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Introduction

This dissertation consists of three experimental studies. The first chapter is based on a laboratory experiment in the field. The second chapter is a laboratory experiment study, and the third chapter exploits and analyses a natural experiment.

The first chapter of this work links two literature strands providing experimental evidence of the intergenerational transmission of other-regarding preferences and offering new insights about where these preferences originate. A large body of literature has been developed recently regarding the importance and development of other-regarding preferences. The literature on cultural transmission of various attitudes, preferences, skills, and economic outcomes is abundant. Though both the development of children's other-regarding preferences and its dependence on their socio-economic background have been relatively well studied, less is known about intergenerational transmission of other-regarding preferences and the nature of the transmission process.

The second chapter aims to understand how people behave when their choice autonomy is threatened. Despite much empirical evidence in the field of psychology, there has been no economic study analyzing the value of free choice. This chapter brings the well known concept of psychological reactance in social psychology into the field of economics, testing the economic significance of the theory.

Finally, the third chapter of the dissertation exploits a natural experiment that occurred in the Republic of Georgia. It implements a difference-in-differences methodology to study whether a religious appeal by an influential religious leader affected childbearing decisions.

Úvod

Tato disertační práce se skládá ze tří experimentálních studií. První kapitola je založena na laboratorním experimentu v přirozeném prostředí. Druhá kapitola je laboratorní experimentální studií a třetí kapitola využívá a analyzuje přirozený experiment.

První kapitola této práce spojuje dva proudy literatury, které poskytují experimentální důkazy o mezigeneračním přenosu sociálních preferencí a nabízí nové poznatky o tom, odkud tyto preference pocházejí. Bohatý proud literatury z nedávné doby se zabývá významem a vývojem sociálních preferencí. Literatura zabývající se kulturním přenosem různých postojů, preferencí, dovedností a ekonomických výsledků je hojná. Ačkoli vývoj dětských sociálních preferencí a jejich závislost na socio-ekonomickém zázemí byly poměrně dobře studovány, méně se ví o mezigeneračním přenosu sociálních preferencí a povaze tohoto procesu.

Druhá kapitola se zaměřuje na pochopení chování lidí v případě, že je nezávislost jejich volby ohrožena. I přes mnoho empirických důkazů z oblasti psychologie zatím neexistuje ekonomická studie analyzující hodnotu svobodné volby. Tato kapitola přináší dobře známý koncept psychologické reaktance z oblasti sociální psychologie do ekonomie a testuje ekonomický význam této teorie.

Třetí kapitola disertační práce využívá přirozený experiment, k němuž došlo v Gruzii. Používá metodu rozdílu v rozdílech, aby zjistila, zda náboženský apel vlivného náboženského vůdce ovlivnil rozhodnutí týkající se rodičovství.

Chapter 1

Like Parent, Like Child: The Intergenerational Transmission of Other-Regarding Preferences

Abstract

Using experimental data on the behavior of children and their parents in four binary choice games, which allows classification of subjects into *altruistic*, *egalitarian* and *spiteful* types, this paper explores the intergenerational relationship of other-regarding preferences. The results show that there is strong positive and significant correlation between the other-regarding preferences of children and their parents. The results also indicate that *parochial preferences* of parents strongly influence the measured *in-group favoritism* and *out-group hostility* of their children. Analysis of the impact of family structure on the strength of the transmission process found that children in large families and those born later tend to be more dissimilar to their parents, while a child's gender does not affect the strength of transmission. These findings provide a new perspective about where other-regarding preferences come from, and also contribute to the literature of cultural transmission.

Keywords: Other-regarding preferences, parochialism, Intergenerational transmission, Cultural traits, Family economics.

1. Introduction

Do parents who view the welfare of extended family and strangers differently, either positively or negatively, produce children with similar attitudes? Do parents consciously invest time and effort to endow their offspring with other-regarding preferences similar to their own? If yes, what is the nature of the transmission process? While there are numerous studies exploring the development of other-regarding preferences and intergenerational transmission of various personal, economic and socio-economic characteristics, there is no study to date which combines the two streams of literature to explore the intergenerational transmission of other regarding preferences. Using experimental data on other regarding behavior of parents and their children in Georgia, this paper attempts to provide such evidence.

Other-regarding preferences have been well documented as an important element of interaction with society, enabling humans to cooperate and co-evolve. *Altruism* and *inequity aversion*, a positive side of other regarding preferences, has been found to facilitate cooperation in social dilemma games and therefore to be an important aspect of a modern welfare state (Fehr & Fischbacher, 2003; Milinski, Semmann, & Krambeck, 2006; Bowles, Fong, & Gintis, 2006; Nowak & Sigmund, 2005). On the contrary, Gaechter and Herrmann (2006) and Herrmann, Christian and Simon (2008) demonstrated that societies in which the extent of *spiteful* behavior is significant tend to exhibit substantially low levels of cooperative behavior. Others (Spicer & Becker, 1980; Fortin, Guy, & Villeval, 2004) noted that *egalitarian* motives may play a crucial role in tax evasion decisions. Studies that emphasize the importance of other-regarding preferences on individual economic performance have found positive links between *altruism* and household welfare (Castillo & Carter, 2002) and productivity (Carpenter & Seki, 2005). On the other hand, Levine (1998) and Balafoutas, Kerschbamer & Sutter (2011) observed positive links

between *spite* and success in competitive environments. Kocher, Pogrebna & Sutter (2009) explored the extent to which other-regarding preferences of team leaders (CEOs, for example) shape their leadership styles and found that *selfish* leaders are more prone to autocratic decision making, which in turn canaffect team productivity.

Recently, a large body of experimental literature has emerged about the development of other-regarding preferences during childhood and the teenage years. Harbaugh, Krause & Liday (2003) conducted a dictator game experiment with children from seven to eighteen and found that their giving in dictator and ultimatum games increases with age. Benenson, Pascoe & Radmore (2007) gathered experimental data on children aged four to nine and also observed that altruistic behavior increases with age and the socioeconomic status of a child's family. Similar age effects on children's *egalitarian* and *efficiency* motives have been demonstrated by Almås, Cappelen & Sorensen (2010) and Sutter et al. (2010). Fehr, Bernhard & Rockenbach (2008) study the emergence of *altruistic*, *egalitarian* and *spiteful* behavior for children aged three to eight. They found that *spitefulness* decreases and *inequity aversion* increases with age. According to this study, children's sharing behavior is also affected by sibling composition and birth order. Children with no siblings tended to share more, as did firstborn children. Fehr et al. (2008) also demonstrated that boys exhibit significant *parochial* tendencies (resulting in either in-group favoritism or out-group hostility, or both), while girls seem differentiate less between in-group and out-group members. Subsequently, Fehr et al. (2011) studied the distribution of other-regarding preferences for children aged eight to seventeen and found that *altruism* becomes more prevalent with age, and older children tend to behave less *selfishly*. Interestingly, *parochialism* also becomes more prevalent with age. The authors also found that girls are less *altruistic* and more *egalitarian*, while they found no gender difference for *spiteful* types. Bauer,

Chytilová & Gebicka (2011) studied the impact of parental education on children's preferences and found that less educated parents are less efficient in terms of endowing children with positive social attributes, leading them to be less *altruistic* and more *spiteful*. Interestingly, Bügelmayer and Spiess (2011) found that higher cognitive skills are associated with more *spiteful* behavior for preschool children.

Though the overall development of and dependence on the socio-economic background of children's other regarding preferences is relatively well studied, as is cultural transmission of various attitudes, preferences, skills and economic outcomes, less is known about the intergenerational transmission of other regarding preferences and the nature of the transmission process. A large body of psychology literature shows that parents and children exhibit similar personality traits (see Loehlin (2005) for an extensive review). In economics, various studies have documented strong intergenerational correlation of cognitive skills (Black, Devereux, & Salvanes, 2009), educational outcomes (Björklund, Lindahl, & Plug, 2006), welfare dependency (Mitnik, 2010), income (Solon, 1992; Eisenhauer & Pfeiffer, 2008; Black and Devereux, 2010) and wealth (Charles & Hurst, 2003). Researchers have also demonstrated the similarity of parents' and children's food preferences (Collado, Ortuño-Ortín, & Romeu, 2006), charity donations (Wilhelm, Brown, & Rooney, 2004), religious beliefs (Bisin, Topa, & Verdier, 2004), risk and trust attitudes (Dohmen, Falk, Huffman, & Sunde, 2011) and impatience levels (Kosse & Pfeiffer, 2012).

Theoretical grounding for the described studies is provided by Bisin and Verdier (2000, 2001), who extend an earlier evolutionary model of cultural transmission by Cavalli Sforza and Feldman (1981). According to this theory, parents willingly engage in direct socialization practices by deliberately instilling children with preferences similar to their own. The theory also

assumes that parents who have dissimilar preferences are less likely to effectively influence children's socialization (later documented by Dohmen et al. (2011)). Therefore, parents seeking to maximize the probability of preference transmission to their children tend to marry those who exhibit similar preferences, thus engaging in positive assortative mating. This prediction was supported by Bisin et al. (2004), who showed that marriage patterns across United States are indeed positively assortative with respect to religious belief. Dohmen et al. (2011) also found that there is positive and significant correlation between spouse's risk and trust attitudes.

As noted earlier, there is yet no evidence in literature related to whether other regarding preferences are transmitted from parents to children. This paper provides experimental evidence of the intergenerational transmission of other-regarding preferences and offers new insight about where these preferences come from. Examining the experimental data on the behavior of children and their parents in four binary choice games, which allow classification of subjects into *altruistic*, *egalitarian* and *spiteful* types, reveals strong intergenerational correlation across these preference types. The results also indicate that parents' *parochial* preferences shape children's loyalty towards in-group members and hostility towards strangers. Finally, analyzing the relationship between family structure and the strength of transmission, the study finds that a child's gender does not play a role, though there is some evidence that children who live in large families or who were born later tend to be less similar to their parents in terms of other-regarding preferences. Later findings are particularly notable, because they indicate that the intergenerational correlation of other-regarding preference types is not solely due to genetic reasons, in which case family structure would not have played a role. Rather, these results may suggest that the parent's attempts to socialize a child by endowing them with social norms similar to their own are of equal importance.

2. Experimental Design and Procedure

2.1 Design

The experimental design is built on a protocol by Fehr et al. (2008) and uses a series of four binary choice dictator games in order to elicit the other-regarding preferences of parents and children. In each game, a subject chooses between two alternative allocations of tokens for him/herself and a partner. In total each participant makes 16 allocation decisions, four sets of four allocation tasks, each set with a different type of partner. Each child (parent) was paired with a parent (spouse), a sibling (child), a parent from another family and a child from another family. This particular design allows study of the nature of intergenerational transmission of other-regarding preferences towards different types of opponents and thus enables evaluation of whether the transmission is partner specific or is a general phenomenon. More importantly, this design makes it possible to observe intergenerational transmission of family bias. From different combinations of choices across these four games, we can classify subjects into mutually exclusive preference types as predicted by theory: *altruistic, efficient, inequality averse, maximin (Rawlsian), spiteful,* and *selfish*.

In the first game the participant chooses between an equal split (30, 30) of a pie between him/herself and a partner or a(40, 10) relatively unequal allocation. In this task, a choice of (30, 30) indicates *egalitarian* choice, as well as family income maximizing choice, whereas the choice of (40, 10) points to an individual's *selfish* motives. In the next game, participants are asked to choose (30, 30) or (20, 50). In this game, *strongly altruistic*/family income maximizing individuals would choose (20, 50) because it maximizes the partners payoff/total size of the pie, whereas a choice of (30, 30) suggests *behindness aversion* (Fehr & Schmidt, 1999; Bolton & Ockenfels, 2000). The third game, in which participants choose between (30, 30) and (50, 20)

helps to contrast *aheadness aversion* and *efficiency* (Charness & Rabin, 2002). In contrast with Fehr et al. (2008)'s experimental protocol, we added a fourth task [(30,30) vs. (40,50)] to our setup. In this game, the choice of (40,50) gives both sender and receiver a higher payoff, though it also creates a disadvantageous inequality for the sender. Therefore, the person who prefers (30,30) over (40,50) may have a strong preference for *inequality aversion*, or s/he could also be motivated by *spite* — a preference to minimize others' payoff.

Classification of other-regarding types

We use multiple ways to identify other-regarding preferences by pooling choices across all four games. First we opted for a very general measure of *altruism* and *selfishness* characterized by *total gives* and *relative earnings* respectively. *Total gives* is the sum of experimental points the subject gave to others. Similarly, we define *relative earnings* as a ratio of the total number of points across four games a subject allocated to him/herself, relative to the number of points s/he gave to others.

Next, we study behavior across all four tasks, to make a more detailed classification of other-regarding preference types. We label individuals *altruistic* if they maximize the payoff of their partner in all four tasks, *efficient* if they maximize the pie size, *selfish* if they maximize their own payoff and *spiteful* if they minimize their partners' payoff. We denote individuals as *strongly egalitarian* if they choose egalitarian allocation in all games, as *weakly egalitarian* if individuals choose egalitarian allocation unless it is too costly to do so[1] and as *maximin* if they prefer allocation in which the lower payoff is highest. Finally, we designate individuals as *other* if their behavior across four games is not consistent with any described classification. The

[1] In the allocation task [(30,30) vs. (50,20)] it is costly for the decision-maker to opt for the egalitarian choice.

payoffs in all four games and the classification into types are summarized in Table 1 in the Appendix. Table 2, also in the Appendix, displays the prevalence of each type for parents and children separately.

The latter analysis is simple and gives a detailed classification of mutually exclusive other-regarding preference types. However, there are limitations. While this method assumes that subjects follow a certain set of decision rules across all four games, there are individuals whose behaviors do not resemble any of the choice patterns outlined in Table 1. As Table 2 shows, about 22% of the total sample is is outside our classification system.

2.2 Experiment sample and procedure

The experiment itself took place from November to December 2011 in the Republic of Georgia, a post-soviet country that gained independence in 1991. Geographically it is located at the crossroads of Europe and Asia and its culture has adopted influences from both continents. According to the CIA World Factbook, it has a population of about 5 million as of 2014. Georgia is a multicultural society with ethnic Georgians constituting a majority.

