Erasmus University Rotterdam

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Behavioural Economics Master Thesis

The Influence of Macroeconomic Conditions during Formative Years on Contestant's Choices in 'Friend or Foe'

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Abstract

In a world where economic circumstances shape our decisions, this thesis examines how the macroeconomic conditions experienced during contestant's formative years (ages 18-25) impact their cooperative behaviour on the TV show 'Friend or Foe.' Beyond individual strategies, the economic environment in which contestants were raised can hold the key to understanding their cooperation rates in this high-stakes game of trust and betrayal.

Analysing 174 contestants from 29 episodes of the American TV gameshow 'Friend or Foe,' this research explores how contestants navigate a Prisoner's Dilemma game with a weakly dominant strategy. Utilizing national average unemployment rates as an indicator of macroeconomic conditions during contestant's formative years, a linear probability model is used to investigate the relationship between these conditions and contestant's likelihood to choose 'Foe'. Results suggest that contestants' macroeconomic conditions during their formative years do not significantly influence their decisions on the show. However, age emerges as a potential predictor of cooperation rates, and gender differences in cooperation align with existing literature. Additionally, the size of the jackpot appears to impact contestant's cooperation tendencies. The analysis discusses the implications of the findings, limitations of the study, and offers avenues for further research in this fascinating area of inquiry.

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Introduction

In a world where economic circumstances shape our decisions, have you ever wondered how the macroeconomic conditions experienced during our formative years impact our cooperative behaviour? Imagine a captivating TV show like 'Friend or Foe,' where contestants navigate a high-stakes game of trust and betrayal. Yet, what if I told you that beyond individual personalities and strategies, the economic environment in which these contestants were raised could hold the key to understanding their cooperation rates? This thesis unravels the intriguing connection between macroeconomic conditions and the cooperative tendencies exhibited by contestants on 'Friend or Foe,' shedding light on the profound influence of economic factors on our decision-making in trust-based scenarios.

'Friend or Foe' is an American TV gameshow that was filmed in 2001. This thesis analyses the outcomes of 174 contestants from 29 episodes of season one that were accessible to me. In the show, contestants are split into pairs, and they answer multiple choice trivia questions to add cash amounts to their respective 'trust funds'. There are three rounds in the show, at the end of each round, the pair with the lowest amount of cash in their trust fund must enter the 'trust box'. In the trust box, both contestants attempt to persuade the other contestant to trust them, and following this, they both secretly choose either 'Friend' or 'Foe'. If both choose 'Friend', they split the trust fund evenly. If one chooses 'Friend' and the other 'Foe', then the Foe wins the whole trust fund. If both choose 'Foe', both contestants win nothing. This situation represents a classic Prisoner's Dilemma game with a weakly dominant strategy.

There are many previous studies which use television game shows as a natural way to observe real decisions in a real-life environment that involve high stakes. This is seen in a paper by Berk et al., (1996) which uses episodes of the gameshow 'The Price is Right' to observe a preference-free test of rational decision theory in an environment with substantial economic incentives. They found that rational decision theory is unable to explain contestant's behaviour on 'The Price Is Right'. A paper by Gertner (1993) studies individual risk-taking behaviour and risk preferences using data from the gameshow 'Card Sharks'. They found that contestants experienced high risk aversion levels on the show, and asset segregation is an important aspect of their risky decision making.

Several related studies also use game show data to analyse real-life situations of Prisoner Dilemma games, where the players choice to defect is a weakly dominant strategy. Papers by Van den Assem, et al., (2012) and Daria et al., (2010) use data from the UK gameshow golden balls, observing if a player's race, age, gender, past deceitful behaviour, and statements made influence their cooperation rate. Belot et al (2007) uses data from a Dutch gameshow called 'Deelt ie het of deelt ie het niet?' (Will (s)he share or not?). This show is similar to 'Friend or Foe' as contestants answer trivia questions to build their jackpots before they decide how to split the money in a Prisoner's Dilemma type-game. Analysing these shows offers a unique opportunity to observe how social preferences play out in a real-life competitive and high stakes environment.

The lives of participants in game shows, like everyone, have been shaped by the macroeconomic conditions they experienced. Macroeconomic conditions refer to the overall state of an economy at a given point in time. They include a variety of metrics that provide light on an economy's functionality, stability, and overall health. Macroeconomic determinants include things like fiscal and monetary policy, trade with other countries, the state of the labour market, and resource availability. These determinants foster the macroeconomic conditions of an economy.

Macroeconomic conditions can be measured by a variety of different indicators. A country's gross domestic product (GDP) shows the output of a country's goods and services. The inflation rate of a country measures the rate at which the cost of goods and services in a country are increasing over time. The unemployment rate measures the proportion of the labour force that is actively seeking employment but unable to find work.

Macroeconomic conditions affect everyone throughout all stages of their lives. However, the literature suggests that people are most affected by macroeconomic conditions when they are in their formative years aged between 18-25. In this emerging adulthood stage of life, people gain a clearer sense of who they are, what their strengths and weaknesses are, what their views and values are, and how they fit into the culture in which they live (Arnett, 2000). At this life stage they also may either finish or continue education and obtain their first job. These life decisions are also affected by macroeconomic conditions at the formative years (Kahn, 2010). This can have life-long consequences as level of education and salary level of

first job have been shown to have a significant impact on future earnings (Oreopoulous, et al., 2012).

The self-exploration of individuals in developed countries during these formative years make it an age of instability. This instability is seen in their frequent moves from one residence to another. Arnett (2004) found that during the ages 18 to 29, people in American society have the highest rates of residential change compared to any other stage of life. They may do this for college or to be more independent; these decisions are greatly affected by the macroeconomic conditions at the time.

The macroeconomic conditions an individual experiences can influence their behaviour and decisions. A seminal paper by Giuliano and Spilimbergo (2014) observes how macroeconomics circumstances experienced during formative years effects preferences for redistribution. They examined a variety of self-reported measures of preferences for government intervention using pooled cross-sectional data from the US General Social Survey and the World Value Survey. They found that individuals who experienced a recession when young support favour more government redistribution, are more likely to vote for left-wing parties, and believe that success in life is determined more by chance than by hard work. This paper was recently redacted.

More research has been conducted on how macroeconomic conditions experienced during formative years can influence individual preferences and attitudes later in life. For instance, studies have shown impacts on job preferences (Cotofan et al., 2023), risk preferences (Malmendier and Nagel, 2011), as well as wages and occupation levels (Kahn, 2010). Research by Bietenbeck et al., (2023) looks at how macroeconomic shocks effects pro-sociality in the form of altruism and reciprocity, they showed that exposure to a recession during formative years is negatively associated with pro-sociality later in life.

In this thesis, I wish to examine contestants on 'Friend or Foe' and look at the relationship between the macroeconomic conditions they experienced during their formative and their cooperation rate in the Prisoner's Dilemma game on the show. This formed the research question for the thesis, 'is a contestant on 'Friend or Foe' more likely to steal the jackpot if they have experienced worse macroeconomic conditions during their formative years (ages 18-25)?

