GLOBAL RELATIONS FORUM YOUNG ACADEMICS PROGRAM
ANALYSIS PAPER SERIES No.2

Perceived Income Inequality and Corruption

DR. ÇINAR BAYMUL

University of Oxford, Ph.D. in International Development
Consultant, University of Manchester

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This paper entitled *"Perceived Income Inequality and Corruption"* is authored by Dr. Çınar Baymul as part of the *GRF Young Academics Program Analysis Paper Series*. GRF thanks him for his contribution and commitment to this effort.

GRF convened the following group of distinguished members to evaluate and guide Dr. Çınar Baymul's paper:

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Global Relations Forum

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Dr. Çınar Baymul is a Consultant at the University of Manchester. Previously, he was a Research Associate at the Global Development Institute at the University of Oxford. Dr. Baymul obtained his Ph.D. in International Development from the University of Oxford in 2017. His research interests include causes and consequences of income inequality, structural transformation in developing countries and the economics of corruption. In addition to his duties at the University of Oxford, Dr. Baymul also works in collaboration with Professor Anthony Shorrocks on constructing a standardized global inequality dataset for the United Nations University World Institute for Development Economics Research (UNU-WIDER).

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Abstract

The theories linking income inequality to corruption are numerous, yet economists mostly fail to support them with empirical evidence. In this paper, Dr. Çınar Baymul argues that the primary reason why empirical studies fail to establish a relationship between income inequality and corruption is the conceptual difference between income inequality and its perception. Corruption in the public sector is the result of an interaction between two agents: a public official and a private individual. A public official takes into account several different factors when they decide to engage in corruption. If income inequality is theorized to be one of those factors, it is essential to take into account that agents are subject to a veil of ignorance, especially in matters relating to the distribution of income. A public official will not have perfect information on the distribution of income; instead they will rely on their own perceptions drawn from a sub-sample of the population. These perceptions are formed by experiences over time with the limited information that economic agents possess. The latest studies on the subject demonstrate that systematic biases exist in individuals' perceptions of inequality. Failure to address these biases might be the cause of the lack of supporting evidence for theories that link income inequality to corruption. This paper develops a new conceptual framework in order to shed light on the relationship between inequality perceptions and corruption. Hypotheses are tested by regression analyses and a laboratory experiment conducted at Istanbul Bilgi University, where the biases between perceptions and actual inequality are removed. Results suggest that inequality increases corruption through how it is perceived by individuals, and policies aimed at reducing inequality should help fighting corruption if the public is made aware of the policy itself.

1. Introduction

In the final days of April 2014, Pope Francis tweeted to his millions of followers a rather controversial statement: "Inequality is the root of all social evil." That same month, the English translation of Thomas Piketty's colossal book on wealth inequality, *Capital in the 21st Century*, hit the shelves and became an international best seller. Just at the start of the year after, President Obama promoted a budget that focused on specifically combating the growing income inequality in the US. Inequality has gathered immense attention from all around the world since the beginning of the decade, it has led to protests and social movements, and it has become one of the most debated issues in the economic and political world.

In their influential book, *The Spirit Level*, Wilkinson and Pickett (2010) demonstrated that high levels of income inequality correlated strongly with many aspects of our social life that negatively impact the prosperity of countries. From epidemic obesity to violence, income inequality has slowly but surely made its mark as the root of many, if not all, social evils in today's world. One of those social evils that inequality is theorized to cause is corruption. Corruption is detrimental to economic development (Ades and Di Tella, 1999; La Porta et al., 1999; Treisman, 2000; Damania et al., 2004). Unfortunately, according to Transparency International's Corruption Perception Index, it is also rampant in countries where sustainable economic growth is needed the most. Policymakers typically choose to tackle corruption through institutional reform, privatization, or increasing public oversight through transparency actions; yet, these widely recommended improvements to bureaucratic quality do not seem to produce successful outcomes towards reducing corruption (Persson et al., 2013). Reducing income inequality is a policy tool that is not often discussed as a way to fight corruption. Nevertheless, theory suggests that in countries where the disparity of wealth between the rich and the poor is very large, the rich can use their wealth to illegally obtain influence over political and judicial mechanisms in order to maintain their status (Scott, 1972; Glaeser et al., 2003; Jong-Sung and Khagram, 2005). A more equal distribution of wealth creates a politically strong middle class to fight the injustice of influence, enabling the losers from corruption to take countervailing actions against the corrupt and reduce its effects in the society (Scott, 1972; Alam, 1995). However, contrary to existing theories, most empirical studies have failed to establish a significant link between inequality and corruption (Husted, 1999; Paldam, 2002; Park, 2003).

In this analysis paper, I argue that income inequality is indeed one of the main causes of corruption, yet theories and empirical research so far have overlooked an important aspect of how the two economic phenomena are connected. I will first establish the economic framework, then test the hypotheses. The analyses will be followed by possible policy implications of the results.

2. Conceptual Framework

In the Oxford Dictionary of Economics, the definition of income inequality is simply given as the differences in income between individuals or families, or between different groups, areas, or countries (Black et al., 2012). Income is distributed unevenly in the economy. However, in most countries, incomes are taxed and used for the creation of public goods and redistributed through transfers. Therefore, pre-tax income of an individual or a household may differ greatly from their after tax income. Ultimately, the focus of most economic research is the differences in income after taxes and transfers, commonly referred to as disposable or net income. Information on individual and household incomes are collected in surveys and censuses usually conducted by national statistics agencies. Data collected are later used to calculate various inequality measures, the most popular being the Gini coefficient, which summarizes the extent to which the actual distribution of income deviates from perfect equality.[1] Assuming that the data reflects how incomes are distributed in a society with or without some corrections, Gini coefficients may be calculated to measure the actual net income inequality in the entire country.

Evidently, in order to calculate the actual net income inequality, one needs to know the amount of income other individuals in the population, or a representative sample of the population, receive. Economists who regularly follow statistical updates on the income distribution may possess this information; however, most individuals in the population are not informed about the actual distribution of incomes in the population. In fact, even the economists only have access to the information of the previous year at best. Therefore, at any given time, individuals can only have estimations on the incomes of others and how they are distributed, based on historical data or their own observations. These estimations are very likely to be biased and incorrect.

In a given distribution of income, actual or estimated, people may have different opinions on how equal that distribution is. A Brazilian tourist who grew up in a society with large gaps between incomes may be of the opinion that citizens of London live in a satisfactorily equal society, while a Swedish tourist may be appalled at the degree of inequality between incomes and wealth in London. Similarly, two Londoners might have different opinions on the level of income inequality in their city. Our opinions on the existing distribution of income are formed by our own experiences, observations, and values, such as our interpretations of fairness and distributional justice. Therefore, evaluations of a given set of endowments are likely to differ between individuals. Some might be more intolerant of inequality than others.