Subjects were recruited from six public schools of Tbilisi, the capital city of Georgia, and one school in Gori, a regional capital. The children were in grades 1 to 11.[2] They and their parents were invited via the schools by an announcement inviting participation in an experiment. We faced a trade-off sampling strategy. We could either allow families to participate in the experiment in any composition and thus have a more representative sample, or require that the qualified families had to have at least two children and both parents needed to be present. We chose the latter sample, because, as mentioned earlier, this allows us to study the nature of

[2] Ages 6-17.

preference transmission towards four different partners and also to observe the transmission of family bias. For this purpose it was stressed that two parents and two children had to be present from each family. We will address this concern more broadly in the results section. In total, our sample consists of 320 subjects.

The sessions took place in the evening, from about 5 p.m. to 6 p.m. when the daily schedule in school was over, in order to avoid distraction and the presence of teachers in the classrooms during the experiment. Upon arrival, the experimenter orally communicated consent forms to the subjects, which informed them that they were about to participate in an economic experiment investigating the nature of economic decision making in families. There was no mention of the nature of the task, or of the fact that they would be playing with partners (family and non-family members alike). It was stressed that their choices in the experiment would remain absolutely confidential and would not be disclosed to third parties (see Supplementary material). The participants were also informed that the average payoff in the experiment would be 25 GEL, which was about USD 15 according to the exchange rate at that time. They were also informed that the reward would not be monetary, and would be delivered in the form of a personal gift certificate for a specific good for the subject. The sample certificate, with instructions on how to use it, was displayed[3]. After completing the consent form, the participants

[3] Care was taken to avoid future reallocation of experimental earnings within a family and to ensure that what participants allocated to themselves during the experiment indeed would accrue to them. It was stressed that parents would not be able to use their children‘s gift certificates, and that children could not use the gift cards of their parents. Each person obtained a person specific gift card, which could be used in specific shops for consumption goods. For example, children could use their certificates either for toys or for children’s clothes. Mothers could redeem gift cards for perfume and certain costume jewelry, while fathers could use their gift cards for men’s clothing or in local restaurants.
The gift cards were designed by the local Liberty Bank. Because the value of each particular gift card was unknown in advance of the experiment, they were ordered after the sessions. It took 2 to 3 days for the gift card to be actually delivered to the participant. For this reason we needed to identify each subject by name to ensure the correct delivery of certificates. The gift cards were delivered through teachers in sealed envelopes bearing the recipient’s name.

were placed in four different classrooms to ensure that each family member was in a different room and unable to communicate[4]. Each family member remained in separate classrooms until all the subjects made their final choices, and there were no communications between family members. On only one occasion we had to run two experimental sessions in the same day in the same school. In order to avoid communication between experienced and fresh subjects, we scheduled sessions to ensure that by the time new subjects arrived, all the subjects who had already participated in the experiment had left. In all other cases, we had a single session per school and there was no need to worry about communications between subjects.

After being allocated to different rooms, the experimenter was responsible for giving instructions in each room and addressing questions if raised. The two mutually exclusive options in each game were represented on paper (see Supplementary material). Each allocation within the task was presented using two circles, each with one arrow directed either to the decision-maker or to a partner. We placed the number of points inside the circles. An arrow directed towards the decision-maker illustrated that s/he would be the recipient of the points inside that circle, while the number in the other circle, with an arrow towards upper side of the paper, illustrated how much the partner would receive. The participants were also instructed that, while they were making decisions regarding four partners, the other three participants (who may or may not be the same people) were making decisions regarding them as well. Finally, in order to ensure that subjects (especially young children) understood the nature of the task, they were shown an example and asked to answer a control question. After the children understood the rules and answered control questions correctly, the experiment began.

[4] The headmasters of the schools kindly provided the classrooms for our sessions.

Since family members are engaged in life time interactions, the decisions made during the experiment may not truly reflect their attitudes towards each other. It could be the case that a child, for example, was nice towards his/her parents during the experiment and thus expected a favor in the future, or that s/he behaved under the fear of future retaliation from parents. It could also be the case that, unlike in typical experiments, the decisions made during experiments could be undone as family members return home (Ashraf, 2009) and could bias an individual's behavior. To address the first issue it was carefully explained that the value of the gift card would be derived from the total number of points collected in the experiment. This included points which participants allocated to themselves in 16 tasks, combined with points which strangers allocated to them. That is, the subjects obtain all the money in one sum, without being told how much any particular person has sent them. It was stressed that, given the described nature of the payment process, it is impossible for any partner, including one's family members, to intuit any individual's behavior in the games. For clarity, this explanation was reiterated orally by the experimenter. Thus, the experiment design rules out any potential future retaliatory behavior and subject's behavior should be free from strategic motives related to it.

After participants completed decision tasks, the parents were asked to fill in a questionnaire asking questions on various socio-demographic characteristics. Data on children including their age, gender, sibling composition and birth order was also collected.

3. Results

3.1 Transmission of Other-Regarding Preferences

Table A1 in appendix A provides a general look at the relationship between the other-regarding preferences of children and parents. Table A1 shows a correlation between total *relative earnings*

and *total gives* of children and parents in the experiment. *Relative earnings* is a very rough measure of other-regarding preferences, measured as a ratio of the total number of points across four games a person allocated to him/her self compared to the number of points s/he gave to others. Similarly, the *total gives* is the sum of points a subject gave to others. All specifications of Table A1 show that there is also significant intergenerational correlation along this dimension of other-regarding preferences. Note that *relative earnings* of children decrease with age and *total gives* increase with age. This is because *relative earnings* are lowest for altruistic types and highest for spiteful types, while the opposite is true for the *giving* variable, and therefore this result is in line with previously documented age effects on other-regarding preferences (Fehr et al., 2011 for example). A similar analysis was repeated by making regressions partner specific. The results again show that there is a strong and significant intergenerational correlation between children's and parents' total *relative earnings* and *total gives* with respect to a specific partner with age effects preserved[5].

The results from Table A1 make a strong case to deepen the analysis and explore the relationship between children's and parents' specific types of other-regarding preferences. As emphasized earlier, experiment games allow classification of subjects' preference types as *strongly altruistic, efficient, strongly* and *weakly egalitarian* and *maximin, selfish* and *spiteful.* However, data analysis reveals that *strongly altruistic, strongly egalitarian* and *selfish* types are uncommon and about 65% of children's preference types fall into *efficient, weakly egalitarian* and *spiteful* (see Table 2 and Figures 1-3 in Appendix)[6]. Therefore these preference types were pooled in three general categories: *altruistic* (including strongly and efficient types), *egalitarian*

[5] See Tables S1-S4 in Supporting Information online at http://home.cerge-ei.cz/lanchava/Chapter%20I%20Supporting%20Information.pdf

[6] The frequency of these preference types is roughly similar to those observed in Fehr et al. (2011).

(including strongly and weakly egalitarian and maximin types) and *spiteful* (including selfish and spiteful types).

In appendix A, tables A2 to A5 report seemingly unrelated regression[7] results. The dependent variable is children's other-regarding preferences (*altruistic, egalitarian* or *spiteful*). The explanatory variables of interest are mothers' and fathers' other-regarding preferences.

Columns (1), (4) and (7) in Tables A2 through A5 reveal that there is strong, positive and significant (P<0.01) correlation of other-regarding preferences between parents and their children. Parents who are altruistic, egalitarian, or spiteful towards related children, related parents, non-related children and non-related parents tend to have children with similar preferences towards others. Note also that the coefficients on mothers' other-regarding preferences are always higher in magnitude in comparison with fathers (in some cases the difference is statistically significant (P<0.01)). This evidence is in line with the hypothesis that mothers are more efficient at instilling social norms in their children (Dohmen et al., 2011).

From the perspective of the socialization hypothesis, which implies that parents actively engage in instilling their other-regarding preferences in their children, it is notable that parents in the study who are spiteful towards their offspring (spouses) do not have children with spiteful preferences towards siblings (parents) (columns (7), (8) and (9) in Table A2 show that coefficient estimates are insignificant and sometimes negative). The theory of intergenerational transmission (Bisin & Verdier, 2000) implies that the transmission occurs because parents care about the ways their children behave and therefore devote time and resources to instill the attitudes which they think are best. In the case of spiteful parents, this is less likely to be so. Analogously, columns (7), (8) and (9) of Table A7 shows that the children whose parents are

[7] Given the multivariate nature of the dependent variable, the error terms across equations for different preference types may be correlated. Therefore the seemingly unrelated regression was preferred over standard OLS procedure.

spiteful towards their spouses do not have similar attitudes (coefficient estimates are not statistically significant). Obviously parents would not teach children to be spiteful towards themselves.

In columns (2), (5) and (8) of Tables A2-A5 the regressions include exogenous controls including the gender and age of a child, and the ages of his/her parents. The relationship between the preferences of children and their parents remain almost identical in size as well as in significance[8]. It is notable that the above results exactly mirror Fehr et al.'s (2011) findings regarding the development and gender composition of other-regarding preferences. In particular, the estimates show that altruistic behavior increases with age, with older children being less spiteful. The results also indicate that girls are less altruistic and more egalitarian (similar to Fehr et al., 2011). While there is no systematic gender difference in spiteful types, the results in Tables A4-A5 show that girls are less spiteful.

Columns (3), (6) and (9) contain regression estimates of the same specification using additional controls such as logarithm of household wealth, mother's wage, father's wage, years of schooling of mother and father and the length of their marriages. Again, the size and significance of the coefficients of interest do not change notably (except in the cases considered above) relative to the first two specifications. The age and gender effect on children's other regarding preferences also remains the same.

The features of the experiment design allow study of the relationship between parochial preferences of children and parents. As before, instead of specifying terms of preferences, we first provide a general look at the relationship. Parochialism is defined in terms of a difference between *relative earnings* and *gives* between family and non-family members. Table A6 in

[8] We also controlled for school fixed effects. The results remain robust, and are available upon frequest.

Appendix A shows strong positive and significant intergenerational relationship between children's and parents' parochial preferences. Table A6 also demonstrates that age effects on parochialism are similar to those found by Fehr et al. (2011). In particular, children become more discriminatory towards out-group members as they get older (they give less to others and keep more for themselves (see columns (2), (3), (5) and (6) of Table A6).

Now one can become more specific and study the relationship between specific types of parochialism. It is defined in two ways: *in-group favoritism* and *out-group hostility*. A child's behavior is labeled *in-group favoritism* if s/he behaved altruistically only towards in-group members (sibling or parent). Similarly, a child is hostile to out-group if s/he behaved spitefully only towards out-group members (non-related child, non-related parent). Note that the *parochial* attitudes of *egalitarian* types are not studied here. This is simply because, as in Fehr et al. (2011), no behavioral difference towards in-group and out-group members for egalitarian types is observed. Tables A7-A8, show the relationship between children's and parents *parochial* preferences. In columns (1) and (8) of Tables A7-A8, the relationship between children's and parents' *parochial* attitudes is displayed. The coefficient estimates of mothers' and fathers' *parochial* preferences are positive, of notable size and significant ($P<0.01$). The results remain robust when including exogenous and additional controls (columns (2), (5) and (3), (6), Tables A7-A8). There is also some evidence that both forms of *parochialism* become more apparent as children get older (similar to Fehr et al. (2011)). Fehr et al. (2008) also found that girls are less *parochial* than boys. The gender coefficient in Tables A7-A8 is also found to be negative, though not significantly. This could be because the Fehr et al. (2008) sample included children from 3 to 8 years old, whereas in this experiment children were aged 6 to 17. Therefore it could be the case that gender differences in the *spiteful* type group are evident in early childhood but

disappear with age. Interestingly, Fehr et al. (2011), who experimented with children with an age range similar to this study, report no gender differences in parochialism.

3.2 Heterogeneity Analysis

So far we have documented that there is a significant intergenerational correlation between children's and parents' other-regarding preferences without consideration of the nature of the transmission process. The observed correlation may be simply due to genetic factors or to the family environment or due to parents' deliberate determination to socialize their children by instilling in them other-regarding preferences similar to their own. While any of the channels of intergenerational transmission could be the main determinant of the observed correlations and the scope of this study is not to gauge which mechanism plays a more important role, this study does, however, provide suggestive evidence in favor of the socialization hypothesis. In section 3.1 it was noted that mothers have stronger impact on endowing children with other-regarding preferences, which should not be the case if only the genetic channel were important, but is perfectly plausible if direct socialization indeed takes place.

To explore potential sources of heterogeneity in the transmission process, data on other-regarding preferences of mothers and fathers was interacted with data on gender, birth order and number of children. Appendix B reports estimation results. The specifications in Tables B1-B6 are similar to columns (2), (5) and (8) of Tables A2-A8 with interaction terms as additional explanatory variables.

Panel A through Tables B1-B6 shows no evidence that the transmission process is stronger or weaker for girls than boys. The result is similar to Dohmen et al. (2011) who find no gender difference in intergenerational transmission of risk and trust attitudes. This finding also

echoes the World Values Survey (2008) data from Georgia. In particular, when asked whether university education is more important for a boy than for a girl, 76% of parents disagreed, indicating that parents are equally concerned about education of female and male children.

Panel B and C of tables B1-B6 show an impact of birth order and number of children on the strength of the transmission process respectively. The results show that the birth order and number of children do not have a significant effect on children's other-regarding preferences in case of mothers (coefficient estimates are sometimes negative, sometimes positive and never statistically significant). This means that mothers have equal impact on all children regardless of birth order and the number of children in the family, thus confirming the result shown in section 3.1 that mothers are more efficient in instilling social norms in children. The coefficient estimates of the interaction terms (with birth order and number of children) are always negative and sometimes statistically significant in case of fathers' other-regarding preferences. The latter results suggest that parents, and fathers in particular, are less efficient in instilling social norms in children in large families and to those who were born later, echoing the theory of quantity-quality tradeoff in home production formulated by Becker and Lewis (1973) and later empirically documented by Horton (1986). Using this result, we can now address the earlier concern about selecting sample families with at least two children. If we allowed one child families to participate, we would expect the transmission in these families to be stronger because, as discussed, transmission is stronger in families with fewer children.

