinated, why did (or will) you get the vaccine? [check all that apply]
a. Self-protection
b. Protecting more vulnerable family members
c. Protecting more vulnerable peers/social circle
d. Pressure from family members
e. Pressure from peers/social circle
f. To feel more comfortable outside home
g. To participate in voluntary activities that require being vaccinated
h. Required by work/school
i. For travel purposes
j. To set an example for others
k. Other [please explain]
l. Do not plan to get vaccinated

Part 5: Demographic questions
23. What is your current zip code?

24. Gender:
a. Man
b. Non-binary
c. Woman
d. Prefer to self-describe [text field]

25. Age (numeric field)

26. Are you
a. American citizen
b. Non-American citizen: please specify country of citizenship

27. Are you Hispanic or Latino?
a. Yes
b. no

28. How would you describe yourself?

c. American Indian or Alaska Native
d. Asian
a. Black or African American
b. Native Hawaiian or Other Pacific Islander
c. White
d. Other

29. How many children do you have (include stepchildren or any children whom you are/were a primary caregiver)? [Numeric field]

30. What is your total household income?
a. Less than 10,000 USD
b. 10,000 to 19,999 USD
c. 20,000 to 29,999 USD
d. 30,000 to 39,999 USD
e. 40,000 to 49,999 USD
f. 50,000 to 59,999 USD
g. 60,000 to 69,999 USD
h. 70,000 to 79,999 USD
i. 80,000 to 89,999 USD
j. 90,000 to 99,999 USD
k. 100,000 to 149,999 USD
l. 150,000 USD or more

31. Are you a smoker?
a. yes
b. no

32. Do you:
a. Work at a full-time job
b. Work at a part-time job
c. Do not have a job

33. Please indicate the highest level of education YOU completed:
a. Some high school
b. High school diploma or equivalent
c. Some college or associate degree
d. B.A.
e. M.A./M.S./M.B.A.
f. M.D./J.D./PhD

g. Other

34. Generally speaking, what do you usually think of yourself as politically?
a. Republican
b. Democrat
c. Libertarian
d. Independent
e. Something else

Part 6: Other supplementary questions (including some (not all) Global Preference Survey measures)

35. How willing or unwilling are you to take risks. [SU/U/SWU/NWU/SWW/W/SW]
c. Strongly unwilling [SU]
d. Unwilling [U]
e. Somewhat unwilling [SWU]
f. Neither willing nor unwilling [NWU]
g. Somewhat willing [SWW]
h. Willing [W]
i. Strongly willing [SW]

36. How willing or unwilling are you to give up something that is beneficial for you today in order to benefit more from that in the future. [SU/U/SWU/NWU/SWW/W/SW]

37. How willing or unwilling are you to punish someone who treats YOU unfairly, even if there may be costs for you. [SU/U/SWU/NWU/SWW/W/SW]

38. How willing or unwilling are you to punish someone who treats OTHERS unfairly, even if there may be costs for you. [SU/U/SWU/NWU/SWW/W/SW]

39. How willing or unwilling are you to give to good causes without expecting anything in return. [SU/U/SWU/NWU/SWW/W/SW]

How much do you agree with each of the following statements?

40. When someone does me a favor, I am willing to return it. [SD/D/MD/NAD/MA/A/SA]

41. People can generally be trusted. [SD/D/MD/NAD/MA/A/SA]

42. Government can generally be trusted. [SD/D/MD/NAD/MA/A/SA]

43. Media can generally be trusted. [SD/D/MD/NAD/MA/A/SA]

44. Scientists can generally be trusted. [SD/D/MD/NAD/MA/A/SA]

Now, we will ask you some questions about future, uncertain outcomes. In each case, try to think about the whole range of possible outcomes and think about how likely they are to occur during the next 12 months. In some of the questions, we will ask you about the PERCENT CHANCE of something happening. The percent chance must be a number between zero and one hundred. Numbers like 2 or 5 percent may be "almost no chance," 20 percent or so may mean "not much chance," a 45 or 55 percent chance may be a "pretty even chance," 80 percent or so may mean a "very good chance," and a 95 or 98 percent chance may be "almost certain." The percent chance can also be thought of as the NUMBER OF CHANCES OUT OF 100.