To answer this question, I watched and recorded information from 29 episodes of 'Friend or Foe'. The variables noted include each contestant's age, gender, race, and the jackpot they were playing for (trust fund). After much deliberation, I used national annual average unemployment rate data from the United States Bureau of Labour Statistics (BLS) as the indicator for a contestant's macroeconomic conditions. With the use of each contestant's age and the data from the BLS, I created a variable for the national average unemployment rate for each contestant when they were between the ages 18-25. This was used as the main predictor variable for a contestant's macroeconomic conditions during their formative years.

I then created a linear probability model to examine if contestants who had worse macroeconomic conditions were more likely to choose Foe. The contestant's choice was a binary variable (Foe = 1), the explanatory variable was national average unemployment rate for each contestant when they were between the ages 18-25, the control variables were age, gender, race, and size of jackpot.

The results show that there does not seem to be much of a relationship between a contestant's macroeconomic conditions during their formative years and their decision to choose Foe. The results also show that men cooperate less than women; this seems to be consistent with the literature. Caparo (2018) and Ortmann and Tichy (1999) also reported that men cooperate less than women in similar scenarios. The influence of the size of the jackpot on the contestant's cooperation rate, shows that they are slightly less likely to choose Foe the larger the jackpot. This is in line with findings by Obelhozer-Gee, et al. (2003), in their research of all 105 episodes of 'Friend or Foe'.

Following this introduction chapter, I will discuss the literature associated with the Prisoner's Dilemma game, which macroeconomic variable to use, social preferences, and how I formed my research question in chapter 2. Next, chapter 3 looks at the gameshow and the different variables used in my analysis. Chapter 4 describes the method used in the analysis. Chapter 5 shows the results that were found. In chapter 6 the results are discussed in detail, as well as the limitations. Chapter 7 is a conclusion of the research.

Literature Review

Prisoner's Dilemma Game

The situation in the trust box in 'Friend or Foe' represents a classic Prisoner's Dilemma game with a weakly dominant strategy. The Prisoner's Dilemma is a classic game theory scenario developed by Tucker (1950), that explores the balance between cooperation for mutual benefit and betrayal for individual reward. It involves two prisoners who are arrested for a crime and are held in separate cells, unable to communicate with each other. Both prisoners can choose between two options, either 'cooperate' or 'defect'. If a prisoner chooses to cooperate, they remain silent. By choosing this option the prisoner trusts the other prisoner to remain silent also. If a prisoner chooses to defect, they confess to the crime, this option prioritises the prisoner's self-interest and betrays the other prisoner. The consequence of these decisions can be represented by these example outcomes:

1. Both cooperate, they both receive 1 year in prison.
2. One prisoner defects, while the other cooperates, the defector does not go to prison, the cooperator receives 20 years in prison.
3. Both defect, they both receive 5 years in prison.

The dilemma arises because the individually rational choice for each player is to defect. Regardless of the other player's choice, defection (betrayal) ensures a higher payoff than cooperation. However, if both players choose to defect, they end up with a worse collective outcome than if they had both chosen to cooperate. The similarities are clear between this Prisoner's Dilemma game and the scenario in the trust box from 'Friend or Foe'. However, in 'Friend or Foe' defecting by choosing 'Foe' is a weakly dominant strategy. This is because choosing this option always yields at least as good a result as choosing 'Friend'; a contestant is never worse off by choosing 'Foe'.

Social Preferences

In this section, I will firstly discuss how social preferences are the primary influence on a contestant's decision on the show. Social preferences refer to an individual's attitudes and

behaviour towards others in social interactions. They are a fundamental aspect of human social behaviour and play a significant role in shaping how individuals interact, cooperate, and make decisions within a social context (Fehr and Fischbacher, 2003) (Charness and Rabin, 2002). The term "social preferences" refers to a human propensity to be concerned not just with one's own payoff, but also with the payoff of the reference group or with the action that results in the payoff. Different features of social preferences include altruism, fairness, reciprocity, and inequity aversion. These features of social preferences are explored in my research of the Prisoner's Dilemma games from the gameshow 'Friend or Foe'.

For clarity, Figure 2.1 shows a general social preference model with possible payoffs for player i in a 2x2 matrix, after they either choose Friend (Cooperate) or Foe (Defect). In this model from Belot et al., (2012) the parameters $\alpha i(X)$, $\gamma i(X)$, $\lambda i(X)$, and $\delta i(X)$ are subtracted from the respective monetary payoffs of the player. The different outcomes from Figure 2.1 give different utilities for the players depending on the social preferences they have. For example, if player i chooses 'Friend' and player j chooses 'Foe'. Player i will get more utility from this if he is motivated by altruistic preferences than if he is motivated by fairness and equal distribution. The four preference parameters in the table are sufficient to reflect different social preference features from the literature for this game. These payoffs are private knowledge to player i, and because they represent social preferences, it is doubtful that the other player j is aware of them.

Player j

Player i		Friend(C)	Foe(D)
	Friend(C)	$\dfrac{X}{2} - \delta i(X)$	$-\alpha i(X)$
	Foe(D)	$X - \lambda i(X)$	$-\gamma i(X)$

Figure 2.1 Social Preferences for player choice (adapted from Belot et al., 2012)

Inequity aversion: if $\alpha i(X) > \lambda i(X) > 0$ and $\gamma i(X) = \delta i(X) = 0$, this is the inequity aversion model from Fehr and Schmidt (1999). This means that individuals not only care about their

absolute levels of wealth or well-being but also care about how their situation compares to other players. Bolton and Ockenfels (2000) have a similar model of fairness with the same parameters. Furthermore, if $\lambda i(X) > \frac{E}{2}$ then the player prefers to cooperate if the other player also cooperates. In their model, envy aversion powers the decision-making.

<u>Altruism:</u> if $\delta i(X) = -\alpha i\left(\frac{X}{2}\right), \lambda i(X) = \gamma i(X) = 0$ and $\alpha i(X) = -\alpha i(X), \ \alpha i > 1$, these are altruistic preferences as the player maximises the total sum of their own and their opposing players payoffs, with weights 1 and αi, respectively. A player with altruistic preferences will play Friend if they expect their opponent to play Friend. If their altruism is sufficiently high, a player will play Friend if they expect their opponent to play Foe, this is because playing Foe is pareto-damaging behaviour, which an altruist does not like. Charness and Rabin (2002) developed a similar idea. In their variation, whether or not the other player is ahead or behind in payoff terms, determines how much weight that player gives to their payoff.

<u>Reputation:</u> if $\lambda i(X) = \gamma i(X) > 0, \delta i(X) = \alpha i(X) = 0$ this means the player suffers a reputation cost of playing Foe that is equal to $\lambda i(X)$. If this reputation cost is greater than $\frac{X}{2}$ for player i, then they will always choose to play Friend. For more moderate reputation costs, the player will generally prefer to choose the action different to their opponents. This means if player i anticipates the other player to play Foe, then they will play Friend to have a 'nice' reputation of sharing. If player i anticipates the opponent to play Friend, then they will play Foe because the monetary payoff of playing Foe is greater than the reputation payoff of playing Friend.