4. Conclusion

Other-regarding preferences have proven to be an important aspect of individual behavior. They shape the ways individuals interact with society and sometimes play a significant

role in determining one's economic outcomes. However, there was no study to date exploring the intergenerational transmission of other-regarding preferences and the nature of the transmission process.

This paper uses experimental data on the behavior of parents and their children to document a strong intergenerational correlation in other-regarding preferences. The results also indicate that there is a strong intergenerational correlation between the *parochial* preferences of children and parents. Analyzing the impact of family structure on the strength of transmission, the study found that children in small families, as well as firstborn children, are more strongly influenced by their parents' preferences, though a child's gender does not affect the strength of transmission.

By providing evidence that children's other regarding preferences are strongly shaped by their parents' preferences, this study provides new perspectives on the origins of these preferences. The aim of this study is not to resolve the exact nature of the transmission process, whether it is due to genetic reasons, family environment, socialization, or to a combination. However, this paper does provide some evidence that, along with other mechanisms, the socialization process may play a role.

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Appendix

Table 1

Definition of preference types given participants' actions indifferent games

Type	(3,3) vs (4,1)	(3,3) vs (2,5)	(3,3) vs (5,2)	(3,3) vs (4,5)
Strongly altruistic	(3,3)	(2,5)	(3,3)	(4,5)
Efficient	(3,3)	(2,5)	(5,2)	(4,5)
Strongly egalitarian	(3,3)	(3,3)	(3,3)	(3,3)
Weakly egalitarian	(3,3)	(3,3)	(5,2)	(3,3)
Maximin	(3,3)	(3,3)	(3,3)	(4,5)
Selfish	(4,1)	(3,3)	(5,2)	(4,5)
Spiteful	(4,1)	(3,3)	(5,2)	(3,3)

Table 2

Frequency of other-regarding preference types

Type	Children	Parents
Strongly altruistic	0.040	0.070
Efficient	0.292	0.232
Strongly egalitarian	0.084	0.121
Weakly egalitarian	0.181	0.043
Maximin	0.026	0.034
Selfish	0.045	0.096
Spiteful	0.175	0.139
None	0.157	0.266
Observations	640	640

Figure 1: Behavioral Types Across Age Groups

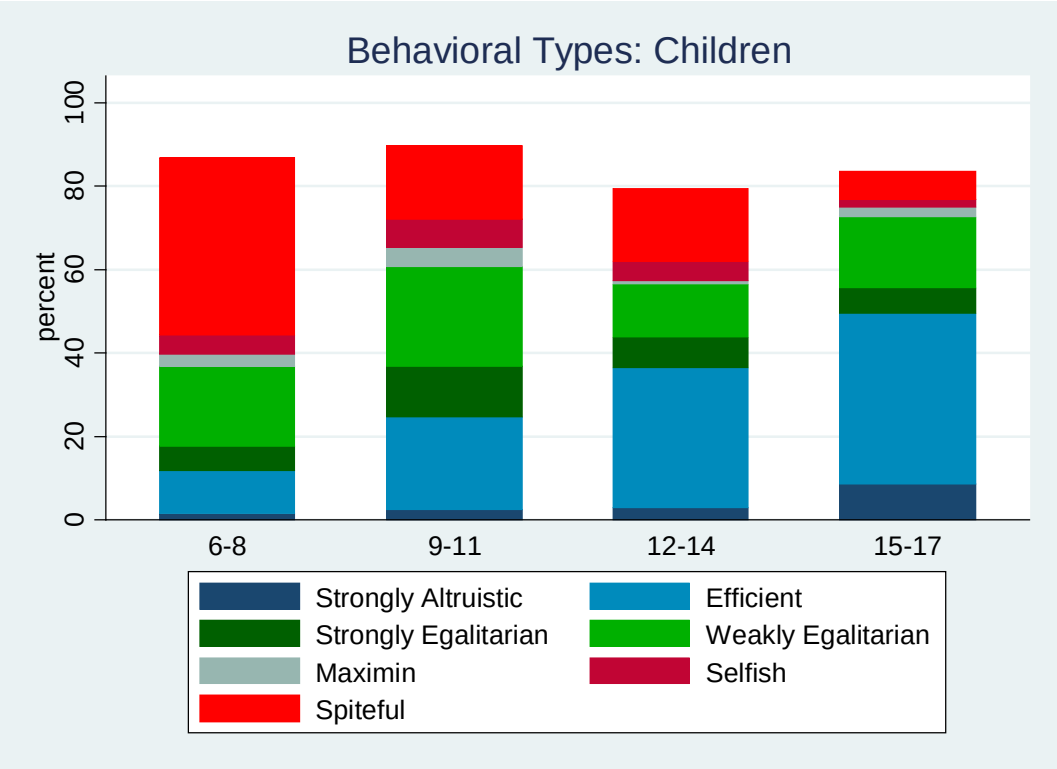
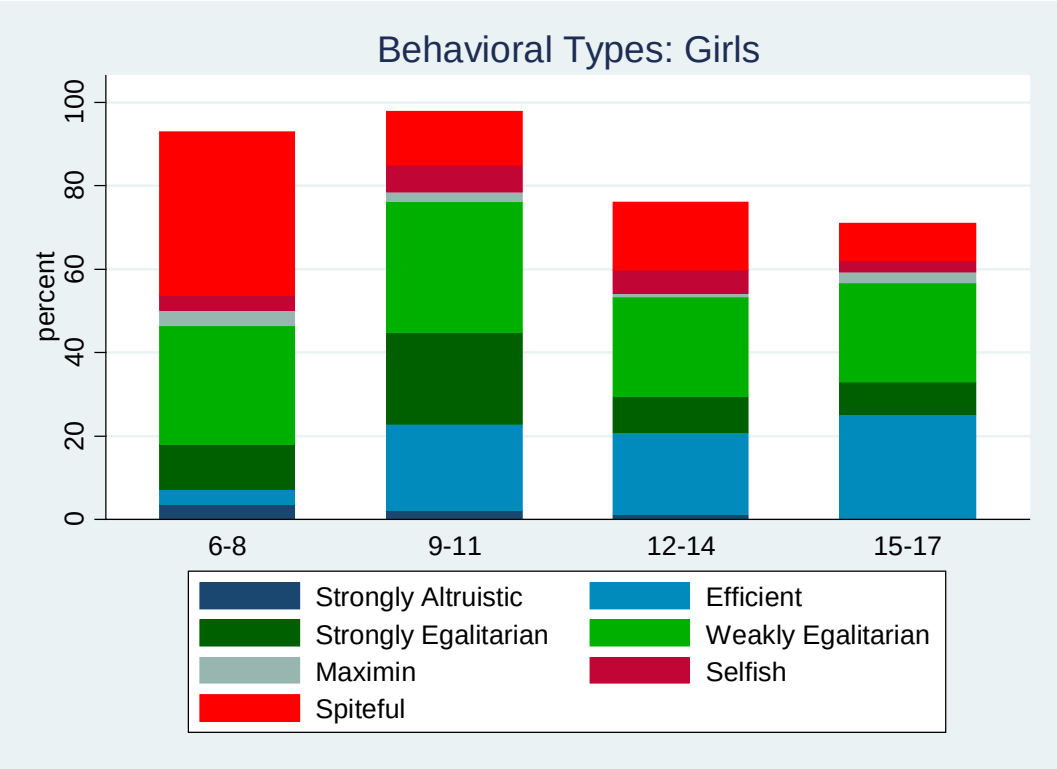


Figure 2: Behavioral Types and Gender



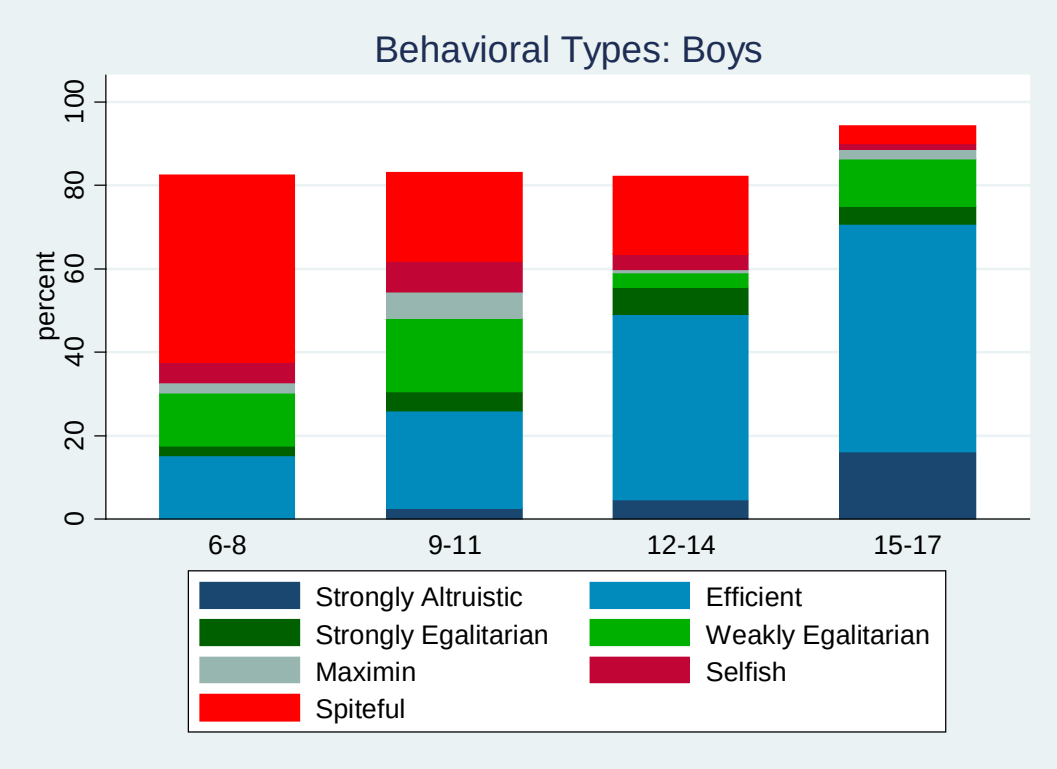
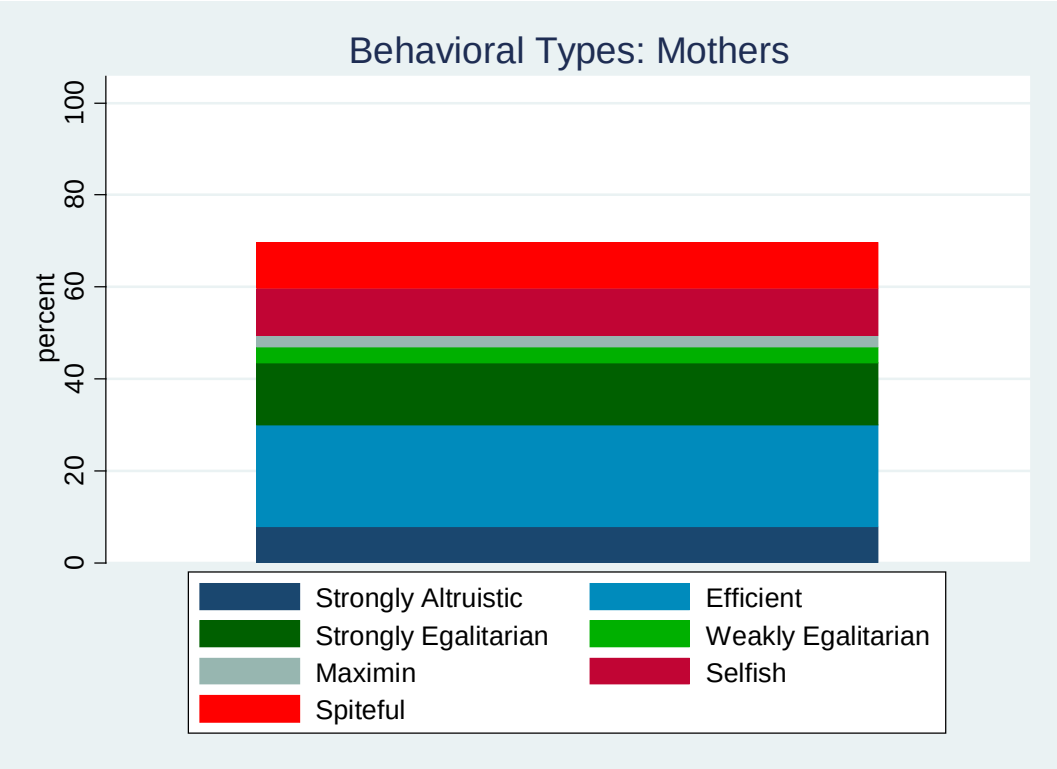
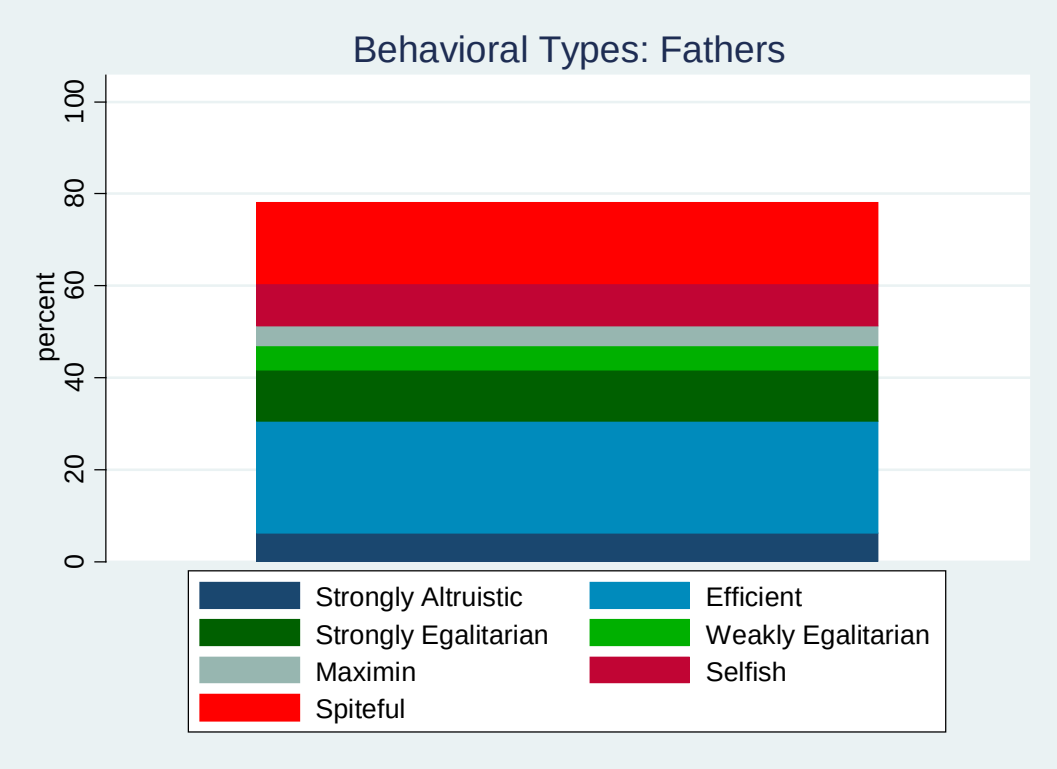