45. Estimate the following:

What percentage of the US population over 12 do you believe will have received at least one COVID-19 vaccine by December 31, 2021? [Toggle bar]

46. Estimate the following:

How do you think an average American resident would answer the previous question? [Toggle bar]

47. To what extent are you afraid of the COVID-19 pandemic?
a. An extremely small extent [ES]
b. A small extent [S]
c. A somewhat small extent [SWS]
d. A moderate extent [M]
e. A somewhat large extent [SWL]
f. A large extent [L]
g. An extremely large extent [EL]

How much do you agree with each of the following statements?

48. I have regularly practiced social distancing in response to the Covid-19 pandemic.

49. I believe that one should practice social distancing in response to the COVID-19 pandemic. [SD/D/MD/NAD/MA/A/SA]

50. Estimate the following:
The percentage of the population who are practicing social distancing in response to the COVID-19 pandemic.

51. Estimate the following:
The percentage of the population who believe that one should practice social distancing in response to the COVID-19 pandemic.

52. Suppose there is a crisis and other people make a decision or provide information that makes matters worse. To what extent would you experience negative emotions (e.g. sadness or anger) as a result? [ES/S/SWS/M/SWL/L/EL]
a. An extremely small extent [ES]
b. A small extent [S]
c. A somewhat small extent [SWS]
d. A moderate extent [M]
e. A somewhat large extent [SWL]
f. A large extent [L]
g. An extremely large extent [EL]

53. Suppose there is a crisis and the government makes a decision or provides information that makes matters worse. To what extent would you experience negative emotions (e.g. sadness or anger) as a result? [ES/S/SWS/M/SWL/L/EL]

54. Suppose there is a crisis and the media makes a decision or provides information that makes matters worse. To what extent would you experience negative emotions (e.g. sadness or anger) as a result? [ES/S/SWS/M/SWL/L/EL]

55. Suppose there is a crisis and scientists make a decision or provides information that makes matters worse. To what extent would you experience negative emotions (e.g. sadness or anger) as a result? [ES/S/SWS/M/SWL/L/EL]

Part 7: Emotional Regulation Questionnaire (ERQ)

We would like to ask you some questions about your emotional life, in particular, how you control (that is, regulate and manage) your emotions. The questions below involve two distinct aspects of your emotional life. One is your emotional experience, or what you feel like inside. The other is your emotional expression, or how you show your emotions in the way you talk, gesture, or behave. Although some of the following questions may seem similar to one another, they differ in important ways. For each item, please answer using the following scale: [SD/D/MD/NAD/MA/A/SA]

56. When I want to feel more positive emotion (such as joy or amusement), I change what I'm thinking about. [SD/D/MD/NAD/MA/A/SA]

57. I keep my emotions to myself. [SD/D/MD/NAD/MA/A/SA]

58. When I want to feel less negative emotion (such as sadness or anger), I change what I'm thinking about. [SD/D/MD/NAD/MA/A/SA]

59. When I am feeling positive emotions, I am careful not to express them. [SD/D/MD/-NAD/MA/A/SA]

60. When I'm faced with a stressful situation, I make myself think about it in a way that helps me stay calm. [SD/D/MD/NAD/MA/A/SA]

61. I control my emotions by not expressing them. [SD/D/MD/NAD/MA/A/SA]

62. When I want to feel more positive emotion, I change the way I'm thinking about the situation. [SD/D/MD/NAD/MA/A/SA]

63. I control my emotions by changing the way I think about the situation I'm in. [SD/D/MD/-NAD/MA/A/SA]

64. When I am feeling negative emotions, I make sure not to express them. [SD/D/MD/-NAD/MA/A/SA]

65. When I want to feel less negative emotion, I change the way I'm thinking about the situation. [SD/D/MD/NAD/MA/A/SA]

Check questions to be included:
1. There are 12 days in a week (True/False)
2. There are two L's in the word "Log" (True/False)
3. Dogs have wings (True/False)
4. Would you rather have $50 or 75$?
5. Fish live in water (True/False)