Another action motivated by a player's reputation is suckers dismay (Obelhozer-Gee, et al. 2003). This means that a player does not want to appear as a sucker and will play Foe if they believe the opponent will play Foe, so that neither player will win the jackpot. In their paper, Obelhozer-Gee, et al. (2003) say there are two types of players in the Friend or Foe game show. Firstly, conditional cooperators are players that play Friend if they believe their opponent will play Friend. To avoid suckers dismay, they play Foe if they believe their opponent is more likely to play Foe. Secondly, money players are players that play Foe regardless of what they think the other player will play.

In summary, different social preference models give different outcomes for the Prisoner's Dilemma game in the show 'Friend or Foe'. If player i is adequately inequity averse, then they will be more likely to cooperate and choose Friend if they believe their opponent will choose Friend. The altruism model show that player i will be likely to choose Friend if they believe their opponent will choose Foe. The reputation models show that contestants may be more likely to choose either Friend if they do not want to appear 'mean' by choosing Foe. Or contestants may be more likely to choose Foe if they do not want to appear to be a 'sucker' by choosing Friend when their opponent chooses Foe.

Choosing appropriate macroeconomic variables for analysis

This research is focused on examining the influence of macroeconomic conditions on social preferences. There is much deliberation about which variable to use as an indicator for the macroeconomic conditions a person experiences. Macroeconomic conditions refer to the overall state of an economy at a given point in time. They include a variety of metrics and elements that provide light on an economy's functionality, stability, and overall health. Economic growth is a major factor of macroeconomic conditions. Economic growth is the rise in a country's output of goods and services over a given time frame. The growth rate of the gross domestic product (GDP) is a frequently used indicator of the overall performance or health of an economy. Inflation is another key macroeconomic condition. The rate at which the cost of goods and services is increasing over time is measured by inflation. Unemployment is also a key macroeconomic condition. The unemployment rate measures the proportion of the labour force that is actively seeking employment but unable to find work.

Worsening macroeconomic conditions can qualify as a recession when they meet certain criteria. While different economists and institutions may have slightly different definitions, a recession is generally characterized by a significant and widespread decline in economic activity. One of the main signs that determines a recession is negative GDP growth. A recession is typically associated with two consecutive quarters of negative economic growth as measured by the GDP. Negative GDP growth indicates a contraction in the overall output of goods and services in an economy.

The replication research paper by Bietenbeck and Thiemann (2023) looks at macroeconomic circumstances for an individual when they are aged 16. They use annual state income obtained from the US Bureau of Economic Analysis (BEA) as their explanatory variable; they deflate this income using the US annual consumer price index which is collected by the US Bureau of Labour Statistics (BLS). A paper by Cotofan, et al. (2021), uses a similar method to obtain their macroeconomic condition explanatory variable. They use data from the BEA, to calculate regional income per capita using state-level income per capita and state-level population. Carreri and Teso (2023), also use income data from the BEA, and define a state in the United States to be in a recession in a given year, if the real personal income per-capita growth is lower than -3.5%.

An indicator to measure a person's macroeconomic conditions which is more commonly used in the literature is average annual national or state unemployment. Kahn (2010) uses both the average annual national and state unemployment rate as indicators for macroeconomic conditions from the year that an individual graduated from college. Schwandt and Von Wachter (2019) investigate the macroeconomic conditions when disadvantaged students graduate from college, they also use state level unemployment rates. In the field of psychology, Bianchi (2013 and 2014) observes individual's macroeconomic circumstances when they enter the workforce and at the time they enter adulthood, using the average annual national unemployment rate as an indicator for these macroeconomic circumstances.

The abundance of literature which uses annual unemployment rates as an indicator for macroeconomic conditions, as well as the simplicity and comprehensibility of using it, led me to use annual unemployment rates as my explanatory variable to indicate macroeconomic conditions. I have recorded each contestant's hometown state, therefore, initially I planned on using state-level annual unemployment rates to have more variation. However, it is unknown if the player's hometown state is the same state they lived in when they were 18-25. Another reason why I could not use the state-level unemployment rate as my explanatory variable, is because the US BLS has only collected state-level unemployment data from 1976, in my research I need data from 1958. The BLS has historical annual national unemployment rate data from 1929.

Research Question

There has not been a lot of research conducted on the direct influence of macroeconomic conditions on social preferences. Other studies explore how economic shocks or changes in macroeconomic conditions may indirectly impact social preferences through various channels. For example, Knack and Keefer (1997) found that countries with higher incomes and less income inequality have higher levels of trust.

However, I wish to examine if the macroeconomic conditions experienced early in an individual's life can have an impact on their social preferences later in life. Previous research by Bietenbeck, et al. (2023) observed whether exposure to a recession during early adulthood shape social preferences and pro-sociality in the long run. Their study involved using the Global Preference Survey developed by Falk, et al. (2018), which includes four measures of social preferences: trust, altruism, positive reciprocity, and negative reciprocity. They define a recession as a period of GDP growth of -3.5% or less. They found that exposure to a recession during an individual's formative years (18-25) is negatively associated with pro-sociality later in life.

In this thesis, I will examine outcomes from the TV gameshow 'Friend or Foe'. This show offers a unique opportunity to observe how social preferences play out in a competitive and high stakes environment. I use the national average unemployment rate for each contestant when they were aged between 18-25 as an indicator for the macroeconomic conditions during their formative years. This study could shed light on how broader economic contexts during upbringing impact trust, reciprocity, and risk aversion, offering valuable insights into the interplay between macroeconomics and social preferences in a real-world setting. The research question being answered will be:

Is a contestant on 'Friend or Foe' more likely to steal the jackpot if they have experienced worse macroeconomic conditions during their formative years (ages 18-25)?

Data

The data I used for this research is from the American TV gameshow 'Friend or Foe?'. This show was filmed in Santa Monica, California. I watched and recorded contestants' information from the 29 episodes in season one that I had access to (there were 40 episodes in season one and 65 in season two, I watched the show on Pluto TV which only had 29 episodes from season one and I could not find the other episodes anywhere). Season one of the gameshow was filmed throughout 2001, the first episode was aired on June 3rd, 2002. This means that contestants would have no prior knowledge of how players generally play the game, unlike in season two, when players could have watched the first season and altered their decisions based on how players usually play.

Format of the game

In each episode there are six contestants; these contestants are randomly split into two groups of three. Every contestant's name, age, hometown, occupation, brief information on what they enjoy doing, and an embarrassing thing they have done in the past is revealed. The 'matching segment' of the show then begins. Each contestant from the first group privately selects who they want to be their partner from the second group.

There are three possible strategies to move through this initial stage. Firstly, each of the three members of group 1 chooses a unique mate. These decisions subsequently result in the formation of the pairs, who move on to the next round of the competition. Secondly, the same group 2 contestant is chosen by two contestants from group 1. The group 1 player whose option did not match that of another gets paired with the group 2 choice first. Then the group 2 agent who was chosen by two group 1 agents, chooses one of them to be their partner, the last pair is then matched. Thirdly, the same group 2 agent is selected by all three group 1 contestants. In this instance, the chosen group 2 contestant selects a member of group 1. Then, one of the other group 2 agents is privately chosen by the two remaining group 1 agents. If they choose the same individual once more, that person will select a group 1 agent.