Figure 3: Behavioral Types of Parents




Behavioral Types: Fathers
percent
0
20
40
60
80
100
Strongly Altruistic
Efficient
Strongly Egalitarian
Weakly Egalitarian
Maximin
Selfish
Spiteful

Appendix A

TABLE A1

The relationship between parents' and children's relative earnings and givings

	Relative earning: child			Giving: child		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Relative earning: mother	**0.580*** **	**0.519*** **	**0.367*** **			
	(0.098)	(0.094)	(0.093)			
Relative earning: father	**0.387*** **	**0.441*** **	**0.266*** **			
	(0.085)	(0.081)	(0.081)			
Giving: mother				**0.633*** **	**0.563*** **	**0.422*** **
				(0.093)	(0.088)	(0.092)
Giving: father				**0.337*** **	**0.354*** **	**0.240*** **
				(0.081)	(0.076)	(0.076)
1 if female		-0.040	-0.077		-12.255	-10.761
		(0.110)	(0.103)		(8.498)	(8.117)
Age of child[A]		-0.315***	-0.354***		23.529***	27.518***
		(0.058)	(0.063)		(4.460)	(0.019)
Age of mother		0.028**	0.016		-2.310**	-1.488
		(0.013)	(0.013)		(1.020)	(1.052)
Age of father		-0.023**	0.005		1.900**	1.548*
		(0.012)	-0.004		(0.931)	(0.895)
Constant	0.294**	0.774	3.203***	0.002	6.736	0.001
	(0.414)	(0.514)	(1.152)	(0.064)	(48.917)	(0.064)
Additional Controls	No	No	Yes	No	No	Yes
Observations	160	160	160	160	160	160
R^2	0.424	0.521	0.625	0.477	0.570	0.645

Notes: Coefficients in all columns are OLS regression estimates, standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively. Additional controls include log of household wealth, earnings of mother and father, schooling of mother and father, and years of marriage.

[A] ordinal variable for the four different age groups (age 6-8 = 0, age 9-11 = 1, age 12-14 = 2, age 15-17 = 3

Relative earning is a continuous measure of the total number of points the person earned in four binary choice games, relative to the total number of points s/he gave to others. It is smallest for strongly altruistic types and largest for spiteful types.

Giving is a measure of the total number of points the person gave to others in four binary choice games. It is smallest for spiteful types and largest for strongly altruistic types.

TABLE A2

The relationship between parent's and children's preferences towards related children

	Altruistic type: child			Egalitarian type: child			Spiteful type: child		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Altruistic type: mother	**0.407*** **	**0.395*** **	**0.292*** **	-0.123	-0.129*	-0.174**	-0.118*	-0.090	0.010
	(0.076)	(0.074)	(0.075)	(0.079)	(0.077)	(0.081)	(0.063)	(0.061)	(0.062)
Altruistic type: father	**0.346*** **	**0.336** **	**0.263*** **	-0.032	-0.016	-0.022	-0.140**	-0.139**	-0.077
	(0.084)	(0.080)	(0.081)	(0.087)	(0.084)	(0.087)	(0.070)	(0.067)	(0.066)
Egalitarian type: mother	-0.001	-0.045	0.004	**0.306*** **	**0.253*** **	**0.232*** **	-0.113	-0.136*	-0.101
	(0.094)	(0.091)	(0.087)	(0.097)	(0.096)	(0.094)	(0.077)	(0.076)	(0.071)
Egalitarian type: father	-0.055	0.002	0.035	**0.223** **	**0.189** **	**0.177* **	-0.070	-0.104	-0.085
	(0.090)	(0.087)	(0.090)	(0.093)	(0.091)	(0.097)	(0.074)	(0.072)	(0.073)
Spiteful type: mother	0.210	0.248*	0.207	-0.039	-0.103	-0.060	**0.047**	**0.053**	**0.022**
	(0.146)	(0.141)	(0.139)	(0.151)	(0.148)	(0.150)	(0.121)	(0.117)	(0.113)
Spiteful type: father	0.175*	0.136	0.084	-0.006	0.027	0.072	**-0.046**	**0.005**	**0.044**
	(0.093)	(0.092)	(0.096)	(0.096)	(0.097)	(0.103)	(0.077)	(0.077)	(0.078)
1 if female		-0.163***	-0.146**		0.181***	0.175***		-0.005	-0.012
		(0.059)	(0.057)		(0.062)	(0.062)		(0.049)	(0.047)
Age of child[A]		0.100***	0.141***		-0.064*	-0.038		-0.110***	-0.130***
		(0.033)	(0.036)		(0.033)	(0.038)		(0.027)	(0.029)
Age of mother		-0.010	-0.004		0.007	0.007		0.001	-0.002
		(0.007)	(0.007)		(0.007)	(0.008)		(0.006)	(0.006)
Age of father		0.009	0.007		-0.014**	-0.013*		0.001	0.003
		(0.006)	(0.006)		(0.006)	(0.007)		(0.005)	(0.005)
Constant	0.047	-0.069	-1.042*	0.243***	0.433*	-0.019**	0.267***	0.299	0.869*
	(0.075)	(0.224)	(0.574)	(0.078)	(0.232)	(0.619)	(0.062)	(0.186)	(0.470)
Additional Controls	No	No	Yes	No	No	Yes	No	No	Yes
Observations	160	160	160	160	160	160	160	160	160
R^2	0.372	0.436	0.501	0.205	0.268	0.312	0.073	0.159	0.278

TABLE A3

The relationship between parent's and children's preferences towards related parents

	Altruistic type: child			Egalitarian type: child			Spiteful type: child		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Altruistic type: mother	**0.467*** **	**0.424*** **	**0.307*** **	-0. 133*	-0.105	-0.143	-0.132**	-0.240***	-0.068
	(0.066)	(0.068)	(0.072)	(0.069)	(0.071)	(0.079)	(0.054)	(0.069)	(0.059)
Altruistic type: father	**0.336*** **	**0.337*** **	**0.221*** **	-0.004	-0.020	-0.017	-0.097*	-0.220***	-0.060
	(0.068)	(0.066)	(0.069)	(0.070)	(0.069)	(0.076)	(0.053)	(0.066)	(0.057)
Egalitarian type: mother	-0.071	-0.043	-0.072	**0.403*** **	**0.355*** **	**0.329*** **	-0.100	-0.254***	-0.082**
	(0.093)	(0.091)	(0.087)	(0.097)	(0.096)	(0.095)	(0.073)	(0.083)	(0.071)
Egalitarian type: father	-0.055	0.043	-0.048	**0.286*** **	**0.244*** **	**0.216** **	-0.074	-0.142*	-0.073
	(0.088)	(0.085)	(0.082)	(0.092)	(0.090)	(0.090)	(0.068)	(0.083)	(0.067)
Spiteful type: mother	-0.042	-0.076	-0.089	0.052	-0.015	-0.029	**-0.020**	**0.067***	**0.068**
	(0.110)	(0.111)	(0.107)	(0.115)	(0.117)	(0.085)	(0.092)	(0.089)	(0.072)
Spiteful type: father	-0.052	-0.095	-0.104	0.028	0.044	0.049	**0.069**	**0.100**	**0.110**
	(0.112)	(0.114)	(0.107)	(0.123)	(0.119)	(0.117)	(0.098)	(0.091)	(0.088)
1 if female		-0.079	-0.084		0.193***	0.192***		-0.079*	-0.072
		(0.056)	(0.054)		(0.059)	(0.058)		(0.045)	(0.050)
Age of child[A]		0.103***	0.131***		-0.002	-0.006		-0.122***	-0.152***
		(0.029)	(0.033)		(0.031)	(0.036)		(0.023)	(0.027)
Age of mother		-0.008	-0.004		0.003	0.006		0.011**	0.004
		(0.006)	(0.007)		(0.007)	(0.007)		(0.005)	(0.005)
Age of father		0.006	0.002		-0.007	-0.006		-0.002	-0.001
		(0.005)	(0.006)		(0.006)	(0.006)		(0.004)	(0.005)
Constant	0.171***	0.088	-0.973*	0.185***	0.322	0.741	0.237***	0.130	0.368
	(0.054)	(0.199)	(0.512)	(0.056)	(0.209)	(0.559)	(0.045)	(0.159)	(0.419)
Additional Controls	No	No	Yes	No	No	Yes	No	No	Yes
Observations	160	160	160	160	160	160	160	160	160
R^2	0.511	0.554	0.611	0.290	0.340	0.374	0.115	0.258	0.317

TABLE A4

The relationship between parent's and children's preferences towards non-related children

	Altruistic type: child			Egalitarian type: child			Spiteful type: child		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Altruistic type: mother	**0.467*** **	**0.449*** **	**0.448*** **	-0.258**	-0.224**	-0.292***	-0.195**	-0.229**	-0.139
	(0.086)	(0.082)	(0.086)	(0.108)	(0.105)	(0.106)	(0.091)	(0.088)	(0.087)
Altruistic type: father	**0.316*** **	**0.274*** **	**0.229* **	-0.033	0.015	-0.049	-0.114	-0.081	-0.030
	(0.083)	(0.081)	(0.081)	(0.104)	(0.104)	(0.101)	(0.087)	(0.087)	(0.082)
Egalitarian type: mother	-0.022	-0.031	-0.008	**0.258*** **	**0.241** **	**0.173* **	-0.075	-0.023	0.025
	(0.077)	(0.074)	(0.078)	(0.097)	(0.096)	(0.096)	(0.081)	(0.080)	(0.079)
Egalitarian type: father	0.091	0.075	0.010	**0.172* **	**0.221** **	**0.165* **	-0.182**	-0.212***	-0.159**
	(0.075)	(0.072)	(0.078)	(0.094)	(0.092)	(0.096)	(0.079)	(0.077)	(0.079)
Spiteful type: mother	-0.024	-0.003	-0.019	-0.088	-0.098	-0.076***	**0.324*** **	**0.304*** **	**0.269*** **
	(0.099)	(0.095)	(0.100)	(0.125)	(0.122)	(0.124)	(0.105)	(0.102)	(0.065)
Spiteful type: father	0.048	0.028	0.094	-0.187*	-0.193**	-0.053	**0.240*** **	**0.284*** **	**0.166** **
	(0.079)	(0.074)	(0.077)	(0.097)	(0.095)	(0.095)	(0.082)	(0.080)	(0.078)
1 if female		-0.156***	-0.165***		0.226***	0.220***		-0.118**	-0.123**
		(0.051)	(0.052)		(0.066)	(0.064)		(0.055)	(0.052)
Age of child[A]		0.087***	0.070**		-0.029	-0.053		-0.092***	-0.105***
		(0.027)	(0.032)		(0.035)	(0.040)		(0.029)	(0.032)
Age of mother		-0.002	-0.001		-0.005	-0.006		0.007	0.001
		(0.006)	(0.006)		(0.008)	(0.008)		(0.006)	(0.007)
Age of father		0.005	0.002		0.006	0.005		-0.005	-0.003
		(0.005)	(0.006)		(0.007)	(0.007)		(0.006)	(0.006)
Constant	0.067	-0.160	0.295*	0.337***	0.187	-0.255	0.252	0.414	0.342
	(0.044)	(0.180)	(0.499)	(0.055)	(0.232)	(0.616)	(0.046)	(0.194)	(0.504)
Additional Controls	No	No	Yes	No	No	Yes	No	No	Yes
Observations	160	160	160	160	160	160	160	160	160
R^2	0.354	0.433	0.458	0.225	0.284	0.370	0.285	0.345	0.448

TABLE A5

The relationship between parent's and children's preferences towards non-related parents