Imagine two respondents who are familiar with measures of income inequality. Respondent A estimates the Gini coefficient for Oxford to be around 0.35

[1] The Gini coefficient is a statistical measure of inequality which depicts perfect equality with zero and perfect inequality, where one person in a society receives the entire income while the rest receives nothing, with one. Gini coefficients are sometimes reported as a scale between zero and one hundred.

and thinks that this distribution is very unequal, and thus answers "Yes, there is too much income inequality in Oxford." On the other hand, Respondent B's estimate of income inequality in Oxford is a Gini coeffcient of 0.40, an estimate that is technically more unequal than A's estimation. However, Respondent B does not believe that this degree of inequality is too much and thus answers "No" to the same question. Despite the fact that Respondent B estimated a more uneven distribution of income in Oxford, their subjective perception of inequality in the city was lower. In this case, Respondent B is more tolerant of inequality than Respondent A.

Fairness considerations and inequity aversion play a role in distributive choices. Individuals may get to vote on redistributive policies in democratic countries, but unless they are dictators, they do not have the power to redistribute incomes by themselves. However, if they perceive their wage as unfair they may engage in undesirable activities to compensate and restore fairness (Cowherd and Levine, 1992). Akerlof and Yellen (1990) shows that workers may reduce their effort if they are not compensated fairly compared to their reference group. Unlike workers in the private sector, public officials can increase their income through illicit gains by taking bribes. Therefore, we can assume that the public officials' inequality aversion, or their desire to equalize the incomes between themselves and the rich, could motivate them to extort bribes.

Once the differences between the concepts are established, the first question that has to be answered becomes whether these estimations of income distributions are biased. Two large-scale empirical studies conducted in the US and Argentina suggest that they are. In a nationally representative sample of 5,522 individuals, Norton and Ariely (2011) asked respondents to estimate the percentage of wealth each quintile in the economy holds and how much they should have in an ideal world. According to their results, Americans estimated that the richest 20% of the country had 59% of the total wealth, and they believed that in an ideal world, this amount should have been closer to 32%. However, at the time of the survey, the top quintile in the US actually held 84% of the wealth. Similarly, the estimated wealth for the poorest 20% of the country was around 5%, while the actual wealth owned by that quintile was only 0.1%. These results demonstrate that Americans significantly underestimated the inequality in their country. In a more recent article published in the Journal of Public Economics, Cruces et al. (2013) conclude that systematic biases exist in perceptions of one's own rank. Using data from the Survey on Distributional Perceptions and Redistribution conducted in Greater Buenos Aires, the authors find that a significant portion of poorer individuals overestimate their position in the overall income scale, while richer individuals tend to underestimate. Respondents with friends from different income groups are less biased and these biases are significantly correlated with the respondent's relevant position within the reference group. The authors argue that agents with biased perceptions will obtain naive estimates of income characteristics of the population.

Let us assume that an inequality-averse public official wants to equalize incomes between themselves and those they perceive to be richer by taking a bribe. Since the only actual information they have is their own income, they use their own wage to estimate what richer individuals earn. As the gap between their

distributional perception and tolerance widens, their estimate for the income of the rich increases. Their aversion to disadvantageous inequality, meaning the loss of utility caused by earning less income than those who are richer, motivates the public official to take bribes. The amount of bribes taken increases with their aversion.

Corrupt acts impose negative externalities on the rest of the society, and these externalities are likely to attach a moral cost to the decision of the public official. In order to incorporate the moral cost, two additional assumptions need to be made. First, assume that the moral cost increases with the amount of the bribe, as larger bribes might have larger negative externalities on the rest of the society. Second, one must assume that those who are more intolerant of inequality incur higher moral costs. This assumption is reasonable if the agent considers the inequality-increasing impact of corruption. Those who are less tolerant of inequality can incur higher costs to their utility because of the inequality they cause through corruption.

In this economic framework based on perceived inequalities rather than actual inequality, I have allowed for the possibilities that estimations of income distributions might be biased and incorrect, and that inequalities might not lead to corrupt actions due to individual tolerances for inequality.

Hypothesis: Corruption increases as individuals estimate higher inequalities in their distributional perceptions.

In the next section, I am going to test this hypothesis through regression analyses by using secondary datasets. My aim is to thoroughly investigate the validity of my model with existing data before moving onto collecting my own data through an experimental study.

3. Perceived Income Inequality and Corruption Across Countries

3.1 Data

Data on perceived inequality itself is scarce. To my knowledge, the only source that provides such information is the Social Inequality surveys conducted by the International Social Survey Programme (ISSP). Over the span of 22 years, the ISSP published the results of four Social Inequality surveys, with the latest taking place in 2009. Social Inequality IV has the largest sample of all, with 55,238 respondents from 40 different countries.[2] Micro data taken from this survey is used to calculate weighted country averages.

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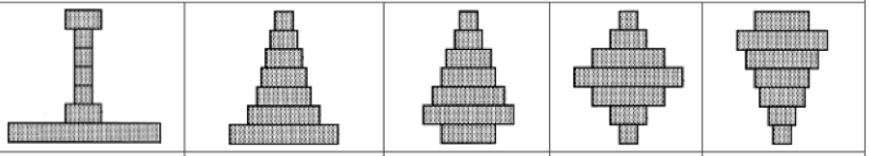
[2] These countries are Argentina, Australia, Austria, Belgium, Bulgaria, Chile, China, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Israel, Italy, Japan, Latvia, New Zealand, Norway, Philippines, Poland, Portugal, Russian Federation, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Turkey, Ukraine, United Kingdom, United States, and Venezuela

The variable depicting aversion to perceived inequality is generated from the responses to the question: "To what extend do you agree with the following statement? - Differences in income in respondent's country are too large." Possible answers are: 1- Strongly Disagree, 2- Disagree, 3- Neither Agree nor Disagree, 4- Agree, 5- Strongly Agree. Niehues (2014) refers to this question as "evaluation of income differences." I am of the opinion that this question satisfactorily captures the notion of aversion to perceived inequality, previously defined as a combination of both distributional perceptions and tolerance for inequality. In order to answer this question, the respondent would have to both map out the distribution of income, subject to available information, and then evaluate the inequality of this distribution based on their tolerance level. Inclusion of the adverb "too" particularly emphasizes this evaluation, as well as the possible aversion. Nevertheless, wording and the structure of the possible answers to this question are problematic. One way to analyze the responses is to attain a numerical value to each answer and treat it as an ordered categorical variable. However, it can be argued that the difference between the answers "agree" and "strongly agree" is unclear, and thus both should be treated equally. Another approach would be to turn the responses into binary dummies, taking the value of one when respondents agree or strongly agree with the statement, and zero otherwise. I will employ both these approaches in my methodology.

Figure 1: Distributional Perception Diagrams

Q14. These five diagrams show different types of society. Please read the descriptions and look at the diagrams and decide which you think best describes <country> ..



Type A	Type B	Type C	Type D	Type E
A small elite at the top, very few people in the middle and the great mass of people at the bottom.	A society like a pyramid with a small elite at the top, more people in the middle, and most at the bottom.	A pyramid except that just a few people are at the bottom.	A society with most people in the middle.	Many people near the top, and only a few near the bottom.

The fourteenth question of the survey, where respondents are asked to choose between five different visual diagrams, addresses the estimated distributions from high to low inequality. The question and the diagrams are shown in Figure 1. The question does not specifically ask respondents' opinions on the distribution of income, but rather how the society is structured between the elite and the rest of the people.