Subsequently, the last pair is then matched. As a result of this selection process, the teams are decided endogenously.

After the 'matching segment' of the show, the pairs are then separated into their respective 'isolation chambers'. The trivia section of the show then begins, the newly formed pairs collaborate and agree together on answers to trivia questions to create a "trust fund" across potentially three rounds. At the beginning of this part of the show each pair is given $200 for their trust fund, therefore, even if they do not answer a single question correctly, they will still be competing for money. In the first round, there are four trivia questions worth $500 each. In the second round, there are four trivia questions worth $1000 each. Up to ten questions worth $500 apiece may be asked in the third round, if the pair answers all questions in this round correctly, their trust fund is doubled. Therefore, the "trust fund" for each team can be anywhere from $200 to $22,400. In the first season of the show the highest trust fund accumulated by any pair of contestants was $9,700.

At the end of each of these trivia rounds, the lowest scoring pair is eliminated, if two pairs are on the same monetary amount then the pair which took the shortest amount of time to answer the questions progresses. When a pair is eliminated, they enter the 'trust box' to decide how to allocate their trust fund. This is a classic Prisoner Dilemma game with a weakly dominant strategy. Both contestants have two buttons no one else can see. The division of the trust fund depends on whichever button they press. In the show a player will either choose 'Friend' or 'Foe'. If they both cooperate and choose 'Friend' then they will split their jackpot. If one player chooses 'Friend' and the other 'Foe' then the Foe will receive the whole jackpot. If both players choose 'Foe' then they both receive nothing. This is a weakly dominant Prisoner Dilemma because neither player has monetary incentive to deviate from playing Foe, as they will never be worse off.

This game can be visually represented by the following table:

Player B

	Friend	Foe
Friend	$(\frac{X}{2}, \frac{X}{2})$	$(0, X)$
Foe	$(X, 0)$	$(0,0)$

Player A

Figure 3.1 Choice Payoff table

Variables from the gameshow

From the 29 episodes in season one of 'Friend or Foe', there were 174 contestants. At the start of every episode each player is introduced. The information revealed about them is their name, age, hometown location (state they were born), occupation, something they enjoy doing, and an embarrassing thing they have done in the past. I recorded this information for all 174 contestants and added each player's gender by looking at their physical appearance.

At the end of each round of the show, I recorded the outcome of the Prisoner Dilemma game played between two players. I recorded the trust fund the players were competing for, whether they chose 'Friend' or 'Foe', and the amount of money they took home.

Macroeconomic Variable Choice

The abundance of literature which uses annual unemployment rates as an indicator for macroeconomic conditions, as well as the comprehensibility of using it, led me to use annual unemployment rates as my explanatory variable to indicate macroeconomic conditions.

I planned on using state-level annual unemployment rates so that there would be more variation in the results, and the variable would be a slightly more accurate representation of their macroeconomic conditions. However, the US Bureau of Labour Statistics (BLS) has only collected state-level unemployment data from 1976, in my research I need data from 1958. The BLS has historical annual national unemployment rate data from 1929. As a result

of this, I used the national annual unemployment rate of the United States from the BLS as my indicator variable for macroeconomic conditions. The unemployment rate describes the number of unemployed people as a percentage of the total labour force (the number of people either working or actively looking for work). The unemployment rate is therefore calculated as $(\frac{number\ of\ unemployed}{labour\ force}\ x\ 100)$.

I combined the gameshow data and the BLS data to create the variables to describe the macroeconomic conditions for each contestant, during the relevant years i.e., when they were 18-25. The variable unemp_at_age_18 shows the national unemployment rate for each contestant when they were 18. The variable avg_unemp_age_adjusted is calculated as the average of the national unemployment rate for each contestant when they were between the ages 18-25. However, if a contestant is younger than 25, this variable represents the average national unemployment rate from when they were 18 to their current age on the show. I also scaled this predictor variable for the average unemployment age adjusted during the impressionable years by multiplying it by 100. I did this so the results are more easily interpretable (ex. average unemployment age adjusted for Amy is 7.675% rather than 0.07675). This is the main predictor variable used in my analysis as it most accurately depicts the macroeconomic conditions for each player during their formative years. For 73% of contestants this is the 8-year average of the national unemployment rate when they were 18-25, and for the remaining 27% who are aged under 25, this is the average from every year they are aged 18 to their current age on the show.

Descriptive Statistics
The table 3.1 shows the descriptive statistics for the variables in the dataset. The first variable Average Unemployment Rate is the average of the national unemployment rate for each contestant when they were between the ages 18-25, if a contestant is younger than 25, this variable represents the average national unemployment rate from when they were 18 to their current age.

The next explanatory variable is Unemployment Rate at 18 which represents what the national unemployment rate was when each contestant was 18. This variable obviously has a

greater range than the Average Unemployment Rate because it is a single year rather than an average.

The Age variable tells us that the contestants are generally younger, the mean is greater than the median, this is reflected in the histogram in figure 3.2 (appendix) which shows that Age is slightly positively skewed. To get a more accurate representation of the Age variable in my analysis, I divided the contestants into different age groups. They were split into groups aged 18-25, 26-33, 34-41, and over 41.

The variable Jackpot represents the amount of money the contestants were competing for, on the show this is called the players 'trust fund'. The mean for the Jackpot variable is positively skewed, this because of contestants in the final round of the show having large potential jackpots.

The variable Winnings represents how much money the contestants won on the show. The median for this variable is 0. This is explained by the overall Foe rate which was 51.7%, this means that more than half of the contestants left the show with nothing.

The variable Choice is a binary dummy variable that represents whether the contestant chooses 'Friend' or 'Foe' during the Prisoner Dilemma game segment of the show. This variable has the value 1 if they choose 'Foe' and 0 if they choose 'Friend'. The mean of this variable is 0.52, this denotes that, 52% of contestants choose not to cooperate by choosing Foe.

The variable gender is a binary variable with the value 1 if the contestant is a male, and 0 if they are female. This variable shows that 49% of contestants were male and 51% of them were female. The distribution of the contestant's gender and the choice they made on the show can be seen in the bar chart figure 3.3 (appendix).

Table 3.1 Descriptive statistics for the variables used in the analysis

	Variables				
	Mean	Median	Std. Dev	Min.	Max.
Average Unemployment Rate (at age 18-25)	5.9	6.09	1.05	4.31	7.71
Unemployment Rate at 18	6.16	5.7	1.5	3.4	10.8
Age	31.48	30	8.91	18	61
Jackpot (dollars)	3711.49	2700	2871	200	9700
Winnings (dollars)	1335.63	0	2072.2	0	9700
Choice (Foe = 1)	0.52	1	0.5	0	1
Gender (Male = 1)	0.49	0	0.5	0	1

Note: table 3.1 shows the descrpitive statistics for the variables in the dataset which I used in my analysis

The table 3.2 shows the correlations among the variables in the dataset. Average unemployment rate at age 18-25 is quite highly correlated with the average unemployment rate at age 18, which is to be expected. As a consequence of this the avergae unemployment rate at age 18-25 was used as the main predictor variable. The average unemployment rate at age 18-25 is also quite highly correlated with age. The relationship between these variables is

shown in the scatterplot figure 3.4, which has a distinct 'n' shape. Younger contestants have quite a low average unemployment rate during their impressionable years, from 1994-2001 the average unemployment rate was 4.9%. The older contestants in this dataset also have quite a low average unemployment during their impressionable years, the average unemployment rate between 1959-66 was 5.2%. The average national unemployment rate during a contestant's impressionable years is the highest for the contestants aged in the middle of the dataset, they had the worst macroeconomic conditions as the average unemployment rate between 1979-86 was 7.7%. This creates a challenge when attempting to look at the direct effect of a contestant's macroeconomic conditions during their formative years. The solution used for this problem was to divide the age variable into four different age groups. Separating the average unemployment rate at age 18-25 variable into different groups was also explored but it did not give as clear results.