	Altruistic type: child			Egalitarian type: child			Spiteful type: child		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Altruistic type: mother	**0.331*** **	**0.351*** **	**0.312*** **	-0.122	-0.135	-0.299***	-0.149*	-0.167*	-0.017
	(0.089)	(0.084)	(0.092)	(0.089)	(0.089)	(0.094)	(0.086)	(0.086)	(0.083)
Altruistic type: father	**0.058**	**0.080**	**0.061**	0.015	0.023	0.007	0.012	0.002	0.043
	(0.090)	(0.090)	(0.090)	(0.090)	(0.096)	(0.092)	(0.088)	(0.093)	(0.081)
Egalitarian type: mother	-0.062	-0.049	-0.087	**0.299*** **	**0.276*** **	**0.191** **	-0.045	-0.027	0.078
	(0.084)	(0.078)	(0.079)	(0.084)	(0.083)	(0.081)	(0.081)	(0.080)	(0.071)
Egalitarian type: father	-0.140	-0.100	-0.124	**0.286*** **	**0.279*** **	**0.195* **	-0.164*	-0.178*	-0.094
	(0.095)	(0.094)	(0.099)	(0.095)	(0.100)	(0.101)	(0.092)	(0.096)	(0.089)
Spiteful type: mother	-0.011	0.025	-0.035	-0.097	-0.131	-0.154	**0.265*** **	**0.260** **	**0.262*** **
	(0.094)	(0.090)	(0.094)	(0.094)	(0.095)	(0.096)	(0.092)	(0.094)	(0.084)
Spiteful type: father	-0.132	-0.135	-0.101	0.024	0.039	-0.047	**0.188** **	**0.196** **	**0.131* **
	(0.089)	(0.087)	(0.086)	(0.089)	(0.092)	(0.088)	(0.086)	(0.089)	(0.077)
1 if female		-0.127***	-0.089		0.097	0.105*		-0.062	-
0.129**									
		(0.061)	(0.061)		(0.065)	(0.063)		(0.062)	(0.055)
Age of child[A]		0.130***	0.120***		-0.047	-0.038		-0.061*	-0.050
		(0.032)	(0.037)		(0.034)	(0.038)		(0.033)	(0.033)
Age of mother		-0.019**	-0.019**		-0.001	0.002		0.018**	0.017**
		(0.007)	(0.008)		(0.008)	(0.008)		(0.007)	(0.007)
Age of father		0.017**	0.018**		-0.003	-0.009		-0.013*	-0.011*
		(0.007)	(0.007)		(0.007)	(0.007)		(0.007)	(0.006)
Constant	0.262***	0.037	0.065	0.199	0.476*	-0.137	0.234	0.223	0.444
	(0.080)	(0.225)	(0.621)	(0.080)	(0.239)	(0.637)	(0.077)	(0.230)	(0.560)
Additional Controls	No	No	Yes	No	No	Yes	No	No	Yes
Observations	160	160	160	160	160	160	160	160	160
R^2	0.194	0.314	0.352	0.264	0.289	0.378	0.206	0.246	0.449

TABLE A6

The relationship between parents' and children's parochialism given by relative earnings and givings

	Relative earning: child's parochialism			Giving: child's parochialism		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Relative earning: mother's parochialism	0.186***	0.195***	0.191***			
	(0.062)	(0.063)	(0.063)			
Relative earning: father's parochialism	0.186***	0.204***	0.159**			
	(0.068)	(0.068)	(0.076)			
Giving: mother's parochialism				0.318***	0.319***	0.341***
				(0.064)	(0.064)	(0.063)
Giving: father's parochialism				0.337***	0.214***	0.210***
				(0.081)	(0.074)	(0.083)
1 if female		-0.068	-0.083	-0.077	5.536	7.211
		(0.064)	(0.065)	(0.103)	(5.032)	(5.085)
Age of child[A]		0.076**	0.117***		-5.471***	-7.869**
		(0.034)	(0.040)		(2.695)	(3.170)
Age of mother		0.000	0.004		-0.164**	-0.433
		(0.007)	(0.008)		(0.627)	(0.671)
Age of father		-0.006	-0.008		0.588	0.947
		(0.007)	(0.007)		(0.572)	(0.588)
Constant	0.114***	0.251	-0.466	-9.631	21.370	50.367
	(0.036)	(0.218)	(0.610)	(2.890)	(17.227)	(47.562)
Additional Controls	No	No	Yes	No	No	Yes
Observations	160	160	160	160	160	160
R^2	0.103	0.143	0.207	0.191	0.227	0.295

Notes: Coefficients in all columns are OLS regression estimates, standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively. Additional controls include log of household wealth, earnings of mother and father, schooling of mother and father and years of marriage.

[A] ordinal variable for the four different age groups (age 6-8 = 0, age 9-11 = 1, age 12-14 = 2, age 15-17 = 3

Relative earning is defined as a difference between points of the total number of points the person earned in four binary choice games, relative to the total number of points s/he gave to others. It is smallest for strongly altruistic types and largest for spiteful types.

Giving is a measure of the total number of points the person gave to others in four binary choice games. It is smallest for spiteful types and largest for strongly altruistic types.

Parochialism in terms of relative earning is defined as the difference in a subject's relative earnings between family and non-family members.

Parochialism in terms of giving is defined as the difference in a subject's giving between family and non-family members.

TABLE A7

The relationship between parent's and children's parochial preferences towards children

	In-group favoritism: child[B]			Out-group hostility: child[C]		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
In-group favoritism: mother[B]	0.323***	0.321***	0.330***			
	(0.063)	(0.064)	(0.064)			
In-group favoritism: father[B]	0.249***	0.227***	0.182**			
	(0.075)	(0.077)	(0.085)			
Out-group hostility: mother[C]				0.303***	0.305***	0.255***
				(0.096)	(0.097)	(0.101)
Out-group hostility: father[C]				0.257***	0.260***	0.181**
				(0.080)	(0.080)	(0.086)
1 if female		-0.033	-0.009		-0.043	-0.064
		(0.056)	(0.056)		(0.048)	(0.048)
Age of child[A]		0.050	0.050		-0.001	0.008
		(0.030)	(0.036)		(0.026)	(0.030)
Age of mother		-0.008	-0.010		0.000	0.000
		(0.007)	(0.007)		(0.006)	(0.006)
Age of father		0.007	0.006		-0.000	0.000
		(0.006)	(0.006)		(0.005)	(0.005)
Constant	0.059*	-0.009	-0.893*	0.073***	0.076	0.126
	(0.035)	(0.196)	(0.528)	(0.025)	(0.166)	(0.463)
Additional Controls	No	No	Yes	No	No	Yes
Observations	160	160	160	160	160	160
R^2	0.256	0.276	0.334	0.164	0.169	0.223

Notes: Coefficients in all columns are seemingly unrelated regression estimates, standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively. Additional controls include log of household wealth, earnings of mother and father, schooling of mother and father and years of marriage.

[A] ordinal variable for the four different age groups (age 6-8 = 0, age 9-11 = 1, age 12-14 = 2, age 15-17 = 3)

[B] dummy variable which equals 1 if subject's behavior can be characterized as altruistic only towards related children.

[C] dummy variable which equals 1 if subject's behavior can be characterized as spiteful only towards non-related children.

TABLE A8

The relationship between parent's and children's parochial preferences towards parents

	In-group favoritism: child[B]			Out-group hostility: child[C]		
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
In-group favoritism: mother[B]	0.348***	0.325***	0.271***			
	(0.076)	(0.079)	(0.081)			
In-group favoritism: father[B]	0.231***	0.248***	0.183**			
	(0.068)	(0.071)	(0.076)			
Out-group hostility: mother[C]				0.305***	0.319***	0.241***
				(0.072)	(0.072)	(0.072)
Out-group hostility: father[C]				0.281***	0.281***	0.214***
				(0.063)	(0.063)	(0.061)
1 if female		-0.048	-0.039		-0.013	-0.047
		(0.060)	(0.060)		(0.053)	(0.051)
Age of child[A]		0.001	0.003		0.035	0.064**
		(0.032)	(0.037)		(0.028)	(0.032)
Age of mother		0.006	0.004		0.009	0.013**
		(0.007)	(0.008)		(0.006)	(0.006)
Age of father		-0.001	-0.001		-0.009	-0.008
		(0.006)	(0.006)		(0.006)	(0.005)
Constant	0.097***	-0.049	-1.295**	0.055*	0.159	0.274
	(0.036)	(0.213)	(0.579)	(0.032)	(0.169)	(0.503)
Additional Controls	No	No	Yes	No	No	Yes
Observations	160	160	160	160	160	160
R^2	0.209	0.216	0.259	0.188	0.213	0.219

Notes: Coefficients in all columns are seemingly unrelated regression estimates, standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively. Additional controls include log of household wealth, earnings of mother and father, schooling of mother and father and years of marriage.

[A] ordinal variable for the four different age groups (age 6-8 = 0, age 9-11 = 1, age 12-14 = 2, age 15-17 = 3)

[B] dummy variable which equals 1 if subject's behavior can be characterized as altruistic only towards related parents.

[C] dummy variable which equals 1 if subject's behavior can be characterized as spiteful only towards non-related parents.

Appendix B: Heterogeneity Analysis

TABLE B1

The relationship between parents' and children's preferences towards related children

Panel a: Gender

Dependent variable	Altruistic type: child	Egalitarian type: child	Spiteful type: child
	(1)	(2)	(3)
Altruistic type: mother*female	-0.015		
	(0.119)		
Altruistic type: father *female	-0.073		
	(0.126)		
Egalitarian type: mother *female		-0.233	
		(0.150)	
Egalitarian type: father *female		0.055	
		(0.135)	
Spiteful type: mother *female			0.124
			(0.196)
Spiteful type: father *female			0.038
			(0.110)
Observations	160	160	160
R^2	0.434	0.267	0.160

Panel b: Birth order

Dependent variable	Altruistic type: child	Egalitarian type: child	Selfish type: child
	(1)	(2)	(3)
Altruistic type: mother*birth order	0.013		
	(0.101)		
Altruistic type: father * birth order	-0.084		
	(0.117)		
Egalitarian type: mother * birth order		0.045	
		(0.136)	
Egalitarian type: father * birth order		-0.209*	
		(0.123)	
Selfish type: mother *birth order			0.005
			(0.192)
Selfish type: father *birth order			0.132
			(0.102)
Observations	160	160	160
R^2	0.441	0.297	0.328

Panel c: Number of Children

Dependent variable	Altruistic type: child	Egalitarian type: child	Spiteful type: child
	(1)	(2)	(3)
Altruistic type: mother*# of children	0.006		
	(0.105)		
Altruistic type: father *# of children	-0.223*		
	(0.124)		
Egalitarian type: mother *# of children		0.013	
		(0.155)	
Egalitarian type: father *# of children		-0.143	
		(0.132)	
Spiteful type: mother *# of children			-0.001
			(0.234)
Spiteful type: father *# of children			0.080
			(0.105)
Observations	160	160	160
R^2	0.458	0.283	0.156

Notes: Coefficients in all columns are seemingly unrelated regression estimates, standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively. The set of explanatory variables in Panels a, b, and c is identical to that in Column (2) of Table A1. birth order=0 for firstborn children and birth order=1 for children born later. # of children=0 if there are only two children in the family and # of children=1 otherwise.

TABLE B2

The relationship between parents' and children's preferences towards related parents

Panel a: Gender

Dependent variable	Altruistic type: child	Egalitarian type: child	Spiteful type: child
	(1)	(2)	(3)
Altruistic type: mother*female	0.002		
	(0.111)		
Altruistic type: father *female	0.092		
	(0.107)		
Egalitarian type: mother *female		0.109	
		(0.154)	
Egalitarian type: father *female		0.211	
		(0.148)	
Spiteful type: mother *female			-0.240
			(0.169)
Spiteful type: father *female			-0.151
			(0.151)
Observations	160	160	160
R^2	0.558	0.355	0.255

Panel b: Birth order

Dependent variable	Altruistic type: child	Egalitarian type: child	Spiteful type: child
	(1)	(2)	(3)
Altruistic type: mother*birth order	-0.011		
	(0.104)		
Altruistic type: father * birth order	-0.102		
	(0.095)		
Egalitarian type: mother * birth order		-0.174	
		(0.140)	
Egalitarian type: father * birth order		-0.277**	
		(0.131)	
Spiteful type: mother *birth order			0.222
			(0.142)
Spiteful type: father *birth order			0.192
			(0.144)
Observations	160	160	160
R^2	0.564	0.386	0.292

Panel c: Number of Children

Dependent variable	Altruistic type: child	Egalitarian type: child	Spiteful type: child
	(1)	(2)	(3)
Altruistic type: mother*# of children	0.199		
	(0.135)		
Altruistic type: father *# of children	-0.205**		
	(0.094)		
Egalitarian type: mother *# of children		0.088	
		(0.144)	
Egalitarian type: father *# of children		-0.141	
		(0.140)	
Spiteful type: mother *# of children			0.111
			(0.155)
Spiteful type: father *# of children			0.190
			(0.145)
Observations	160	160	160
R^2	0.568	0.348	0.330

Notes: Coefficients in all columns are seemingly unrelated regression estimates, standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively. The set of explanatory variables in Panels a, b, and c is identical to that in Column (2) of Table A1. birth order=0 for firstborn children and birth order=1 for children who were born later. # of children=0 if there are only two children in the family and # of children=1 otherwise.

TABLE B3

The relationship between parents' and children's preferences towards non-related children

Panel a: Gender

Dependent variable	Altruistic type: child	Egalitarian type: child	Spiteful type: child
	(1)	(2)	(3)
Altruistic type: mother*female	-0.146		
	(0.175)		
Altruistic type: father *female	-0.045		
	(0.154)		
Egalitarian type: mother *female		-0.103	
		(0.61)	
Egalitarian type: father *female		0.179	
		(0.156)	
Spiteful type: mother *female			0.039
			(0.178)
Spiteful type: father *female			-0.048
			(0.143)
Observations	160	160	160
R^2	0.439	0.283	0.345

Panel b: Birth order

Dependent variable	Altruistic type: child	Egalitarian type: child	Spiteful type: child
	(1)	(2)	(3)
Altruistic type: mother*birth order	-0.066		
	(0.146)		
Altruistic type: father * birth order	-0.263**		
	(0.132)		
Egalitarian type: mother * birth order		-0.075	
		(0.137)	
Egalitarian type: father * birth order		-0.215**	
		(0.145)	
Spiteful type: mother *birth order			-0.229
			(0.178)
Spiteful type: father *birth order			-0.016
			(0.125)
Observations	160	160	160
R^2	0.465	0.308	0.394

Panel c: Number of Children

Dependent variable	Altruistic type: child	Egalitarian type: child	Spiteful type: child
	(1)	(2)	(3)
Altruistic type: mother*# of children	-0.135		
	(0.185)		
Altruistic type: father *# of children	-0.038		
	(0.180)		
Egalitarian type: mother *# of children		-0.166	
		(0.157)	
Egalitarian type: father *# of children		-0.448**	
		(0.153)	
Spiteful type: mother *# of children			0.017
			(0.207)
Spiteful type: father *# of children			-0.154
			(0.180)
Observations	160	160	160
R^2	0.436	0.326	0.347

Notes: Coefficients in all columns are seemingly unrelated regression estimates, standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively. The set of explanatory variables in Panels a, b, and c is identical to that in Column (2) of Table A1. birth order=0 for firstborn children and birth order=1 for children who were born later. # of children=0 if there are only two children in the family and # of children=1 otherwise.