The term "elite" is not defined and there is no clarity on whether these diagrams reflect inequality of social power, wealth, or income. Despite this ambiguity, both Niehues (2014) and Gimpelson and Treisman (2015) measure perceived inequality through the responses given to this question. Gimpelson and Treisman (2015) justifies this choice by arguing that prior questions in the survey focused

on earnings and pay, and thus respondents would interpret these diagrams as income distributions. In my view, the use of the word "elite" suggests that the question focuses on the disparities of wealth rather than income. Nevertheless, I will use it as a measure to capture distributional perceptions of income in the society.

Assuming each bar represents a different income class with equal gaps, Gimpelson and Treisman (2015) calculates Gini coefficients for each diagram using the area of the bars. According to the authors, Gini coefficients for Diagrams A to E are respectively 0.42, 0.35, 0.30, 0.20, and 0.21, hence Diagram E represents a slightly more unequal society than D. It is possible that respondents who chose Type A might have a much more unequal society in mind than a society with Gini coefficient of 0.42; nevertheless, I am going to follow Gimpelson and Treisman (2015) and use their reported Gini coefficients for each of these diagrams in my analysis. This variable will be named *Distributional Perception*.

The other main variable of interest is the tolerance for inequality calculated from the responses to the World Values Surveys (WVS). The survey asks the respondents whether incomes should be made more equal or the society needs larger income differences as incentives. The respondents decide on a score between 0 and 9, 0 being in complete agreement with the first statement (more equal distribution), and 9 supporting more inequality. The answers given can be interpreted as the individual tolerances to income inequality. It is important to note that the statement does not refer to the responsibilities of the government in reducing income inequality. It simply reflects the attitude of the respondent towards inequality.

Other control variables are per capita gross domestic product (GDP) of countries, share of natural resource in total merchandise exports, government consumption and trade in the GDP, and the rule of law. GDP and natural resource data is taken from World Bank's WDI and the rule of law data is from the ICRG dataset. Gini values are also controlled for in order to make sure the impact of perceived inequality is not through actual income inequality's effect on corruption. UNU-WIDER's World Income Inequality Dataset is the source for the Gini coefficients. Finally, data for the dependent variable, corruption, comes from Transparency International's Corruption Perception Index (CPI) in 2009. In CPI, maximum corruption level is indicated by 10.

3.2 Results

Results of the OLS regressions examining whether a causal relationship exists between distributional perceptions, tolerance, and corruption are given in appendices A and B. Coefficient estimates of the *Distributional Perception* are positive and significant in every column. It survives inclusion of the actual Gini coefficient, meaning that the effect of distributional perceptions does not come from actual income inequality's impact on corruption. In fact, confirming the results from the previous analyses, I find that actual income inequality and corruption are negatively linked to each other across countries. Countries with

higher Gini coefficients seem to experience lower corruption. Controlling for tolerance for inequality does not significantly alter *Distributional Perception's* coefficient estimates either. Tolerance enters the regression positively and significantly. Breusch-Pagan and Shapiro-Wilk tests were conducted for each regression and no evidence for heteroskedasticity or non-normality has been found.

These results strongly support the second main hypothesis and suggest that as inequality in the estimated distributions rises in countries, they experience more corruption. All else being equal, a 1-percentage point increase in the *Distributional Perception* variable, transformed into Gini coefficients, corresponds to an approximate 0.3-point increase in the Corruption Perception Index, meaning a 4.5-point difference in corruption between the two countries with highest (Ukraine) and lowest (Norway) distributional perceptions in the sample.

OLS regressions examining whether a causal relationship exists between aversion to perceived inequality and corruption are given in Appendix B. The main variables of interest are Aversion to Perceived Inequality, measured by quantifying the responses given to the "Differences in income in respondent's country are too large" statement, and the total percentage of respondents who have agreed or strongly agreed to the statement, which is used as an independent variable and labelled Agreement Rate. A positive and significant impact of aversion to perceived inequality with both measures is observed, demonstrating that high perceived inequality corresponds to high corruption across countries. Keeping the rest of the variables constant, a 1-point rise in Aversion to Perceived Inequality is associated with corruption that is 1.81 points higher in the CPI. Similarly, corruption would be 0.54 points higher in a country if Agreement Rate were to rise by 10%.

Among the other control variables, economic development measured by the natural logarithm of GDP per capita of countries and the rule of law have the most significant causal effect on corruption. Countries who are richer and countries who have a better rule of law experience lower corruption as expected. Once again, actual income inequality has an adverse relationship with corruption, opposing existing economic theories.

These regression results confirm the hypotheses regarding perceptions and attitudes to inequality. However, due to the lack of perception data, the sample size is relatively small. In order to robustly test my hypothesis, I built an experiment that will be presented in the next section.

4. An Economic Experiment on Perceived Inequality and Corruption

In order to test the hypotheses that an increase in perceived inequality raises corruption while an increase in intolerance toward inequality lowers corruption, the economic model will be modified to capture the dynamics of an ultimatum game.

Let us first consider a simple ultimatum game where a proposer distributes an amount of money between himself and a second player. The second player responds to this offer by either agreeing with the proposed distribution and gaining her respective share, or by rejecting the offer, which results in both parties not receiving any positive payoffs. Rejection is inefficient and causes loss of surplus. Acceptance of any distribution in which the responder receives a positive amount leaves her better off than rejection; therefore, the game-theoretic solution of the ultimatum game is that the proposer offers the minimum positive amount to the responder, and keeps the rest of the money for himself. However, experiments show that the modal and median offers in ultimatum games are usually between 40-50% of the total amount.[3] In one of the most influential papers of the experimental economics field, Fehr and Schmidt (1999) models this persistent outcome in relation to individuals' preferences for equity and fairness. I will employ this model with slight adjustments to examine the effect of inequality on corruption. The Fehr and Schmidt (1999) model is augmented by adding another term to measure moral cost due to negative externalities associated with corruption and allowing for exogenous initial endowments. In the experimental model, negative connotations are attached to the decision of generating a surplus to be divided between two players. For instance, consider a case where two players divide an amount of money (surplus) that actually belongs to a third party between themselves. This surplus does offer an increase in utility due to monetary gains, yet the individual incurs a moral cost because of the decision to extort this surplus.

4.1 Experimental Design

Cases where the public official can act as a monopoly and extort bribes constitute a setting similar to the ultimatum game. When a traffic police officer demands a bribe to let the speeding driver go without a ticket, he is the first mover in an ultimatum game. The driver may agree to pay the bribe as long as the utility of doing so is greater than receiving a fine. If the bribe is paid, both parties profit from this exchange, since the driver either does not have to pay the higher fine or gets to keep his license. If the driver refuses to pay the bribe, neither he nor the police officer benefits from the interaction. In this example, the police officer was a price-setter. The driver cannot possibly go to another police officer and negotiate a lower bribe to let go of the fine. Similar monopolistic extortion may happen in different settings and levels of the bureaucratic hierarchy.