Table 3.2 Correlation table

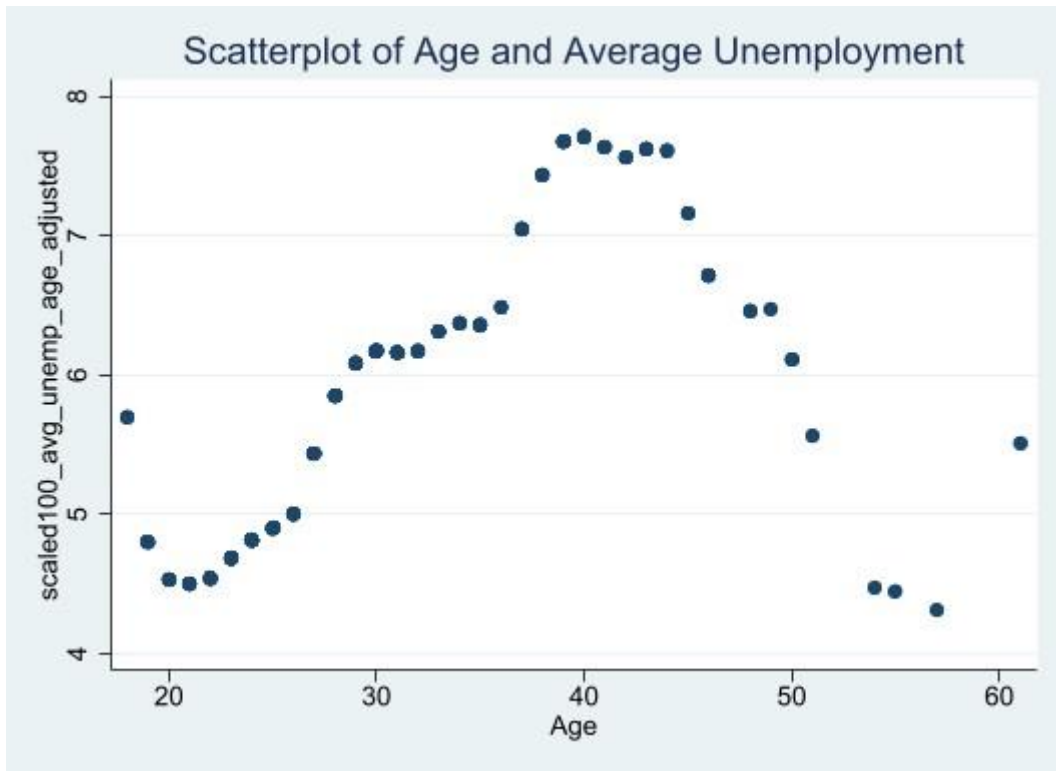|	1	2	3	4	5	6	7
1. Average Unemployment rate (18-25)	1						
2. Unemployment rate age 18	0.58	1					
3. Age	0.68	0.32	1				
4. Jackpot (dollars)	0.05	-0.06	0.08	1			
5. Winnings (dollars)	-0.03	-0.06	-0.09	0.51	1		
6. Choice (Foe = 1)	-0.13	-0.11	-0.16	-0.10	0.07	1	
7. Gender (Male = 1)	-0.06	0.06	-0.05	0.17	0.15	0.13	1

Figure 3.4 Scatterplot of contestants age and the average unemployment rate when they were 18-25

Note: This scatterplot shows the relationship between each contestant's age and the scaled national age adjusted average unemployment rate

Methodology

The present research is about how the macroeconomic conditions experienced by people during their impressionable years influence their social preferences, using game show data. In this section, I will discuss the approach and different techniques used to analyse the dataset. In this empirical research, I use data from the TV gameshow 'Friend or Foe', as well as historical US national unemployment rate data from the United States Bureau of Labour

Statistics (BLS). The main objective of this research is to observe if the macroeconomic conditions experienced by the contestants during their impressionable years influence their decision to choose 'Foe' or 'Friend' in the show.

Models used in similar studies

There are many previous studies which use television game shows as a natural way to observe real decisions in a real-life environment that involve high stakes, thus observing their social preferences. There is a Prisoner's Dilemma game in the UK television gameshow 'Golden Balls', in the last part of every show the final two contestants decide whether to 'Split' or 'Steal' the jackpot they have accumulated. A paper by Van den Assem, et al (2012), analyses this show. They model the Split or Steal decision using a binary probit model. As these coefficients do not have any intuitive economic meaning, they report the marginal effects applied to the medians of the explanatory variables. Research by List (2007) looks at how 'Friend or Foe' is a natural Prisoner's Dilemma experiment. He uses a Tobit model to show how a partners characteristics influence the take-home earnings of a Nash player. He also uses a discrete choice logit model; this is done to examine how characteristics of a group 2 player influence a group 1 players decision to choose their partner.

Linear probability model

For ease of implementation and interpretation, I will use a Linear Probability Model (lpm) for my analysis. I also estimated a logit model with margins to confirm that the lpm is acceptable. In a linear probability model, the regression equation is estimated using ordinary least squares (OLS) regression, which is typically used for continuous dependent variables but can be adapted for binary outcomes. The linear probability model assumes a linear relationship between the independent variables and the probability of the binary outcome.

When implementing a Linear Probability Model, there are certain assumptions that need to be considered to ensure correct estimation and interpretation of the results. These assumptions are similar to those of linear regression models but with additional considerations due to the

binary nature of the dependent variable. Firstly, the relationship between the independent variables and the probability of the binary outcome is considered to be linear. This assumption holds after splitting the Age variable into different categories. Secondly, the players actions are independent of each other; this holds as players have not seen how other players played the game in different episodes, they only possibly observe player's decisions from the same episode. Thirdly, the homoscedasticity assumption holds. Fourthly, there is no endogeneity as the independent variables are assumed to be exogenous and not correlated with the error term. Fifthly, there is no perfect multicollinearity as the independent variables are not perfectly correlated with each other. A final reason why I chose to use a linear probability model to estimate my results is because the model's predictions are constrained between 0 and 1, the predicted probabilities are between 0.39 and 0.69 which means the model is an extremely close approximation to a logit model.