TABLE B4

The relationship between parents' and children's preferences towards non-related parents

Panel a: Gender

Dependent variable	Altruistic type: child	Egalitarian type: child	Spiteful type: child
	(1)	(2)	(3)
Altruistic type: mother*female	-0.035		
	(0.122)		
Altruistic type: father *female	0.086		
	(0.118)		
Egalitarian type: mother *female		0.105	
		(0.118)	
Egalitarian type: father *female		0.144	
		(0.129)	
Spiteful type: mother *female			-0.026
			(0.126)
Spiteful type: father *female			-0.103
			(0.116)
Observations	160	160	160
R^2	0.312	0.302	0.255

Panel b: Birth order

Dependent variable	Altruistic type: child	Egalitarian type: child	Spiteful type: child
	(1)	(2)	(3)
Altruistic type: mother*birth order	-0.033		
	(0.108)		
Altruistic type: father * birth order	-0.381***		
	(0.105)		
Egalitarian type: mother * birth order		0.070	
		(0.110)	
Egalitarian type: father * birth order		-0.262**	
		(0.117)	
Spiteful type: mother *birth order			0.130
			(0.117)
Spiteful type: father *birth order			-0.049
			(0.102)
Observations	160	160	160
R^2	0.373	0.312	0.246

Panel c: Number of Children

Dependent variable	Altruistic type: child	Egalitarian type: child	Spiteful type: child
	(1)	(2)	(3)
Altruistic type: mother*# of children	-0.085		
	(0.115)		
Altruistic type: father *# of children	-0.059		
	(0.114)		
Egalitarian type: mother *# of children		0.106	
		(0.116)	
Egalitarian type: father *# of children		-0.289**	
		(0.127)	
Spiteful type: mother *# of children			0.124
			(0.121)
Spiteful type: father *# of children			-0.041
			(0.106)
Observations	160	160	160
R^2	0.332	0.297	0.252

Notes: Coefficients in all columns are seemingly unrelated regression estimates, standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively. The set of explanatory variables in Panels a, b, and c is identical to that in Column (2) of Table A1. birth order=0 for firstborn children and birth order=1 for children who were born later. # of children=0 if there are only two children in the family and # of children=1 otherwise.

TABLE B5

The relationship between parents' and children's parochial preferences towards children

Panel a: Gender

Dependent Variable	In-group favoritism: child[B]	Out-group hostility: child[C]
	(1)	(2)
In-group favoritism: mother*female[B]	0.096	
	(0.130)	
In-group favoritism: father *female[B]	-0.024	
	(0.159)	
Out-group hostility: mother *female[C]		0.059
		(0.193)
Out-group hostility: father*female[C]		-0.024
		(0.166)
Observations	160	160
R^2	0.280	0.170

Panel b: Birth order

	In-group favoritism: child[B]	Out-group hostility: child[C]
Dependent Variable	(1)	(2)
In-group favoritism: mother*birth order[B]	0.150	
	(0.113)	
In-group favoritism: father *birth order[B]	-0.204	
	(0.145)	
Out-group hostility: mother *birth order[C]		-0.211
		(0.188)
Out-group hostility: father*birth order[C]		-0.468***
		(0.150)
Observations	160	160
R^2	0.283	0.248

Panel c: # of children

	In-group favoritism: child[B]	Out-group hostility: child[C]
Dependent Variable	(1)	(2)
In-group favoritism: mother*# of children [B]	-0.027	
	(0.112)	
In-group favoritism: father *# of children [B]	-0.329**	
	(0.145)	
Out-group hostility: mother *# of children [C]		0.296
		(0.218)
Out-group hostility: father*# of children [C]		0.078
		(0.189)
Observations	160	161
R^2	0.312	0.182

Notes: Coefficients in all columns are seemingly unrelated regression estimates, standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively. The set of explanatory variables in Panels a, b, and c is identical to that in Column (2) of Table A5. birth order=0 for firstborn children and birth order=1 for children who were born later. # of children=0 if there are only two children in the family and # of children=1 otherwise.

[B] dummy variable which equals 1 if subject's behavior can be characterized as altruistic only towards related children.

[C] dummy variable which equals 1 if subject's behavior can be characterized as spiteful only towards non-related children.

TABLE B6

The relationship between parents' and children's parochial preferences towards parents

Panel a: Gender

	In-group favoritism: child[B]	Out-group hostility: child[C]
Dependent Variable	(1)	(2)
In-group favoritism: mother*female[B]	0.099	
	(0.163)	
In-group favoritism: father *female[B]	0.149	
	(0.140)	
Out-group hostility: mother *female[C]		-0.147
		(0.114)
Out-group hostility: father*female[C]		-0.141
		(0.126)
Observations	160	160
R^2	0.225	0.227

Panel b: Birth order

	In-group favoritism: child[B]	Out-group hostility: child[C]
Dependent Variable	(1)	(2)
In-group favoritism: mother*birth order[B]	-0.051	
	(0.145)	
In-group favoritism: father *birth order[B]	-0.303**	
	(0.123)	
Out-group hostility: mother *birth order[C]		0.013
		(0.086)
Out-group hostility: father*birth order[C]		0.030
		(0.115)
Observations	160	160
R^2	0.255	0.214

Panel c: # of children

Dependent Variable	In-group favoritism: child[B] (1)	Out-group hostility: child[C] (2)
In-group favoritism: mother*# of children [B]	-0.041	
	(0.221)	
In-group favoritism: father *# of children [B]	-0.244*	
	(0.125)	
Out-group hostility: mother *# of children [C]		0.167
		(0.134)
Out-group hostility: father*# of children [C]		-0.063
		(0.116)
Observations	160	160
R^2	0.239	0.222

Notes: Coefficients in all columns are seemingly unrelated regression estimates, standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively. The set of explanatory variables in Panels a, b, and c is identical to that in Column (2) of Table A5. birth order=0 for firstborn children and birth order=1 for children who were born later. # of children=0 if there are only two children in the family and # of children=1 otherwise.

[B] dummy variable which equals 1 if subject's behavior can be characterized as altruistic only towards related children.

[C] dummy variable which equals 1 if subject's behavior can be characterized as spiteful only towards non-related children.

Supplementary material

Instructions

Welcome to our experiment. Depending on your decisions in this experiment you will be rewarded with a certain kind of gift certificate you can use to ‚purchase‘ a special good for yourself.

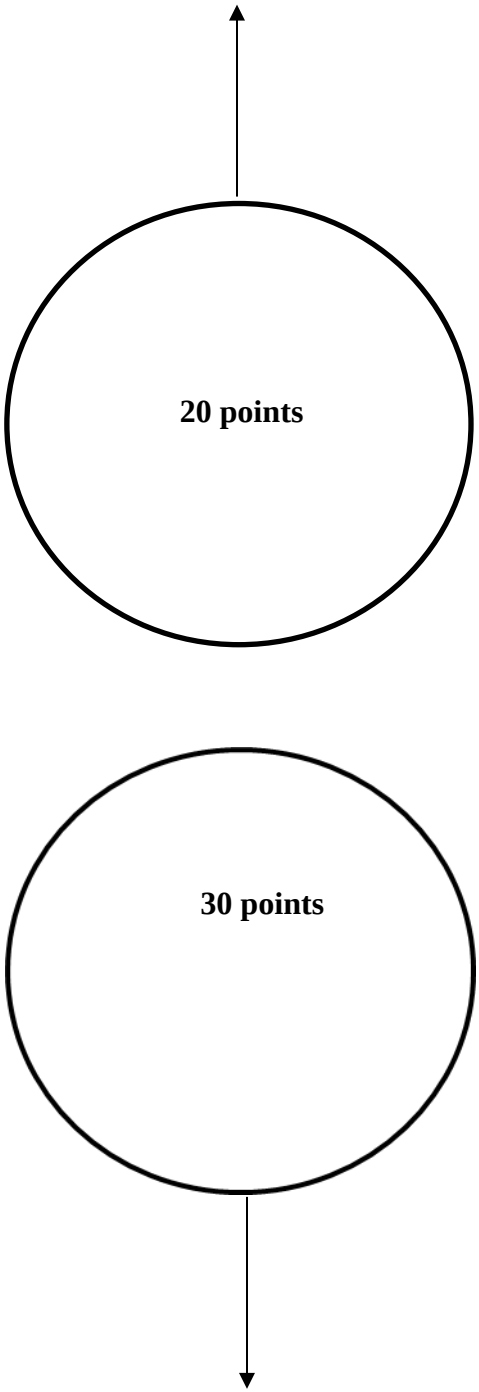
Before we start, we will explain the rules of the experiment. It is important that you listen carefully now, to make sure that you understand the rules of our game. In case you have questions, please rise your hand and an experimenter will assist you. We kindly ask you not to communicate with other participants.

You will play a game in which you have to decide how to divide money between yourself and the person you are paired with. You will be paired with four different participants about whom you will be informed during the experiment. Two of them will be your child (parent) and your spouse (sibling). The two others are anonymous people from other families. What you will know about them is that one is a child and another one is an adult. You will not be told who these persons are either during or after the experiment. Neither will the persons you are paired with will be told with whom he or she was paired. With each participant you will play four games. After you make all four choices you will switch to another one. How much money you and the participant you are paired with receive depends on your decisions. Another four participants (=they may or may not be the same people you are making decisions about) will also make the same decisions regarding you and three others in the group. In this case you will receive the money which the other participant decided to give to you. How much you receive depends on the other participant’s choice.

Let us discuss an example:

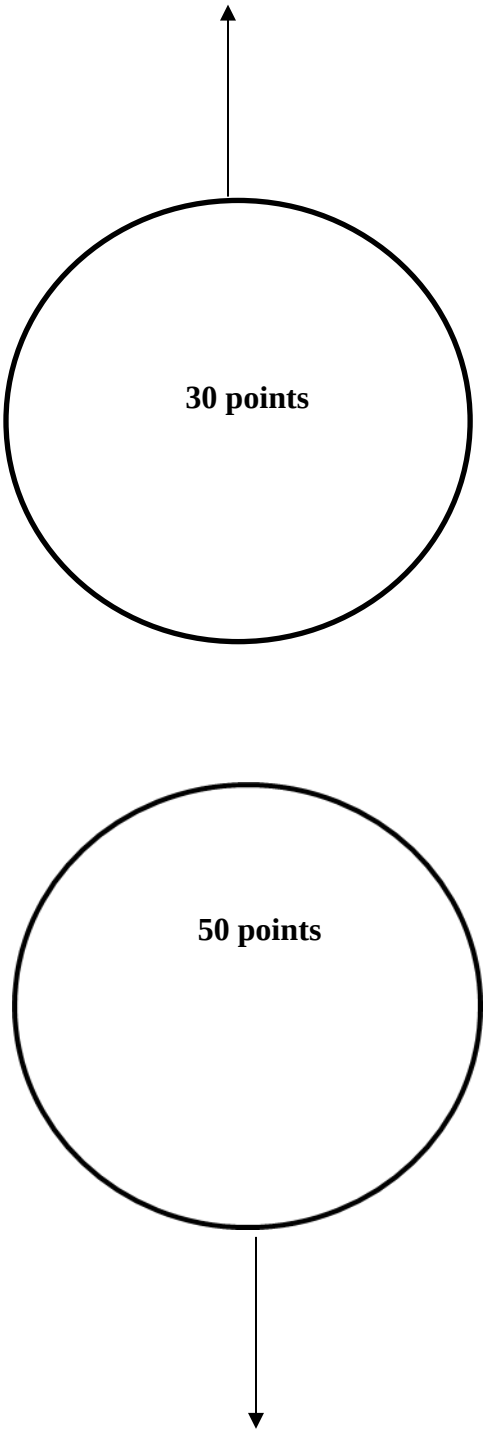
Option A

Other Person



Option B

Other Person



me me

As you can see there are two possible ways to allocate the money: option A and option B. With option A you get thirty points and the participant you are paired with gets twenty points. With option B you get fifty points and the person you are paired with gets thirty points.

As we mentioned earlier, for each person you are paired with you make four decisions. The four decision sheets differ from each other in the amounts of money that can be divided. We also told you that four other participants will make the same decisions regarding you. At the end of the experiment you will get a gift certificate for a special good for yourself with the monetary value depending on the total points you collected. The exchange rate will be set so that each gift certificate will have a monetary value of 25 GEL on average.

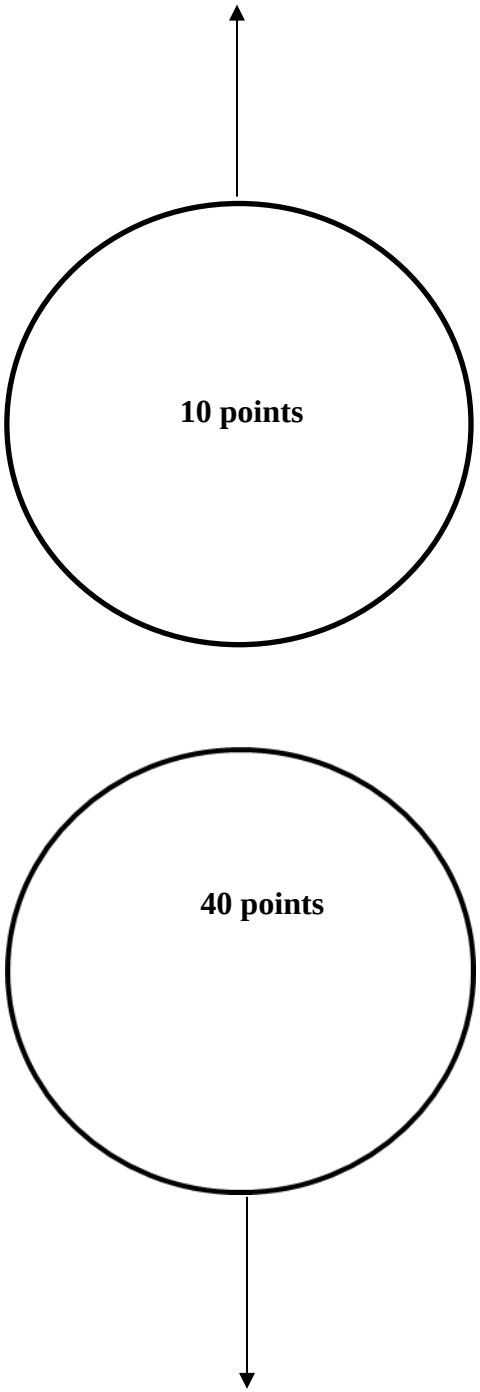
Each person you are paired with will get the sum of points from four decisions you made regarding to this person. Note that the other four people including your child (parent, spouse) will also receive points from other four participants of the experiments. They will get all the points in one lump sum, without being told how much you or any other particular person has sent them. The points earned during the experiment will be exchanged for a gift certificate for special goods, for your child (parent, spouse) as well as for other participants, which has the same monetary value of 25 GEL on average.