Evidently, there are differences between the potentially corrupt interaction between the officer and the driver, and the classic ultimatum game. First, corruption has negative externalities on the rest of the society. The driver who did not lose his license thanks to a bribe may end up harming another individual the next time he is speeding. On a larger scale, a government contract can be given to a less efficient firm because of a corrupt agreement, damaging the economy. These externalities are associated with a moral cost on both the bribee and the briber if

[3] See Chapter 2 of Camerer (2003) for a detailed review of results

they are aware that their actions are frowned upon in the society and most likely illegal. The traffic police officer may refrain from demanding a bribe if he believes it is morally wrong to do so. Similarly, the driver may reject a demand for a bribe even if his utility payoff from paying the bribe is significantly higher. Lambsdorff and Frank (2010) suggests promising to donate an amount to a third-party charity to reflect the externalities. This amount reduces every time a bribe has been accepted. According to the authors, reduction of the donation pool might invoke sentiments of altruism and capture the societal loss caused by corruption. The same mechanism is employed in this experiment and a donation pool is set for a charity, which is reduced with every surplus successfully generated by the players.

Table 1: Endowments of the Clients in Both Groups

Role	Treatment Low	Treatment High
C	1500	200
C	1650	500
C	1750	900
C	1850	1100
PO	2000	2000
C	2150	2600
C	2250	3100
C	2350	3600
C	2500	4000
Average	2000	2000
Perceived Gini	9.1	37.5
Actual Gini	6.3	26.3

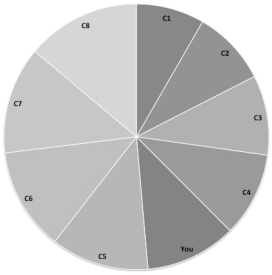
The second major difference between the ultimatum game and a corrupt interaction is that corruption can be detected and punished. Both parties risk receiving this punishment, sometimes without even reaching an agreement. Several studies have already examined the effect of uncertainty, risk, and punishment on corruption and found that both higher degrees of uncertainties on getting caught and increased penalties, if caught, reduce corrupt decisions (Abbink et al., 2002; Berninghaus et al., 2013). Implementing a detection mechanism would most likely have a negative impact on the amount of bribes demanded and accepted without providing us information on inequality's effect on corruption. It would also require us to model and control risk aversion

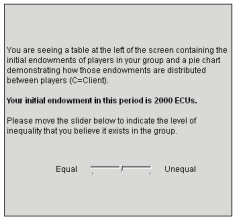
for each subject, complicating the analysis and potentially causing identification issues. Therefore, I prefer to remove stochastic features from the corruption experiment, weakening its external validity, yet allowing me to focus on the main research question.

In the bribery experiment, subjects play the ultimatum game with negative externalities in groups of 16 players. Each group consists of eight public officials (proposers) and eight clients (responders). Every public official receives an initial endowment of 2,000 ECU (Experimental Currency Unit), while the amounts clients receive differ from each other and between treatments. In Treatment Low, endowments of the clients are distributed more equally than Treatment High (Table 1). Average endowment is equal to 2,000 ECU in both treatments, and thus they only differ in their distributional inequality. All players experience both treatments. The subjects are informed that a donation pool of 15,000 ECU is established per group to be given to a charity at the end of the game. They are asked to choose between three politically neutral charities before the game starts. The most popular choice receives whatever is left in the donation pool at the end of the game.

Figure 2: Information Screen in Treatment Low

Player	Endowment
C1	1500 ECU
C2	1650 ECU
C3	1750 ECU
C4	1850 ECU
You	2000 ECU
C5	2150 ECU
C6	2250 ECU
C7	2350 ECU
C8	2500 ECU



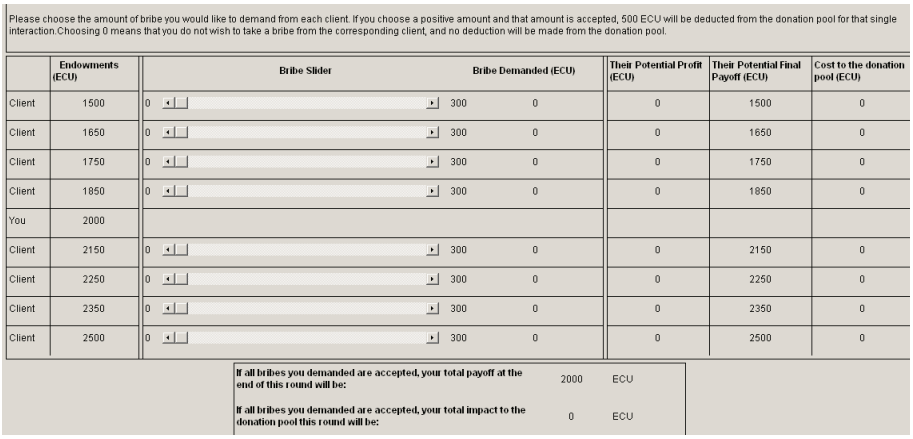


In the first stage, players' endowments are revealed to each other in a table as well as a pie chart demonstrating the distribution of endowments in the group. Before the first decision stage, subjects are also asked to move a slider to determine how equal they find the current distribution (Figure 2). This is done in order to measure their intolerance for inequality, as previously defined in this paper. After the information screen, every public official decides how much of the 300 ECU surplus he will allocate to himself as a bribe from each of the eight clients in his group. He can demand a maximum amount of 299 ECUs from each individual client and demanding the minimum amount of 0 ECU means that the public official is not asking a bribe from that client. He makes these decisions simultaneously. An example screen is shown in Figure 3. Whatever the public official's decision is, he is informed of:

- His potential profit and final payoff if the offers are accepted by the clients;
- The client's potential profit and payoff as a result of their own interaction;
- The potential deduction from the donation pool.

Once all the public officials in the group finalize their decisions, each client receives offers from the eight public officials. The clients are also informed about potential payoffs and costs to the donation pool. They either accept or reject the proposed offers individually. If a bribe is given in exchange for a favorable outcome, 500 ECU is removed from the donation pool automatically in exchange for the surplus of 300 ECU created between the players. Hence, despite the fact that both players profit from corruption, it reduces efficiency for the whole economy. Payoffs of the round are not revealed to public officials in order not to influence their decision in the upcoming treatment. Clients, on the other hand, know their exact payoffs as their own decisions determine the outcome. The final amount remaining in the donation pool are not shared with the subjects either. Public officials are also not informed about the final decisions of the clients regarding their offer. The second treatment commences after all clients in the group finalize their decisions. One of the two rounds is chosen randomly to determine the payment to subjects and the donation to be made to the charity.

Figure 3: Decision Stage of the Public Official in Treatment Low



I conducted the experiments in Turkish at the Bilgi Economics Lab of Istanbul (BELIS) at Istanbul Bilgi University. 128 subjects were recruited among students of Istanbul Bilgi University using the Online Recruitment System for Economic Experiments developed by Greiner (2015). The first four sessions, with 16 subjects in each, took place on different days in a time span of six days in May 2015, while the remaining four sessions were conducted on May 18th, 2016. Subjects played the experimental game in separate booths to ensure that they could not see the screens of other players. All subjects played both treatments. The game was coded in the widely used z-Tree platform.[4]

[4] See Fischbacher (2007) for documentation on z-Tree

4.2 Results

Result 1: Equal splits were rejected more often than in traditional ultimatum games.