Hypothesis

This hypothesis will investigate whether the contestants on the gameshow 'Friend or Foe' who experienced worse macroeconomic circumstances during their impressionable years (18-25) as indicated by average annual unemployment rate, are more likely to choose 'Foe' in an attempt to steal the jackpot, when on the show. I estimate the following regression:

$$Choice_i = \beta_0 + \beta_1 * AvgerageUnemployment_i + X_i + \varepsilon_i$$

In this linear probability model, $Choice_i$ indicates the decision player i makes in the gameshow. This is a binary dependent variable which equals 1 if the contestant chooses 'Foe' and 0 if they choose 'Friend'. $AvverageUnemployment_i$ denotes the national average annual unemployment rate for contestant i when they were 18-25, X_i is a vector of the control variables for contestant i, this vector contains age categories 18-25, 26-33, 34-41, over 41, gender, race, and the jackpot they were playing for, and ε_i is the error term.

Results

In this section I will present the results of my linear probability model, I will then discuss the outcomes from them.

Table 5.1 Linear probability model regression results for the relationship between a contestant's macroeconomic conditions during their formative years and their choice on the gameshow

Choice (Foe = 1)	Coefficient	Std. err.	t	P>t	[95% conf.	interval]	Significance
Average Unemployment (age 18-25)	-0.015	0.071	0.210	0.833	0.155	0.125	
Age 26-33	-0.131	0.126	1.040	0.299	0.378	0.117	
Age 34-41	-0.140	0.205	0.690	0.493	-0.544	0.263	
Age over41	-0.130	0.181	0.720	0.472	-0.487	0.227	
Gender (Male = 1)	0.144	0.078	1.840	0.067	-0.010	0.297	*
Race (White = 1)	0.028	0.099	0.290	0.775	-0.168	0.225	
Jackpot (in 1000's of dollars)	-0.023	0.014	1.720	0.088	-0.050	0.004	*
Constant	0.691	0.359	1.920	0.056	-0.018	1.399	

*** = p < 0.01, ** = p < 0.05, * = p < 0.10   N = 174

This table shows the regression results from the Linear Probability Model, which was created to observe whether the contestants on the gameshow Friend or Foe who experienced worse macroeconomic circumstances during their impressionable years (18-25) are more likely to choose 'Foe' in an attempt to steal the jackpot. The explanatory variable Average Unemployment (age 18-25) represents the national annual average unemployment rate when each contestant was aged between 18-25, if a contestant is younger than 25, this variable represents the average national unemployment rate from when they were 18 to their current age.

The table shows that if a contestant has a percentage point increase in their Average Unemployment, they will be 1.5 percentage points less likely to choose 'Foe' and steal the jackpot, all other variables held constant. This effect, however, is insignificant at the 10% significance level. The direction of this effect is the opposite of what was expected, a possible reason for this is that a contestant's current financial instability has a greater impact on their choice rather than the previous macroeconomic conditions they experienced.

In Table 5.1 contestants aged 18-25 are taken as the reference category. Comparing the other age categories to the 18-25 group shows that, contestants aged between 26-33 are 13.1 percentage points less likely to choose 'Foe', contestants aged between 34-41 are 14 percentage points less likely to choose 'Foe', and contestants aged over 41 are 13 percentage points less likely to choose 'Foe', ceteris paribus. However, the results for none of the age categories are significant at the 10% significance level, this may be because the sample size is too small.

This table also shows the relationship between gender and a contestant's decision to choose Foe in attempt to steal the jackpot. The results show that males are 14.4 percentage points more likely to choose 'Foe' compared to females, holding all other variables constant, this effect is significant at the 10% significance level.

In Table 5.1 the relationship between race and a contestant's decision to choose Foe is observed. The results show that white people are 2.8 percentage points more likely to choose 'Foe' compared to non-white people, ceteris paribus, this effect is insignificant at the 10% significance level.

Table 5.1 also shows the effect the size of the jackpot has on a contestant's decision to choose Foe and attempt to steal the jackpot. The results show that if the jackpot increases by one unit ($1000) the contestants are 2.3% less likely to choose Foe, ceteris paribus. This effect is significant at the 10% significance level.

The constant in Table 5.1 cannot be interpreted since the age group 18-25 is omitted from the model. If this variable is included then it shows that with all variables held constant, contestant's choose Foe 51.7% of times.

Discussion

The main goal of this research was to examine the effect of macroeconomic circumstances during young adulthood (i.e., between 18-25 years of age, termed the 'formative years' in this study) on social preferences. As an indicator for macroeconomic conditions, I used national annual unemployment rate data from the United States Bureau of Labour Statistics. Social preferences were deduced from a TV gameshow 'Friend or Foe'. Gameshows provide a natural way to observe real decisions in a real-life environment that involve high stakes, providing an analogy for social preferences. I developed a data set from episodes in the first season of the show.

The hypothesis was that the contestants who experienced worse macroeconomic circumstances during their impressionable years (18-25) were more likely to steal the jackpot by choosing Foe in the gameshow 'Friend or Foe' and thus were less likely exhibit prosocial behaviour.

To test this theory, I ran a linear probability model. The contestant's choice (whether they choose Friend or Foe) was the dependent variable, the main predictor variable used was calculated as the average of the national unemployment rate for each contestant when they were between the ages 18-25, if a contestant was younger than 25, this variable represented the average national unemployment rate from when they were 18 to their current age on the show.

Inconsistency with the literature

The regression results from this model show that contestants who had higher average unemployment rates during their impressionable years were not more likely to choose 'Foe'. They were actually slightly less likely to do so, although this effect was not statistically significant. The hypothesis was formed after examining the literature on how the macroeconomic circumstances people experience influence their behaviour and decisions later in life. In general, the literature indicates that people who experienced worse macroeconomic conditions when they are in their emerging adulthood stage are normally

more self-serving and uncharitable. For example, research by Bietenbeck, et al. (2023), found that exposure to a recession during formative years (18-25) is negatively associated with pro-sociality later in life. Interestingly, they found this effect was unique to exposure from recessions just during this period in life and exposure to recessions at other ages had no significant effect.

More work from Bietenbeck and Thiemann (2023) this time replicating a paper by Giuliano and Spilimbergo (2014), found that individuals who experienced a recession during their formative years were more likely to favour redistribution in both the short and long run. However, Cotofan, et al. (2023) found that growing up in bad macroeconomic conditions increases anti-immigration attitudes, even though immigration has a positive influence in reducing global poverty. This seems to suggest that the findings from Bietenbeck and Thiemann (2023) are better explained as individuals who experienced a recession during their formative years are more likely to favour redistribution because of self-interested reasons. This caused me to have the belief that contestant's on 'Friend or Foe' who had worse macroeconomic conditions during their formative years would act more selfishly on the gameshow and thus would be more likely to steal the jackpot.

Is age a better predictor?

I think that a contestants age may be a better predictor for their likeliness to steal the jackpot on the gameshow. The results from the model show that contestants aged between 26-33, 34-41, and over 41 were all less likely to choose Foe than contestants aged between 18-25. While this result was not statistically significant, I am inclined to believe this was due to having a small sample size. Other research on 'Friend or Foe' by Oberholzer-Gee, F. et al. (2003) which focused on how well players coordinated, found using data from all 40 episodes of season 1, that young players play Foe nearly two thirds of the time and older players play Foe 39% of the time, this result was statistically significant.