Thank you for your attention,

Before proceeding to the experiment we ask you to answer a control question:

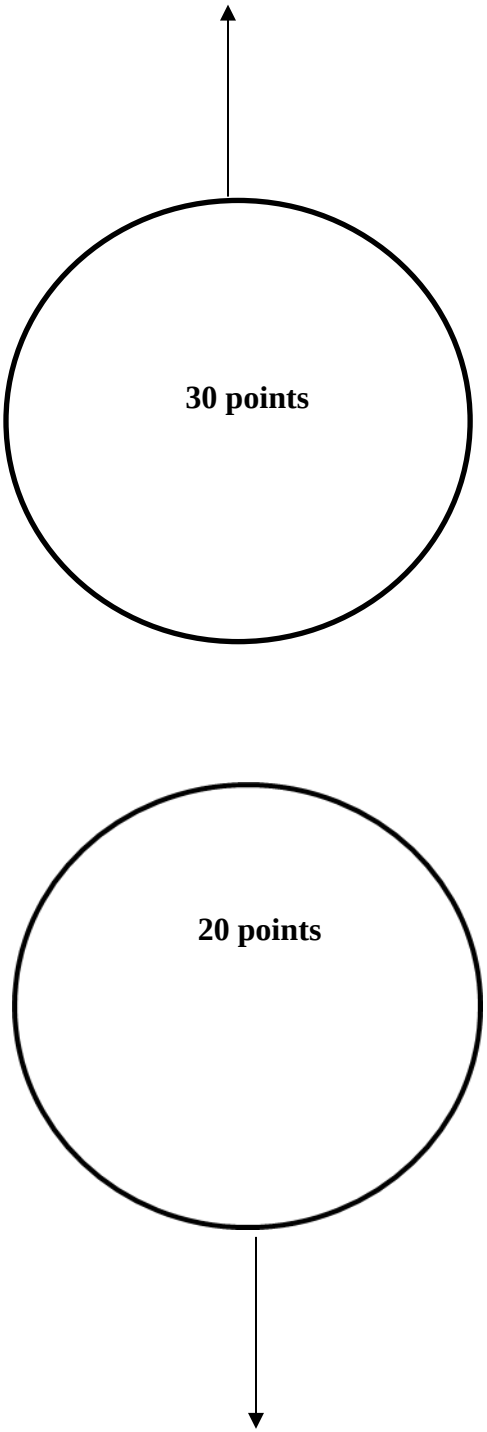
Option A

Other Person



Option B

Other Person



me me

Please answer the following questions:

1. If you choose an option A you will get ___ points.
2. If you choose an option A the other person will get ___ points.
3. If you choose an option B you will get ___ points.
4. If you choose an option A the other person will get ___ points.

Chapter 2

Free to Choose: An Experimental Investigation of the Value of Free Choice

Abstract

This study is the first economic experiment that tests the economic significance of the theory of psychological reactance (Brehm, 1966). For this purpose, I design an economic experiment in which subjects are asked to express their valuation of two-choice situations. In one case, subjects are given absolute freedom, while in another, the extent of their freedom of choice is limited. As the experiment data revealed, subjects' valuation of free and limited choice situations did not differ significantly. Thus, in the experiment, the subjects did not display signs of reactance. In the end, the potential reasons for why the subjects did not exhibit reactance are discussed. The lessons derived from this study may serve as a guide for testing the economic significance of the reactance theory.

Kewords: psychological reactance, freedom of choice, law enforcement

JEL Classification: K0, C90, A1

1. Introduction

There are many real life situations (prohibitive laws, drug regulations, speed limits, etc.) in which the freedom of individuals is limited. The regulation mechanisms usually send a message of authority and punishment, and they usually ignore behavioral aspects of individual liberty. Therefore, without understanding how freedom of choice in economic decision-making works, how individuals value freedom, how people react when their choice autonomy is limited, or how they face a prohibition issued by an external authority, regulation mechanisms may be flawed from a behavioral standpoint and thus limited in their effectiveness. Moreover, understanding the economic significance of freedom could be informative for policy debates regarding the enforcement of prohibitive laws, taxation, and the decriminalization of drug consumption.

The importance of freedom of choice for individual behavior and the consequences of limiting it are thoroughly studied in the social psychology literature originating from the ideas of J. W. Brehm (1966), who developed the theory of psychological reactance. It claims that individuals consider freedom a naturally endowed right, and once choice autonomy is threatened or eliminated, an emotional state arises that triggers individuals to actively strive to restore their freedom of choice. In other words, individuals tend to exhibit "control aversion". There is abundant literature on psychological reactance and related experiments in social psychology[9]. For example, in Hammock and Brehm's (1966) experiment, an experimenter threatened children's freedom to choose a certain candy bar among others by stating that it should not be chosen. Children reacted by more often choosing the prohibited candy bar. Worchel and Brehm (1970) explicitly prohibited subjects from taking a particular position on a

[9] See Clee and Wiklund (1980) for an extensive review.

certain theme, and found that the subjects were then more likely to adhere to the forbidden position. Brehm, Lloyd, Sensenig and Shaban (1966) found that unavailability of certain music recordings increased their attractiveness. Similarly, Worchel, Lee and Adewole (1975) asked subjects to rate cookies that came either scarcely or abundantly supplied. Subjects found the cookies that were scarcely supplied more desirable. Shin and Shin and Ariely (2004)[10] show that subjects are willing to spend money and effort in order to keep options accessible, even in cases when they know that these options will never be used.

While the extent of reactance has been very well studied through the lens of social psychology, little is known about its economic significance. That is, how much economic value, expressed in monetary units, would individuals sacrifice in order to preserve their sense of autonomy and freedom Economists have devoted limited attention to the theory of psychological reactance (Verhallen, 2000; Schneider & Enste, 2000; Tucker, 2011). However, an understanding of how the forces of psychological reactance affect economic decision-making could be important for several reasons. For example, the conventional economic theory of crime, employing a general equilibrium analysis of crime and punishment, implies that the optimal level of fines and types of parameters must be equal to the monetary gains that criminal offenders can obtain from violating a certain law (Becker, 1968; Ehrlich, 1973; Polinsky & Shavell, 2007; and others). However, as the theory of psychological reactance predicts, if criminals derive additional utility, on top of monetary gain, from violating the law, then the optimal level of punishments, derived earlier in economic theory without acknowledgement of the phenomenon of reactance, would no longer be socially optimal. Latter argument, however, would call for the greater acknowledgement of the human need for

[10] I would like to thank Michał Krawczyk for pointing out this extremely interesting reference.

individual liberty to successfully implement regulation mechanisms.

This study is the first attempt to incorporate the theory of psychological reactance into the economics of law enforcement and regulation and to experimentally test the economic significance of the theory. For this purpose, I design an economic experiment in which subjects are asked to express their valuation of two-choice situations. In one case, subjects are given absolute freedom, while in the other, the extent of their freedom of choice is limited. However, in order to measure the extent of reactance solely, a limit is chosen so that in normal situations (i.e. without constraint), the subjects would not pursue a set of behaviors beyond that limit. In the experiment, the subjects do not display signs of reactance, as their valuation of free and limited choice situations did not differ significantly. Potential reasons for this could include a degree of cognitive over exhaustion and a possible lack of salience of the imposed constraint. The lessons derived from this study may serve as a future guide for testing the economic significance of the reactance theory.

2. Literature Review

As noted above, the literature on psychological reactance in social psychology is extensive, and from the mainstream of these studies, a definite pattern of behavioral response to freedom limitation emerges. In particular, the literature shows that if individuals are prohibited from pursuing a certain set of behaviors or substances, they exhibit excess interest in them and often opt by all means to engage in the prohibited behaviors or goods, as they derive additional pleasure from acting against the prohibition. A notorious example occurred in a study that banned the sale and use of detergents containing phosphates in a city in Florida in the early 1960s (Mazis, Settle, & Leslie, 1973). Having no impact on cleaning effectiveness, phosphates were banned solely for environmental reasons. However, city residents, unhappy with the

detergent ban, stopped buying detergents (that did not contain phosphates) in the city's stores and smuggled phosphate- containing detergents from neighboring cities where their sale was legal. Compared to residents of neighboring cities, the city residents who were banned from using phosphate detergents rated them higher in terms of cleaning effectiveness (Mazis et al., 1973). Further, recent record gun sales at U.S. gun trade shows, as a reaction to the intensified debates over gun control in Washington, D.C. that followed the Sandy Hook massacre[11], might be considered an up-to-date example of how the forces of psychological reactance shape individual behavior.

Despite predicting certain behavioral patterns following a prohibition of a good or service, the psychological literature offers less insight into how important, from a pure economic decision- making point of view, preservation of freedom behavior isfor individuals. That is, the psychology literature does not tell us whether, when the law is enforced by means of monetary (fines) or non-monetary (imprisonment, probation) punishments, the utility gain derived from acting against the law outweighs the expected cost of potential punishment. If this is the case, then as several studies below demonstrate, law enforcement, guided by standard deterrence theory, may lack effectiveness, and in fact, it may trigger more people to commit more crimes.

Scientific literature related to Prohibition in the United States acknowledges that the policy was a failure; alcohol consumption increased during the Prohibition era (Dills & Miron, 2003; Miron & Zwiebel, 1991; Miron & Zwiebel, 1995). Peopleeven began to drink poisonous alcohol (Darrow & Yarros, 1927), and the death rate from alcohol poisoning peaked (Coffey, 1975). There is no clear account in the literature which would explain why,

[11] More information can be found at: http://www.dailymail.co.uk/news/article-2256058/Record-sales-Virginia-gunfamilies-stock-weapons-Sandy-Hook-massacre.html

against the predictions of deterrence theory, such a dramatic increase in alcohol consumption occurred during the Prohibition era.

In a famous experiment, Gneezy and Rustichini (2000) show that introducing a small monetary punishment for parents who usually came late to pick up their children from in certain day care centers in Israel doubled the number of late-comers. The authors acknowledge that standard deterrence theory is unable to explain the result. Their explanation is the following. Parents think that by paying the fine, which goes to teachers, they acquire the right to use the teachers' service: that is, to force teachers to care for their children longer. However, a very interesting outcome occurred when the fine was abolished. The number of parent delays remained unaltered from its new higher state. This does not seem to be explained by the argumentation developed by Gneezy and Rustichini, a fact the authors themselves are aware of.

Slemrod, Blumenthal and Christian (2001) demonstrated that after an increase in the probability of being audited, average tax compliance for high income US taxpayers declined. This result is in contrast to the traditional economic theory of tax evasion (Allingam & Sadamo, 1972; Spicer, 1974). The authors' argument is that high income individuals have more opportunities to hire professional lawyers, who can legitimately reduce taxable income. However, this line of reasoning does not explain why the taxpayers' timing for hiring professional lawyers coincided with the policy notice, nor why they did not pursue these legitimate ways of reducing their taxable income earlier (before the announcement of the increased audits).

Although from the standard economic theory point of view the facts above may seem puzzling, the concept of reactance might be a good explanatory tool. It could be the case

that because of reactance, the benefit people derived by acting against the law was more than the expected cost of punishment. Therefore, it seems that a new legal initiative has increased unlawful behavior. If this is the case, then policymakers might need to rethink the ways they plan and implement regulation mechanisms. They may need to look at law enforcement also from a psychological point of view, to acknowledge the human desire for freedom in order to design more efficient enforcement mechanisms. Therefore, testing the economic significance of the theory of psychological reactance and understanding how individuals value freedom may inform policy and may also fill the gap between the theory of deterrence and punishment and human tendencies.

3. Experimental Design & Procedure

3.1 Design

The major aim of the experimental design is to understand how non-binding constraints affect human behavior in various choice circumstances. Ensuring that the constraint is non-binding helps us to estimate the impact of control aversion on individual behavior. The experiment used constrained and unconstrained versions of the following three games: the Dictator Game (DG), the Holt and Laury lottery choice task (HL), and the Simple Effort game (EG).

In the unconstrained DG, the subjects are given an initial endowment and are free to send any amount to the recipient[12]. In the constrained DG, subjects are not allowed to send more than 76% to the recipient. The choice of 76% as a maximum amount subjects can send is arbitrary, though it is chosen to ensure that the imposed constraint is non-binding (based on previous findings), and in a normal situation, no subject would ever consider sharing more than what is imposed by the constraint. Indeed, according to Camerer (2003), the average donations

[12] The recipient in this case was the Czech Red Cross.

in the DGs completed so far are about 20% of the initial endowment, and normally, people do not choose to share more than 50%.

In the unconstrained HL (see Table 1 in the Appendix), subjects can make choices between risky and safe options in the lottery. In the constrained HL, the subjects are not allowed to choose option B (the risky option) more than seven times. Again, the constraint is chosen so that it is not something subjects would usually do. As Holt and Laury (2002) report, subjects choose option B 4.8 times on average, with about 96% of participants never choosing the risky option more than seven times. Therefore, the choice of seven as the maximum number of times a person can choose option B is considered a non-binding constraint with enough safety.