Out of the total 1,024 interactions that took place in eight sessions between the subjects in the role of public officials and the clients, the public officials demanded bribes in 685 occasions. The top five most frequent demands were 100 ECUs, 150 ECUs, 200 ECUs, 250 ECUs and 299 ECUs (maximum amount). Table 2 displays how these common demands were distributed between clients, and their rates of acceptance. The most common offer was an equal split, mostly demanded from clients relatively poorer than public officials. In a normal ultimatum game, rejection of equal splits is very low according to Camerer's (2003) compilation of ultimatum game results. However, only 54% of these demands were accepted, possibly because of the moral cost of corruption associated with the negative externality on the donation pool and the unequal distribution of initial endowments. The second most common demand, 200 ECUs (2 to 1 split), was accepted one third of the time. Public officials demanded 100 ECUs, and left double as the total surplus to the client, mostly from the poorest client in the game, while bribe demands of more than 200 ECUs were made to richer clients.

Table 2: Common Demands

Demand	C1	C2	C3	C4	C5	C6	C7	C8	Total	Accepted
100	11	4	6	3	3	2	1	0	30	83%
150	14	16	18	16	13	11	13	13	114	54%
200	8	7	13	10	14	16	15	18	101	34%
250	1	2	3	4	6	6	9	8	39	21%
299	2	2	2	3	5	5	7	10	36	14%

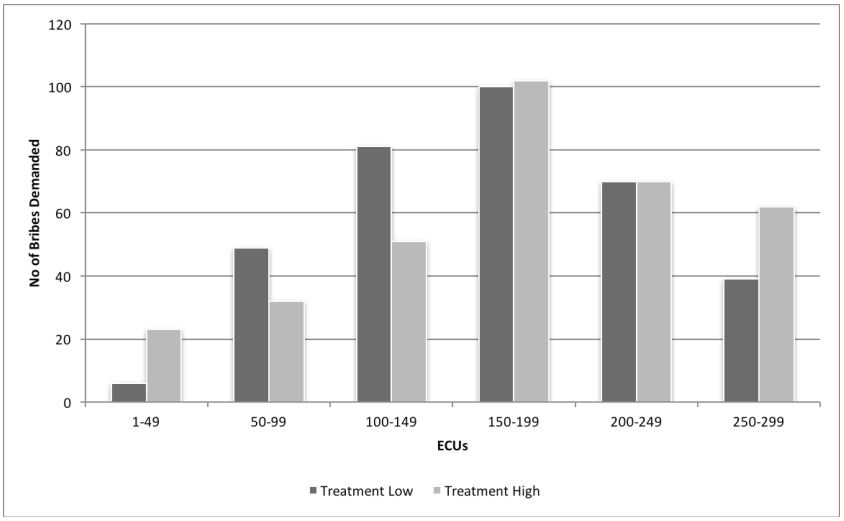
The frequency of bribes demanded in each treatment is shown in Figure 4. Each pair of columns depicts the number of demands made by the public officials between the indicated range. Notice that the number of bribes demanded including and above 250 ECUs increases sharply in the high inequality treatment. Similarly, a drop in the 100-149 range is apparent, as more public officials decided to divide the split more favorably to themselves.

Result 2: The number of bribe demands from the rich clients were higher than the number of demands from the poor.

Given that the public officials received no signals before and no feedback after their decisions, their choices are independent from those of the clients, and hence certain patterns can be identifiable in the data when these choices are aggregated. Figure 5 shows the total number of bribes demanded from each client group. Each client group consists of eight subjects in the role of clients.

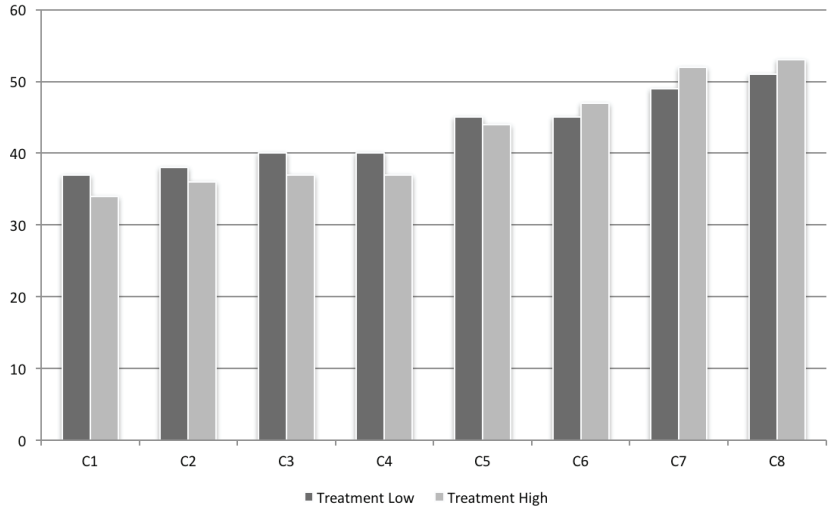
C1 is the group of eight clients that were given the lowest endowments in each session and C8 is the group of the richest clients. Their initial endowments in the two treatments can be found in Table 1. There are eight subjects in the role of public officials in each session, who start the treatments with 2,000 ECUs.

Figure 4: Frequency of Bribes Demanded per Amount Range



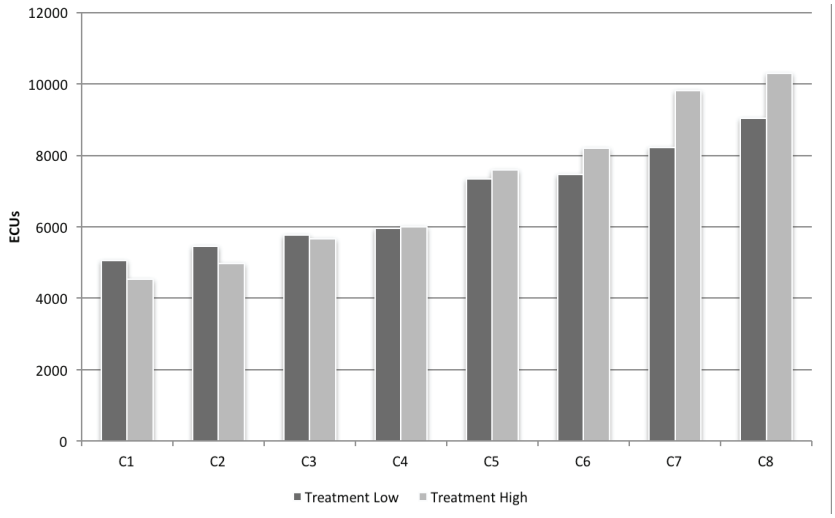
Maximum total number of bribes in each period can be 512.

Figure 5: Total Number of Bribes Demanded from Each Client Group



Maximum total number of bribes that can be demanded from a group of clients in each treatment is 64.