Using data from a similar gameshow 'Golden Balls' Van den Assem, et al. (2011) found that women were less likely to choose Steal as they got older, but this effect was not statistically significant. However, they found that men were a lot less likely to choose Steal as they got

older. Their cooperation rate increased by more than one percentage point per year, and this result was statistically significant. Looking at how age effects social preferences and cooperation rates from lab experiments, Matsumoto, et al. (2016) found using five economic games (including the Prisoner's Dilemma game) that pro-social behaviour increased with age from the emerging adulthood stage and beyond, in all five games. These results show that pro-sociality does increase with age both in the gameshow setting and in the laboratory setting. This indicates that an individual's age may be a better predictor for their cooperation rate on 'Friend or Foe' rather than the macroeconomic circumstances they experienced during their formative years.

Financial instability

On the show 'Friend or Foe', many contestants mention after the Prisoner Dilemma game and their attempt to steal the jackpot by choosing Foe, that their current financial situation and financial instability were their primary reasons to do so. A lot of these contestants also apologised to the other player for choosing Foe when the other player chose Friend, they often state that they badly needed the money to improve their financial situation in some way or another.

The younger adults in this dataset are aged between 18-25 in the years around 1994-2001. The United States economy was doing reasonably well at this time; indicated by the national average unemployment for these years being 4.9%. However, during these years it was still difficult for people in the emerging adulthood stage of life to have economic stability and self-sufficiency. This was due to an increase in globalisation, a decrease in unionisation, and the minimum wage not keeping up with inflation (Danziger and Ratner 2010). This may be the reason why contestants aged between 18-25 were more likely to choose Foe despite having adequate macroeconomic conditions during their impressionable years. These contestants were living in their emerging adulthood stage of life. This is the time of highest residential change, exploration of life decisions, and the most volatile years of life (Arnett, 2000). During this stage of life, sensation seeking is higher than any other stage of life (Zuckerman and Ruch 2001), they define sensation seeking as "a trait defined by the seeking

of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experience". This gives further reasoning why contestants in this age range were more likely to steal the jackpot by choosing Foe.

Macroeconomic conditions by age group

As mentioned, the contestants aged between 18-25 had adequate macroeconomic conditions during their impressionable year which they were still living in while on the show. These contestants were 18-25 in the years 1994-2001, during this time the US economy performed relatively well. In this period, there were no recessions, the minimum wage increased from $4.25 to $5.15, and the NASDAQ hit a record high.

The contestants aged 26-33 had worse macroeconomic conditions during their impressionable years compared to the younger contestants. The national average unemployment rate between 1986-1993 was 6.3% (compared to 4.9% between 1994-2001). During the last two quarters of 1990 and the first quarter of 1991 the US economy experienced negative growth, this period is now defined as the 1990-1991 recession (or the Gulf War recession). In both the year previous and the following year, economic growth was weak as well (Blanchard, 1993). These contestants experienced these harsh macroeconomic conditions during their impressionable years but still chose Foe less than contestants aged 18-25, although this result was not statistically significant.

Contestants aged between 34 and 41 experienced worse macroeconomic conditions than those aged between 18-25 and those aged between 26-33. The average national unemployment from 1978-1985 was 7.6%. During this time, there were two recessions in the United States. Inflation rates were rising throughout the late 1970's and peaked at 22% in 1980. The Federal Reserve raised interest rates to stop this inflation which caused a six-month recession as GDP dropped over 2% and unemployment spiked (Sablik, 2013). Not long after this, the US entered a sixteen-month long recession which became known as the Energy Crisis Recession. The Federal Reserve's strict monetary policy raised interest rates again to decrease inflation, which caused GDP to drop by 3% and unemployment spiked to

10.8%. This recession was intensified by global oil prices rising (Sablik, 2013). However, these contestants chose Foe less than contestants aged 18-25 and slightly less than contestants aged 26-33, although neither of these results were significant.

Finally, contestants that were older than 41 had fair macroeconomic conditions during their formative years. The average national unemployment rate from 1961-1977 was around 5%. There was an eleven-month long recession from 1969-1970 but this was a mild recession, the US also entered the Vietnam War during this time, although this did not particularly weaken their economy. Contestants aged over 41 chose Foe less than those aged between 18-25, but this result was not statistically significant.

Gender

One of the most meaningful results from the analysis is the different cooperation rates between males and females. The Linear Probability Model shows that males choose Foe 14.4 percentage points more than females, and this effect is significant at the 10% significance level. This effect seems to be in line with the literature. For example, Capararo (2018), found using a variation of a one-shot Prisoner's Dilemma game, that men cooperated 4 percentage points less than women.

Interestingly, Ortmann and Tichy (1999) examine Prisoner's Dilemma games from the lab where the choice to defect is a weakly dominant strategy, therefore, the games they analysed had the same format as the 'Friend or Foe' Prisoner's Dilemma game I examined. In their research, they observe whether there are gender differences in cooperation rates in a repeated Prisoner's Dilemma game. Focusing on the first round, they found that females cooperated 62% of the time, while males cooperated only 41% of the time. They accepted their null hypothesis that female first-round cooperation rates exceed males first-round cooperation rates.

Using data from all episodes of season one and two of 'Friend or Foe', research by Obelhozer-Gee, et al. (2003) concentrated on how players play the game depending on the characteristics of their partner. They found that men choose Foe at a statistically

indistinguishable rate if they are playing a man or a woman. However, in season two of the show, women chose Foe 60% of the time against men and 45% of the time against women. This effect is statistically significant, they cannot reject the hypothesis that women play the same against men and women, but they can reject the hypothesis that men play the same against men and women.

Size of the Jackpot

The jackpot (or trust fund as it's called on the show) is generally much larger than any amount of money offered in lab or experiments. From the 29 episodes I observed, the maximum trust fund was $9,700, the minimum was $200, and the median was $2,700. This allows for a great opportunity to examine the relationship between cooperation rates and stakes. The results from the linear probability model show that if the jackpot increases by $1000 the contestant is 2.3 percentage points less likely to choose Foe, this result was significant at the 10% significance level. This gameshow setting is unique; the results will be compared to similar research from gameshows with large stakes, as lab and field experiments are not as relevant.

The result shows that contestants on 'Friend or Foe' are slightly more likely to cooperate if the jackpot they are playing for increases, but this relationship is weak. Using data from all 105 episodes of 'Friend or Foe' Obelhozer-Gee, et al. (2003) found contestants are more likely to cooperate if their jackpot is $200 (they answered no questions correctly). Furthermore, they found no real relationship between cooperation rates and stakes when contestants were playing for a jackpot greater than $200.

Van den Assem, et al. (2012) found similar results when analysing the relationship between cooperation rates and stakes from the gameshow 'Golden Balls'. In their research, cooperation rates were high when the jackpot was relatively small; for amounts less than £500 people cooperated 73.4% of the time. However, as the stakes increased greater than this, the cooperation stayed around the same at 45%. They attributed the high cooperation rates for relatively small jackpots to a "big peanuts" phenomenon. This is described as when the players are making a choice for a few hundred pounds when they potentially could have been

playing for tens of thousands of pounds, they are paying for peanuts, and cooperate as they do not want to steal what they perceive to be a small amount of money.