Appendix C

Appendix to Chapter 4

C.1 Summary Statistics

Table C.1: Summary statistics of variables of interest

Variables	Mean	Std. Dev.
Male	0.621	0.486
Female	0.379	0.486
Age	18.868	1.444
Hispanic	0.100	0.300
White	0.670	0.470
Major: Agriculture and Life Sciences	0.038	0.192
Major: Architecture and Urban Studies	0.008	0.087
Major: Business	0.293	0.456
Major: Engineering	0.398	0.490
Major: Liberal Arts and Human Sciences	0.107	0.310
Major: Natural Resources and Environment	0.025	0.156
Major: Science	0.130	0.337
Democrat	0.356	0.479
Republican	0.278	0.448
Independent	0.268	0.443
Others	0.098	0.297

C.2 Education Outcomes

Table C.2: Submission of minute paper (Logistic regression model)

Variables	(1) Minute Paper	(2) Minute Paper
Incentive	3.242***	0.765***
	(0.293)	(0.279)
Incentive and Nudge	3.847***	-
	(0.321)	
Active Participation		1.503***
		(0.293)
Constant	-0.981***	1.504***
	(0.239)	(0.202)
Observations	928	840

Standard errors in parentheses. ***p<0.01, **p<0.05,*p<0.1.

Table C.3: Standardized test scores (Multiple linear regression model)

Variables	(1) Test Score	(2) Test Score	(3) Test Score	(4) Test Score
Incentive	0.269**	0.0580	-0.00182	0.0800
	(0.117)	(0.0692)	(0.137)	(0.0691)
Incentive and Nudge	0.187	-	-0.101	-
	(0.117)		(0.139)	
Active Participation		0.262***		0.218***
		(0.0707)		(0.0716)
Minute Paper			0.428***	0.443***
			(0.115)	(0.134)
Constant	-0.206*	-0.165***	-0.323***	-0.559***
	(0.106)	(0.0624)	(0.110)	(0.134)
Observations	928	840	928	840
R-squared	0.006	0.018	0.021	0.031

Standard errors in parentheses. ***p<0.01, **p<0.05,*p<0.1.

C.3 Health Outcomes

Table C.4: Uptake of flu shot (Logistic regression model)

Variables	(1) Flu Shot	(2) Flu Shot	(3) Flu Shot	(4) Flu Shot
Nudge treatment	1.058***	1.021***	1.017***	1.067***
	(0.186)	(0.190)	(0.190)	(0.211)
Age		-0.158**	-0.161**	-0.185**
		(0.0788)	(0.0794)	(0.0851)
Woman		0.226	0.351*	0.261
		(0.202)	(0.199)	(0.213)
White		-0.229	-0.358*	-0.411*
		(0.207)	(0.201)	(0.219)
Risk attitude			0.0180	
			(0.0914)	
Time preference			0.119	
			(0.0968)	
Willingness to punish if oneself wronged			0.0517	
			(0.0679)	
Willingness to punish if others wronged			-	
Altruistic			0.0462	
			(0.0976)	
Republican		-0.601**		
		(0.256)		
Independent		-0.269		
		(0.246)		
Others		-0.521		
		(0.350)		
Flu shot taken last year				1.230***
				(0.213)
Knowledge of flu				-0.139**
				(0.0587)
Knowledge of flushot				0.160**
				(0.0730)
Perception regarding flu				0.157***
				(0.0342)
Constant	-1.001***	2.345	0.913	-0.928
	(0.135)	(1.509)	(1.675)	(1.830)
Observations	522	521	521	521

Standard errors in parentheses. ***p<0.01, **p<0.05,*p<0.1.