Figure 6: Total Amount of Bribes Demanded from Each Client



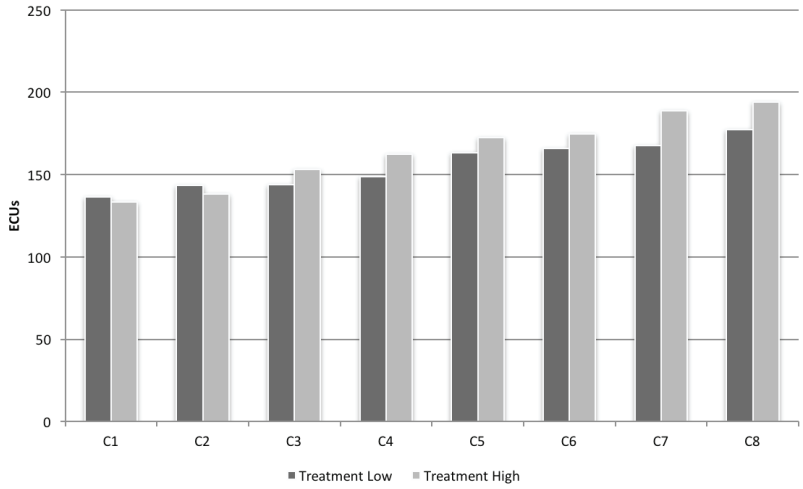
Maximum total amount that can be demanded by a single PO is 299 ECU. Maximum total amount that can be demanded from a group of clients in each treatment is 19,136 ECU.

Their initial endowment is higher than what is given to Clients 1 to 4, and lower than the initial endowments of Clients 5 to 8. Each of these eight public officials can demand an amount of X ECUs individually from the eight clients in their session (C1 through C8) in both treatments. Hence, each client can receive up to eight bribe demands in each treatment. With eight sessions in total, the clients who received the same initial endowment are taken as a single group, and each group can receive a maximum of 64 bribe demands. However, as public officials may choose not to demand bribes, columns in Figure 5 correspond to the total number of bribe demands (X) actually received by the labelled client group. Keeping in mind that for each bribe demand of X ECUs accepted by the clients, they receive 300-X ECUs as profit, a bribe demand from a public official can be considered as an opportunity for the client. Therefore, in Figure 5, it can be noticed that the public officials have given clients who are initially poorer than themselves fewer opportunities to profit from bribery. Number of bribes demanded from relatively poorer clients stay similar in both treatments, while we see that numbers demanded from clients richer than the public official rises with inequality.

Result 3: Public officials demanded higher bribes from the richer clients.

Figure 6 shows the total amount of bribes demanded from each client group. We observe that the public officials demanded more bribes in total from the richer clients. In Treatment High, where endowment inequality was higher, public official demands from the rich clients were higher compared to Treatment Low. On the other hand, demands from the poor were higher in Treatment Low.

Figure 7: Average Bribe Demanded from Each Client



Maximum total amount that can be demanded from a client by a single PO is 299 ECU.

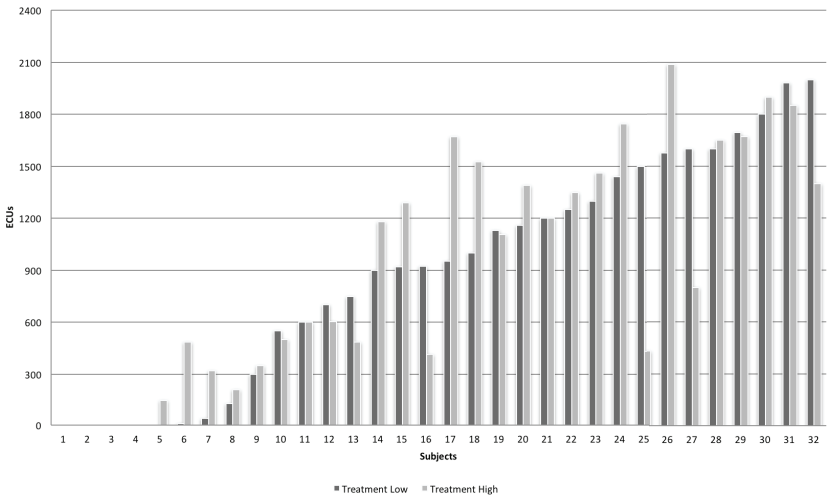
The average bribe demands from each client group are obtained when the total amount of bribes is divided into the number of bribe demands. Figure 7 displays the average bribes demanded from each client group. Average bribes demanded from clients are closer to each other when inequality is lower compared to the high inequality treatment, with the difference between the highest and lowest average, which are the average bribes demanded from the poorest and richest clients, being 41 ECUs. However, in the high inequality treatment, we see that the variance of average bribes demanded from clients is higher and the difference between highest and lowest average increases to 61.

Since each demand of X provides an opportunity to earn 300-X ECUs for the clients, one can also calculate the total potential profits offered to them (Figure 8). When inequality is lower, the difference between the lowest and highest potential profits offered remains in a range of 550 ECUs between all the client groups; however, more variation in total potential profits in the high inequality treatment is observed. Studies consistently find the first movers in an ultimatum game with equal initial endowments offer the responders between 40 and 50% of the total surplus. Average offers of the potential profits in the low inequality treatment were comparable to a conventional ultimatum game, with the highest average offer being 54% to C1 and the lowest being 40.1% to C8. Once disparities between initial endowments increased in the high inequality treatment, public officials demanded larger bribes and hence offered less profits to the rich clients. In Treatment High, the average share of the potential surplus left to the poorest clients was 56%, while the average profits offered to the richest clients were only 35% of the total surplus of 300 ECUs.

Result 4: No significant impact of the inequality treatment on bribery is detected by comparing simple means.

Previous graphs do not provide us with any clear information about the main hypothesis regarding the decisions of the public officials, which is that the total amount of bribes demanded (otherwise referred to as desired income) should increase as inequality rises. Figure 9 shows total bribes demanded by each public official in the low and high inequality treatments. 11 out of 64 subjects in the role of public officials refused to demand any bribes from clients in the low inequality treatment, while this number decreases to 10 when inequality increases. The rest demanded bribes in both treatments. No effect regarding the difference in inequality is apparent in this graph either. In fact, the difference between average desired incomes in the two treatments are very small. The average desired income when inequality is high is 2,891 ECUs while it is only 2,848 ECUs in the other treatment.

Figure 8: Total Demands of Each Public Official



Maximum amount of bribes that can be demanded by a PO in each period is 2,392.

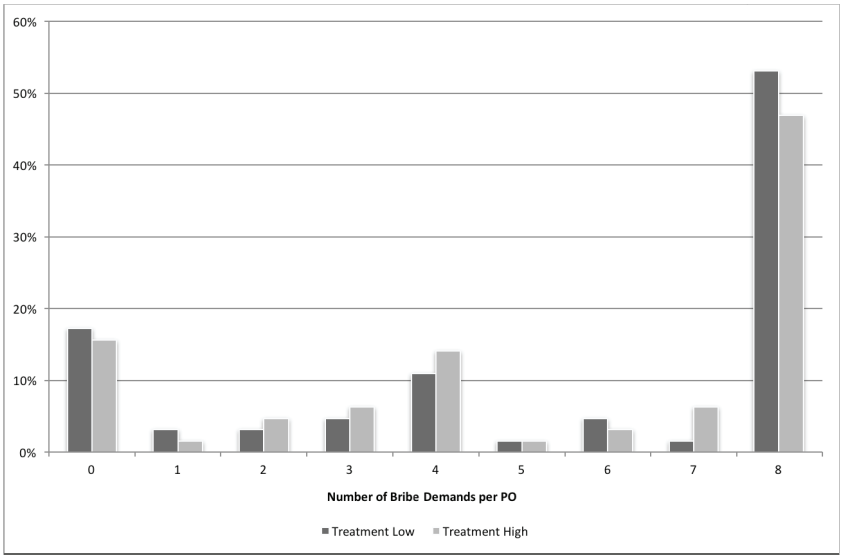
Hence, when one compares simple means without controlling for other variables potentially effecting public officials' decisions, a significant effect of the treatment (the change in inequality), on the amount of bribes demanded is not observed.