Limitations

The main limitation of this research is that the sample size of the dataset is too small. The episodes in the dataset are from the 29 episodes from season one of the gameshow 'Friend or Foe' that are available on the streaming service Pluto TV. The archives say that there were 40 episodes in season one and 65 episodes in season two, but it was not possible to access these anywhere. As a consequence of this, the analysis of the 174 observations was constrained by a small sample size. This may not have been the case if it was possible to access all 105 episodes, which would have been 630 observations.

A general limitation which is common among the related literature on how macroeconomic conditions can affect certain behaviours or decisions, relates to how confident can we be that these broad macroeconomic indicators translate down to the individual. Having a single variable as a macroeconomic circumstances indicator does not take personal economic experiences such as a change in personal income, employment status, or family employment status into account. Future work could consider a more fine-tuned examination of how personal economic experiences effect social preferences rather than using a single broad macroeconomic condition variable. However, this would require a lot of personal data for each individual.

It is important to consider the caveats of using gameshow data when interpreting the results from the analysis. One concern is that the teams are selected endogenously, and partner selection is not random. This may influence a contestants cooperation rate since it is possible that they are stuck with a partner they did not want to be with.

A related point to this is that the performance of a contestant and their teammate when they are answering the trivia questions will influence their cooperation rate. In the gameshow, questions are multiple choice and contestants must agree on answers together. When analysing how player contributions affect their cooperation rate Obelhozer-Gee, et al. (2003)

calculated each player's net contribution as the number of correct answers they contributed minus the number of incorrect answers they contributed. From their analysis on season one of the gameshow, they found that players whose net question contribution was greater than the median (2.5 answers) were more likely to choose Foe.

Another concern which may influence cooperation rates from the gameshow compared to lab or field experiments is that the show is broadcast nationwide. This may affect a player's social preferences as they place a greater emphasis on fairness and reciprocity because they know many people will be judging their actions if they choose Foe. On the contrary, knowing that their decision is being televised a contestant could also be influenced to not cooperate and choose Foe, if they have a drive to win and possibly want to show off that they duped their opponent. However, this is still just another setting and the special circumstances do not make the results any less interesting. The unique opportunity provided by TV game shows allows researchers to examine theoretically intriguing behaviour at stakes that are impossible to recreate in a lab setting.

Conclusion

The main objective of this thesis was to investigate whether the contestants on the gameshow 'Friend or Foe' who experienced worse macroeconomic circumstances during their impressionable years (18-25) as indicated by annual unemployment rate, are more likely to choose 'Foe' in an attempt to steal the jackpot, when on the show. The gameshow data from 'Friend or Foe' was used as it allows for different features of social preferences such as trust, altruism, and reciprocity to be observed in a real-world setting with high stakes. As an indicator for macroeconomic conditions, I used the national average unemployment rate for each contestant when they were aged between 18-25. This was used as an indicator for its effectiveness and comprehensibleness in similar research (Schwandt and von Wachter, 2019) (Kahn, 2010) (Bianchi, 2013 and 2014).

The regression results from the linear probability model show that contestants who had higher average unemployment rates during their impressionable years were not more likely to choose 'Foe'. This result was not in line with what Bietenbeck, et al. (2023) found. In their research, exposure to a recession during formative years (18-25) is negatively associated with pro-sociality later in life.

I believe it is possible that age could be a better predictor for the likeliness to steal the jackpot. The results show that contestants aged between 18-25 were more likely to choose Foe than any other age group. This result was not statistically significant, but other research on 'Friend or Foe' by Oberholzer-Gee, F. et al. (2003), found using data from all 40 episodes of season one, that young players play Foe nearly two thirds of the time and older players play Foe 39% of the time, this result was statistically significant. Many contestants say that financial instability was the reason they chose Foe. According to Arnett (2000), individuals in the emerging adulthood stage of life (18-25) experience more financial instability than any other age group. This signifies that it may be better to use a contestant's financial situation and age to predict their cooperation rate. Younger contestants had favourable macroeconomic conditions during their formative years but exhibited less pro-social behaviour.

The results from the analysis also show that men choose Foe at a higher rate than women. This result was statistically significant and is in line with similar research conducted on

gender cooperation rates in Prisoner Dilemma games by Ortmann and Tichy (1999) and Caparo (2018).

Overall, a limitation of this thesis that is common in similar research, is that using a single macroeconomic indicator to summarise an individual's macroeconomic conditions over an eight-year period is too imprecise. Although it would be more difficult to test, incorporating personal economic experiences or possibly a well-being measure into the macroeconomic indicator variable could give more relevant results.

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Appendix

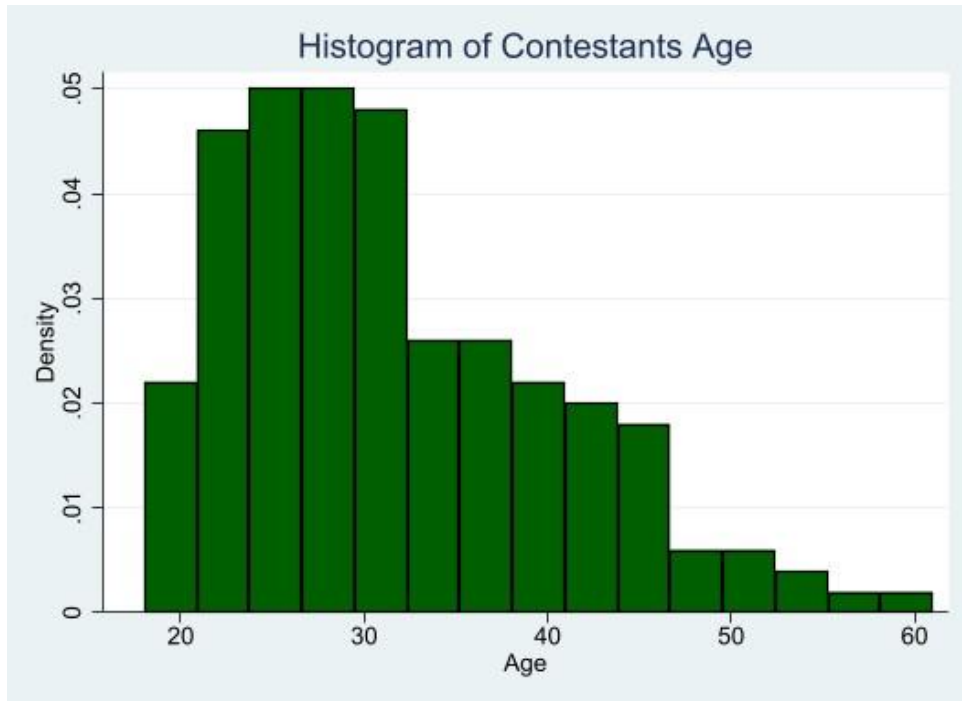**Figure 3.2** Histogram of contestant's age

Figure 3.3 Bar chart of the choices made contestants separated by gender