C.4 Survey Questions

C.4.1 Survey 1[Pre-intervention survey]:

Part 1: Demographic questions

1. Gender:
a. Man
b. Non-binary
c. Woman
d. Prefer to self-describe [text field]

2. Age (numeric field)

3. Are you
a. American citizen
b. Non-American citizen: please specify country of citizenship

4. Are you Hispanic or Latino?
a. Yes
b. no

5. How would you describe yourself?
c. American Indian or Alaska Native
d. Asian
a. Black or African American
b. Native Hawaiian or Other Pacific Islander
c. White
d. Other

6. How many years have you been at Virginia Tech
a. 1
b. 2

c. 3
d. 4
e. 5
f. more than 5

7. What is your Major/College? (if more than one pick what you consider to be your primary Major or College).
a. Science
b. Architecture and Urban Studies
c. Agriculture and Life Science
d. Business
e. Engineering
f. Liberal Arts and Human Sciences
g. Natural Resources and Environment

8. What is your household income relative to other students at Virginia Tech?
a. significantly higher
b. somewhat higher
c. about the same
d. somewhat lower
e. significantly lower

9. Are you a smoker?
a. yes
b. no

10. Generally speaking, what do you usually think of yourself as politically?
a. Republican
b. Democrat
c. Libertarian
d. Independent
e. Something else[please specify]

11. What is your religious affiliation?
a. Christianity
b. Islam
c. Judaism
d. Hinduism
e. Buddhism
f. Atheist

g. Other (please specify)

Part 2: Other supplementary questions (including some (not all) Global Preference Survey measures)

12. How willing or unwilling are you to take risks. [SU/U/SWU/NWU/SWW/W/SW]
a. Strongly unwilling [SU]
b. Unwilling [U]
c. Somewhat unwilling [SWU]
d. Neither willing nor unwilling [NWU]
e. Somewhat willing [SWW]
f. Willing [W]
g. Strongly willing [SW]

13. How willing or unwilling are you to give up something that is beneficial for you today in order to benefit more from that in the future. [SU/U/SWU/NWU/SWW/W/SW]

14. How willing or unwilling are you to punish someone who treats YOU unfairly, even if there may be costs for you. [SU/U/SWU/NWU/SWW/W/SW]

15. How willing or unwilling are you to punish someone who treats OTHERS unfairly, even if there may be costs for you. [SU/U/SWU/NWU/SWW/W/SW]

16. How willing or unwilling are you to give to good causes without expecting anything in return. [SU/U/SWU/NWU/SWW/W/SW]

Part 3: Knowledge and Attitude about the Flu and the Flu Shot

17. When was the last time you contracted the flu?
a) Within last 12 months
b) Within last 24 months
c) More than two years ago
d) Never
e) Do not remember

18. When was the last time you got a flu shot?
a) Within last 12 months
b) Within last 24 months

c) More than two years ago
d) Never
e) Do not know

19. The flu can be spread through coughs, sneezes or dirty hands
a) Strongly agree
b) Agree
c) Neither agree nor disagree
d) Disagree
e) Strongly disagree

20. The flu can be spread by people who do not feel sick
a) Strongly agree
b) Agree
c) Neither agree nor disagree
d) Disagree
e) Strongly disagree

21. Otherwise healthy people who get the flu can die from it
a) Strongly agree
b) Agree
c) Neither agree nor disagree
d) Disagree
e) Strongly disagree

22. The flu shot can help prevent people from getting sick with the flu
a) Strongly agree
b) Agree
c) Neither agree nor disagree
d) Disagree
e) Strongly disagree

23. The flu shot can make people sick with the flu
a) Strongly agree
b) Agree
c) Neither agree nor disagree
d) Disagree
e) Strongly disagree

24. Getting the flu shot is a good idea
a) Strongly agree
b) Agree
c) Neither agree nor disagree
d) Disagree
e) Strongly disagree

25. I think majority of people around me get the flu shot
a) Strongly agree
b) Agree
c) Neither agree nor disagree
d) Disagree
e) Strongly disagree

26. I am likely to get the flu
a) Strongly agree
b) Agree
c) Neither agree nor disagree
d) Disagree
e) Strongly disagree

27. The flu could make me really sick
a) Strongly agree
b) Agree
c) Neither agree nor disagree
d) Disagree
e) Strongly disagree