Result 5: A significant and increasing impact of the inequality treatment on corruption is observed when tolerance for inequality is controlled for.

Regression-adjusted average treatment effect results are displayed in Appendix C. Only data gathered in the first periods of each session is used to compare the averages in the two treatments. The top row shows the average effect of the

treatment variable. Without additional controls, the treatment itself, that is playing the game in high or low inequality distributions, does not significantly alter public officials' decisions on the total amount of the bribes demanded. However, once the treatment is conditioned on how tolerant of inequality the subjects were, a significant and positive impact of the treatment emerges. The estimate of the effect of tolerance on the total amount of the bribe demanded by the public officials is only significant in the high inequality treatment. With the full set of controls included in the regressions, increase in inequality leads to an average increase of 391 ECU between the total bribe demands of the officials.

Figure 9: Number of Bribes Demanded by POs in 1 Period



What do these results tell us about the impact of inequality and tolerance for inequality on the public officials' decision making process? As hypothesized, the regression-adjusted treatment effects indicate that a rise in inequality by itself did not alter the decisions of the subjects in the role of public officials. Despite being an interesting result that confirms the hypotheses of the common theory, the impact of the change in inequality is questionable as it is only significant when conditioned on tolerance.

Result 6: Public officials that were more tolerant of inequality demanded more bribes.
Result 7: Female subjects in the role of public officials demanded less bribes than male subjects.

Results of the Tobit regressions with random effects in Appendix D confirm the findings of the between-group analysis. The sequence of the treatments is controlled for to make sure that random effects regressions are appropriate.

Coefficient estimates for the sequence variable are always insignificant, confirming the validity of the methodology. The dependent variable in the first three columns is the total amount demanded by the public official. When tolerance is not controlled for, a change in inequality has no impact on the desired income; similarly, tolerance by itself played no role on how high the demands of the public officials were. Once both the change in inequality and intolerance are controlled for, significant coefficient estimates are observed. According to the results in the second column, public officials demanded an extra 224,9 ECUs as bribes when inequality was higher. This is an 11% increase on the initial endowment. On the other hand, when inequality and other variables are kept constant, those subjects who deemed the observed distribution of endowments to be more unequal demanded less bribes. Subject gender was also a significant predictor of desired income. In line with previous studies done on the field, female subjects demanded lower bribes.

5. Conclusion

Corruption is a plague that separates the less developed countries from the developed. This paper explains, using a regression analysis and an experiment, why and how the widening gap between the rich and the poor in less developed countries further aggravates corruption. Fairness is an important virtue in human life, and combined with selfish greed, it can motivate public officials to engage in corrupt actions to equalize the incomes that they perceive to be unequally and unfairly distributed. Evidently, perceptions might be, and in most cases regarding income distributions are, biased. In this experiment, despite the fact that perfect information on the distribution of income in the economic experience was given, we nonetheless witnessed a negative impact of income inequality on corruption in the subject groups when their attitudes towards inequality were controlled for.

This research might have the following implications for policy concerning the fight against corruption. The first is that an increase in the relative wages of public officials should reduce corruption. Raising wages not only reduces the gap between the rich and the public official, but it may also decrease the incentive to be corrupt if the public official believes that he will lose his job if he gets caught (Becker and Stigler, 1974.) However, Van Rijckeghem and Weder (2001) has demonstrated that even though an increase in public sector wages does reduce corruption, it might be a very costly option. Governments may not be in the position to offer such a raise without serious economic consequences.

The model and empirical study offer another way out of the vicious cycle of corruption: Implementation of progressive tax policies that effectively lessen income gaps will improve the structural corruption problem. Economists and policymakers have been debating whether reducing income inequality would be beneficial for the economy as a whole. I have shown that one of the

positive side-effects of a more equal positive distribution of income helps remove a large obstacle hindering economic growth in developing countries.

Finally, this research has also demonstrated the significance of the role of perceptions and attitudes to inequality in the decision making process of individuals. Redistribution policies may not be able to address the problem of inequality in the short term. However, I believe that policymakers will still observe an impact on corruption, as such policies begin the process of shaping public perceptions. Therefore, in order to effectively influence perceptions, it is also wise to make the public aware of the aim and expected results of these sometimes inexplicably complicated policies.

Appendix A

Distributional Perceptions and Tolerance Regression Results

	I	II	III	IV	V	VI	VII	VIII
Distributional Perception	0.32***	0.32***	0.26***	0.26***	0.29***	0.27***	0.28***	0.28***
	(5.05)	(5.33)	(3.75)	(4.02)	(4.24)	(4.21)	(4.13)	(4.21)
n(GDPpc)	-1.48***	-2.09***	-1.15**	-1.76***	-1.07**	-1.62***	-1.62***	-1.62***
	(-3.10)	(-4.10)	(-2.43)	(-3.48)	(-2.26)	(-3.18)	(-3.13)	(-3.19)
Natural Resources	1.59**	1.84**	0.82	1.09	0.50	1.07	1.07	1.08
	(2.06)	(2.52)	(1.00)	(1.42)	(0.58)	(1.26)	(1.24)	(1.28)
Government Size	-5.14	-8.20*	-2.16	-5.19	-4.44	-7.41	-7.59	-7.74*
	(-1.13)	(-1.84)	(-0.46)	(-1.18)	(-0.98)	(-1.65)	(-1.61)	(-1.71)
Trade	-0.17	-1.06	-0.18	-1.03	0.03	-0.78	-0.76	-0.75
	(-0.29)	(-1.62)	(-0.32)	(-1.66)	(0.06)	(-1.24)	(-1.16)	(-1.18)
Gini		-0.08**		-0.08**		-0.07**	-0.07**	-7.53**
		(-2.45)		(-2.47)		(-2.22)	(-2.19)	(-2.25)
Law			-0.54**	-0.51**	-0.28	-0.37	-0.37	-0.36
			(-2.18)	(-2.22)	(-0.99)	(-1.39)	(-1.32)	(-1.34)
Tolerance					0.44**	0.39*	0.61	
					(2.12)	(2.02)	(0.45)	
Tolerance Squared							-0.03	
							(-0.16)	
log(Tolerance)								1.20*
								(-1.98)
No of observations	40	40	40	40	38	38	38	38
Adjusted R	0.77	0.80	0.80	0.82	0.80	0.82	0.82	0.82

Dependent variable is Corruption. t-values in parentheses. *,**,***: coefficient significant in 10, 5, and 1% significant levels respectively.

Appendix B

Aversion to Perceived Inequality Regression Results

	I	II	III	IV	V	VI	VII	VIII
Aversion to	1.54***	1.58***	1.79***	1.81**				
Per. Ineq.	(2.96)	(3.24)	(3.63)	(3.63)				
Agreement					4.07**	4.61***	5.38**	5.44***
Rate					(2.70)	(3.33)	(3.88)	(3.89)
ln(GDPpc)	-1.79***	-2.42***	-2.31***	-2.32***	-1.80***	-2.52***	-2.43***	-2.45***
	(-3.90)	(-4.83)	(-4.68)	(-4.70)	(-3.86)	(-5.08)	(-5.07)	(-5.09)
Natural	0.42	0.72	0.82	0.84	0.33	0.72	0.87	0.89
Resources	(0.49)	(0.90)	(0.93)	(0.95)	(0.38)	(0.91)	(1.00)	(1.02)
Trade	-0.41	-1.32*	- 1.12	-1.08	-0.35	-1.43**	-1.24*	-1.22*
	(-0.69)	(-1.95)	(-1.67)	(-1.62)	(-0.58)	(-2.12)	(-1.89)	(-1.84)
Government	-2.00	-5.28	-8.21	-8.60*	-0.40	-4.19	-7.27	-7.68
Size	(-0.41)	(-1.12)	(-1.73)	(-1.79)	(-0.08)	(-0.90)	(-1.57)	(-1.65)
Law	-0.85***	-0.82***	-0.71***	-0.70**	-0.88***	-0.83***	-0.71***	-0.70***
	(-3.60)	(-3.70)	(-2.78)	(-2.72)	(-3.66)	(-3.81)	(-2.88)	(-2.81)
Gini		-0.08**	-0.08**	-0.08**		-0.09***	-0.10***	-0.10***
		(-2.42)	(-2.34)	(-2.37)		(-2.79)	(-2.91)	
Tolerance			0.44**				0.45**	
			(2.11)				(2.21)	
log(Tolerance)				1.35**				1.40**
				(2.08)				(2.20)
No of observations	40	40	38	38	40	40	38	38
Adjusted R	0.77	0.80	0.80	0.80	0.76	0.80	0.81	0.81

Dependent variable is Corruption. t-values in parentheses. *,**,***: coefficient significant in 10, 5 and 1% significant levels respectively.

Appendix C

Average Treatment Effects: Dependent variable - Amount of Bribes Demanded

	I	II	III	IV
High Inequality	75.81	423.99**	110.72	390.78**
(Treatment)	(0.47)	(2.49)	(0.68)	(2.27)
Treatment Low				
Tolerance		4.89		4.35
		(1.25)		(1.08)
Female			-263.81	-232.74
			(-1.53)	(-1.45)
Scholarship			2.52	1.88
			(0.83)	(0.68)
Mother			56.71	53.56
			(0.66)	(0.64)
POparent			238.19	276.45
			(1.20)	(1.46)
Treatment High				
Tolerance		23.45***		19.64**
		(3.52)		(2.19)
Female			-421.37*	-154.21
			(-1.65)	(-0.50)
Scholarship			-3.09	-1.81
			(-0.94)	(0.57)
Mother			-97.36	-80.13
			(-0.81)	(-0.76)
POparent			-353.02	-163.85
			(-1.33)	(-0.51)
Obs.	64	64	64	64

Associated z values are in parentheses. *, **, ***: Significant in 10, 5 and 1% respectively.

Appendix D

TOBIT Results - Public officials

	I Amount Demanded	**II** Amount Demanded	**III** Amount Demanded	**IV** Number of Demands	**V** Number of Demands	**VI** Number of Demands
High inequality	54.76	224.93**		-0.37	1.76**	
(Treatment)	(0.99)	(2.50)		(-0.63)	(1.97)	
Tolerance		5.01**	1.01		0.07***	0.03**
		(2.41)	(0.77)		(3.00)	(2.43)
Female	-414.30**	-383.21**	-406.69**	-6.11***	-5.37***	-5.68***
	(-2.19)	(-2.10)	(-2.17)	(-2.85)	(-2.70)	(-2.76)
Scholarship	-2.05	-2.00	-2.05	-0.04	-0.04	-0.04
	(-0.72)	(-0.73)	(-0.72)	(-1.17)	(-1.19)	(-1.18)
Mother	-9.16	-11.71	-9.70	-0.96	-0.98	-0.97
	(-0.10)	(-0.14)	(-0.11)	(-0.98)	(-1.09)	(-1.03)
POparent	-20.34	27.32	-10.95	1.86	2.28	2.05
	(-0.09)	(0.12)	(-0.05)	(0.71)	(0.94)	(0.82)
Treatment	-16.72	-58.46	-25.47	-1.92	-2.37	-2.16
Sequence	(-0.09)	(-0.33)	(-0.14)	(-0.94)	(-1.24)	(-1.10)
Obs.	128	128	128	128	128	128

Dependent variable for each column is given in bold letters. z-values are given in parentheses.
*,**,***: coefficient significant in 10, 5, and 1% significant levels respectively.

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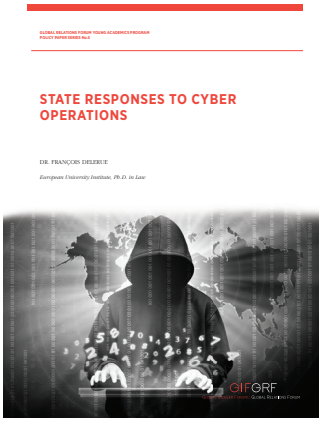

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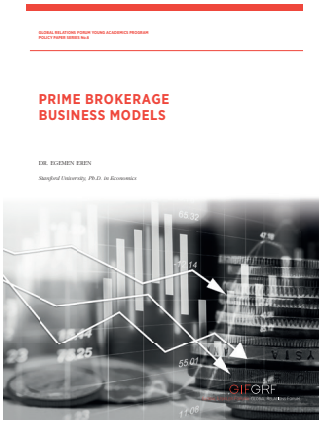

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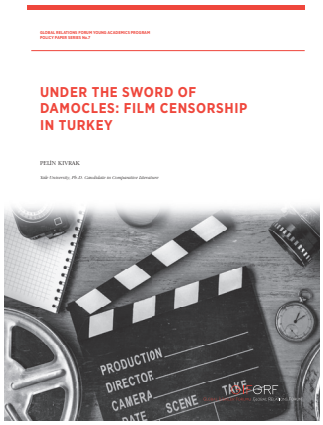

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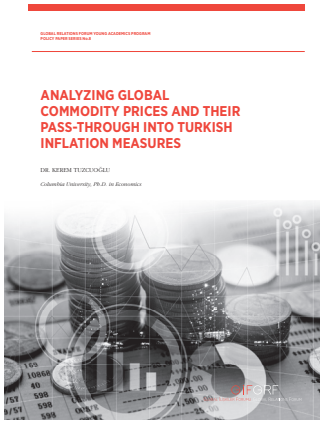

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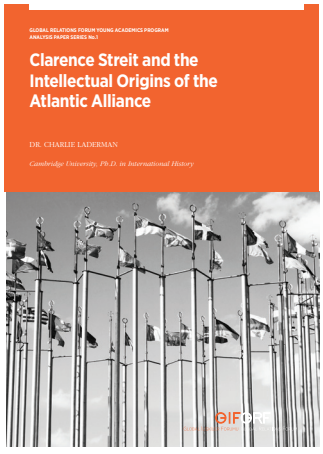

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