28. Getting the flu shot is even more important this year with the ongoing pandemic
a) Strongly agree
b) Agree
c) Neither agree nor disagree
d) Disagree
e) Strongly disagree

29. The preventive measures in place due to ongoing pandemic will also lessen my chances of contracting the flu
a) Strongly agree
b) Agree
c) Neither agree nor disagree

d) Disagree
e) Strongly disagree

30. Did you already get the flu shot this year?
a) Yes
b) No

31. Are you planning on getting a flu shot at the Flu Clinic organized by Schiffert this year?
a) Yes
b) No
c) Unsure

32. Are you planning on getting a flu shot from someplace other than at Schiffert this year?
a) Yes
b) No
c) Unsure

Part 4: Interventions

[next page]

[This will be displayed to participants online after completion of the online survey 1 based on whether they are sorted to Control or Treatment]

Control:

[Information on flu shot]:The Schiffert Health Centre will be organizing a Flu Clinic for 2021 in the Rec Sports Fieldhouse, 510 Beamer Way, on Wednesday, October 6 from 9 a.m. to 5 p.m. Flu vaccine will be provided by their partner Kroger. Only the injectable vaccine will be available. Attendees are required to wear a face cover/mask and maintain physical distancing. Individuals who feel sick, are experiencing symptoms of COVID-19, or have been exposed to someone with COVID-19 should not attend the event. Kroger Health will be accepting U.S. insurance carriers. Attendees are responsible for checking that the flu shot will be covered by their insurance plan. Out-of-state insurance providers may have specific stipulations. Please have your insurance card ready at check-in. The flu shot will also be available to eligible students at Schiffert Health Center starting October 2021. Students must make an appointment by calling (540)231-6444. The cost of the vaccine will be charged to the student's account. Students can choose to pay on the day of service via cash, check,

or Hokie Passport or pay it online later via Hokie SPA/Hokie Wallet. The flu shot is also additionally available at select pharmacies and grocery stores in your town.

[next page]

[Message]: Please visit any Sports Facility (gym, sports practice courts, etc.) located either on-campus or off-campus and click a photo of yourself with the name of the location clearly visible. You will be required to upload the picture as part of the second survey in about a month from today.

Treatment:

[Information on flu shot]:The Schiffert Health Centre will be organizing a Flu Clinic for 2021 in the Rec Sports Fieldhouse, 510 Beamer Way, on Wednesday, October 6 from 9 a.m. to 5 p.m. Flu vaccine will be provided by their partner Kroger. Only the injectable vaccine will be available. Attendees are required to wear a face cover/mask and maintain physical distancing. Individuals who feel sick, are experiencing symptoms of COVID-19, or have been exposed to someone with COVID-19 should not attend the event. Kroger Health will be accepting U.S. insurance carriers. Attendees are responsible for checking that the flu shot will be covered by their insurance plan. Out-of-state insurance providers may have specific stipulations. Please have your insurance card ready at check-in. The flu shot will also be available to eligible students at Schiffert Health Center starting October 2021. Students must make an appointment by calling (540)231-6444. The cost of the vaccine will be charged to the student's account. Students can choose to pay on the day of service via cash, check, or Hokie Passport or pay it online later via Hokie SPA/Hokie Wallet. The flu shot is also additionally available at select pharmacies and grocery stores in your town.

[next page]

[Message]: Please visit any venue that is currently providing flu-shots located either on-campus (Schiffert Health Center, Flu Clinic at Rec Sports Fieldhouse, 510 Beamer Way, on Wednesday, October 6 from 9 a.m. to 5 p.m.) or off-campus (select pharmacies) and click a photo of yourself with the name of the venue clearly visible. You will be required to upload the picture as part of the second survey in about a month from today.

C.4.2 Survey 2 [post-intervention survey][to open one month from Survey 1 opening]:

1. Please upload the picture you were asked to take during the prior survey.

2. Did you get the flu shot for the current flu season?
a. Yes
b. No