While DG and HL involve other-regarding and risky decision-making respectively, another game is used in order to examine how control aversion affects individual behavior in much simpler individual decision making situations. This effort game, EG — see Table 2 in the Appendix — consists of two tasks. In the first task, the subjects add two numbers in the range of 1 to 10. In the second task, they count the number of zeros in a 6-digit number. For each correct answer, subjects are rewarded; however, the reward diminishes with time. The subjects have 1 minute for both tasks. In the unconstrained EG, they can freely choose how to allocate time between the two tasks. In the constrained version, they are not allowed to pursue the task of adding numbers for more than 45 seconds. Unlike DG and HL, EG has no established results in the literature, which would guide the imposing of a non-binding constraint. However, if one looks carefully at the payoff structure, then choosing 45 seconds as the maximum time that can be spent doing the first task can be considered non-binding. This is so because after 45 seconds, the task of adding numbers pays nothing while switching to the

task of counting zeros can earn subjects considerable money. In fact, the game is designed so that subjects can maximize their earnings if they allocate time between the two tasks evenly[13]. Therefore, it would be fair to assume that normally, people would prefer to maximize their payoff; that is, after 30 seconds, the payoff-maximizing individual would logically switch to the counting task and earn 8 ECUs, rather than to continue adding numbers to earn 2 ECUs and zero thereafter.

The experiment employs a strategy method in order to elicit the individuals' valuation for each of these games. Subjects are initially endowed with 100 currency units (ECUs) and are asked to state their valuations of each version of the game using the Becker-DeGroot-Marschak (BDM) willingness-to-pay (WTP) elicitation mechanism (Becker, DeGroot, & Marschak, 1964). See instructions in the supplementary material section for further details. That is, by paying enough,[14] the subjects can earn the right to play one randomly selected game. In fact, the payoffs for each game are designed so that a rational person would be willing to pay the entire endowment (100 ECUs) to play either version of the above mentioned three games.

If it is observed that subject's WTP is higher in the unconstrained versions compared to the constrained versions, then one might argue that the price differential is driven by their demand for choice autonomy or, in other words, by control aversion. Consider DG for example: The only difference between the constrained and unconstrained versions of the game

[13] The assumption here is the subjects' productivity does not differ too much across the two tasks. In fact, given the reward structure of the game, an individual's productivity in a counting task is not necessarily less than half of his productivity in the math task. Considering the very simple nature of these two tasks, it is reasonable toassume that subjects would be almost equally well-skilled in each.

[14] The subjects can earn the right to play the game by participating virutally in the second price auction for the game. They first have to state their WTP (in the range from 0 to 100 ECU) for the given game. Then, the computer would draw a random number (N) from 0 to 100, and if a participant's stated WTP is higher than the random number generated by the computer, the participant will pay N ECU—not their stated WTP—and will earn the right to play the game if selected. Otherwise, the subjects keep the initial endowment of 100 ECU.

is that in the constrained version, subjects cannot send more than 76% of their endowment. According to previous literature, since sending more than 50% of the endowment is not what subjects usually do, one can say that participants should not mind a non-binding constraint unless they strongly dislike being controlled in any way. The same logic extends also for the other games.

3.2 Experimental sample and procedure

The experiment took place December 2012 in the Laboratory of Experimental Economics (LEE) in Prague. The participants (218 in total) mostly consisted of undergraduate students from various universities in Prague. The recruitment process used the Online Recruitment System for Economic Experiments (ORSEE) (Greiner, 2004). The experiment was conducted in English using z-Tree software (Fischbacher, 2007). Each subject received a printed copy of the instructions (see the supplementary material section).

The experiment consisted of two stages. In the first stage, the subjects learned that they were endowed with 100 ECUs, and their WTP for the constrained and unconstrained versions of the described games was elicited using the BDM procedure. The order of the games was perfectly balanced across subjects. In the second stage, subjects could play one randomly selected game if they paid enough for it in the first stage, and could earn additional points by playing the game. Otherwise, they kept the initial endowment of 100 ECU.

The sessions lasted approximately one hour on average. At the end of the experiment, points were converted to Czech crowns (CZK), and a payment process was administered. Each subject received 350 CZK on average, which was about USD 18 according to the exchange rate at that time. For the sake of confidentiality, the person in charge of payment was not part

of the research team and was not informed of the details of the experiment. Also, personal information the cashier collected about any subject (name, surname, ID number) was not disclosed to the experimenter. This privacy policy was explained to the subjects, and they were told that neither the cashier nor the experimenter would be able to link their decisions in the experiment to their identities[15].

4. Results

Table 1 reports the average WTP for the unconstrained and constrained versions of each game. As the reported numbers reveal, there is virtually no difference in the average WTP in the unconstrained and constrained versions of either game (p = 0.79 for DG; p = 0.41 for HL; p = 0.91 for EG).

Table 1

Summary Statistics:

Game	Mean WTP	Std. Dev.	Observations
DG Unconstrained	47.293	35.06	218
DG Constrained	46.802	33.57	218
HL Unconstrained	60.333	27.87	210
HL Constrained	59.309	26.98	210
EG Unconstrained	52.802	30.34	218
EG Constrained	52.917	29.86	218

After a raw comparison of means, the distributions of WTP across the unconstrained and constrained versions of each game were analyzed. Figures 1-3 plot the kernel density distributions of WTP. A paired-sign test showed no statistical difference in

[15] The cashier paid earnings based on the computer terminal number inscribed on the tokens subjects received at the beginning of the experiment. An experimenter, unaware of the subjects' identity, gave the cashier a payment file, with earnings e linked to the computer terminal number. Therefore, the cashier knew how much to pay the person who was holding a particular token that had the number of the terminal on it.

the distributions of WTP for DG (p = 0.25); HL (p = 0.21); or EG (p = 0.56). The Wilcoxon paired-sign rank test gives identical results.

Figure 1

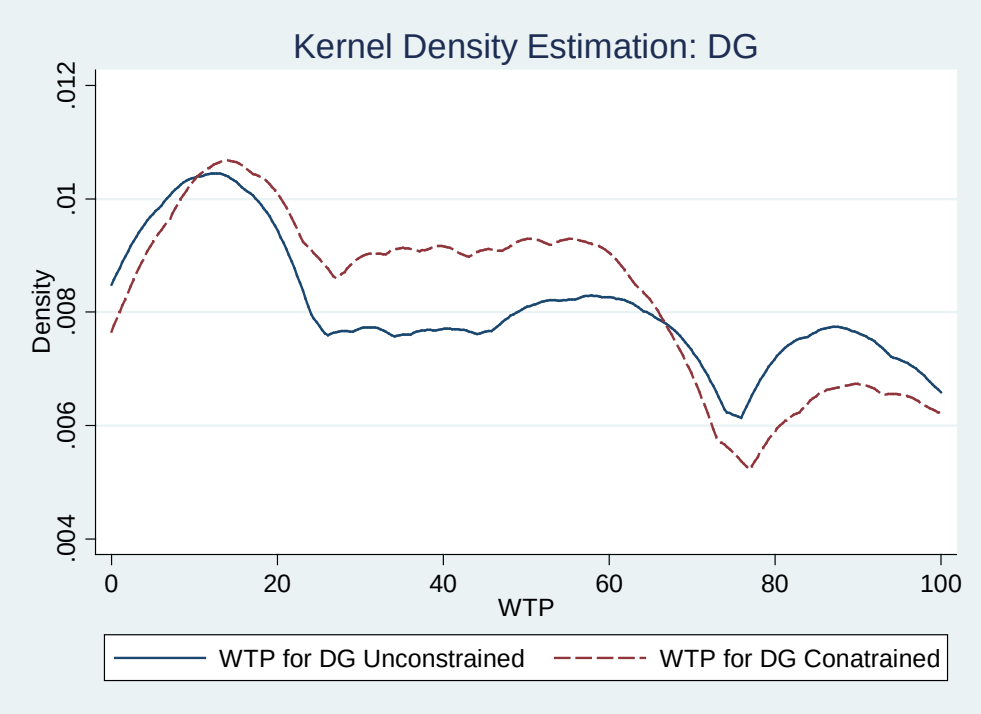


Figure 2

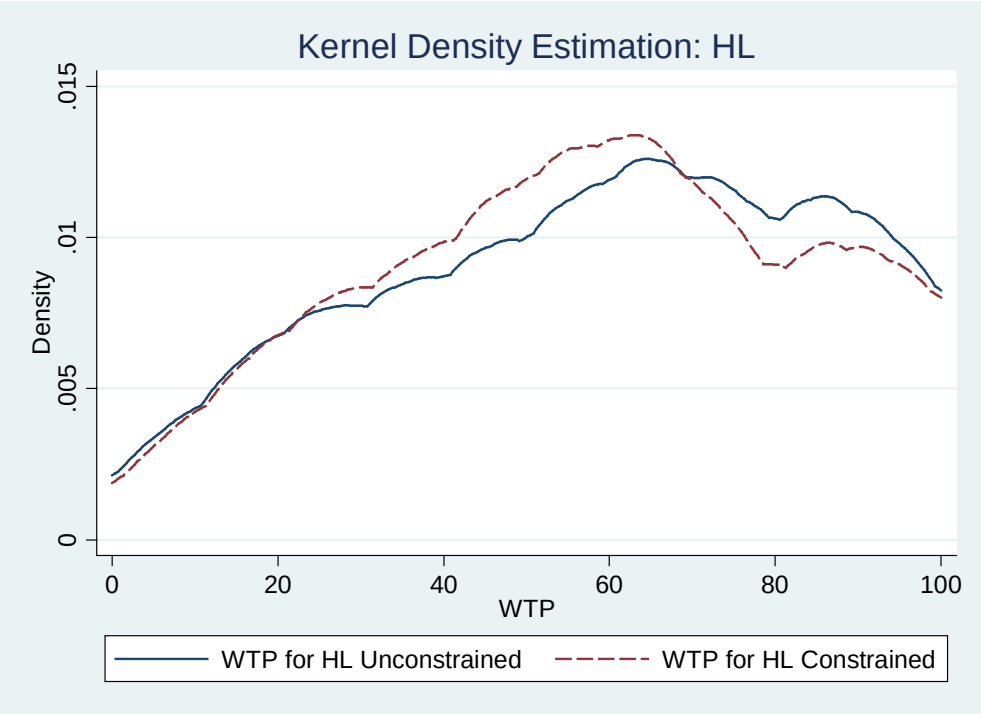
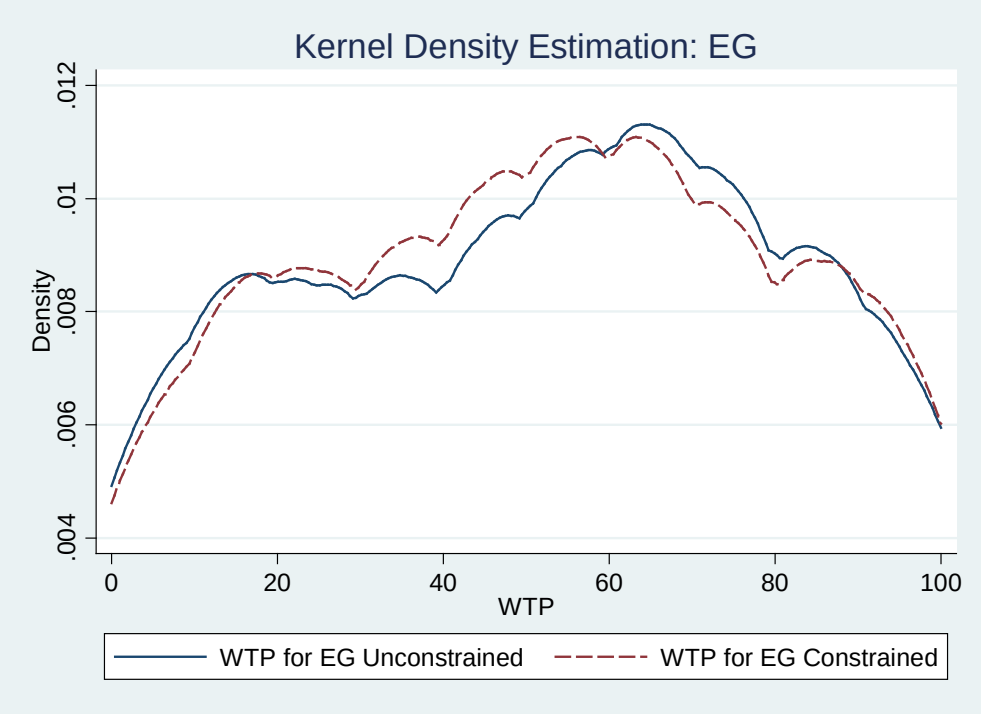


Figure 3



Overall, it appears that there is no difference between the WTP of unconstrained and constrained versions of the games. In other words, in these data, the initial hypothesis about control aversion was not confirmed.

However, looking at the subjects' behavior in individual games reveals interesting patterns. This analysis also confirms that our assumption of non-binding constraints was valid. Table 2 summarizes the subjects' behavior in DG .

Table 2

Summary Statistics: Behavior in Games

Game	Mean	Std. Dev.	Observations
Donation in DG Unconstrained	12.727	21.18	22
Donation DG Constrained	11.625	17.64	16
# of Risky Choices in HL Unconstrained	3.75	1.80	20
# of Risky Choices in HL Constrained	4	1.37	21

There were 38 cases in which participants played a DG (constrained or unconstrained). In 9 of 38 cases, the difference between the prices of DG unconstrained and DG constrained was positive (i.e. the subjects' valuation of the game in which they had freedom of choice was higher compared to their valuation of the constrained version of the game). The mean contribution for these 9 subjects was 27.44, and in only 1 of 9 cases did a subject give beyond the constraint. If we exclude this one person, then giving for the 8 remaining subjects averages 20.25% with minimum 0 and maximum 60.

From these data, the first fact one can conclude is that for these 8 people, the imposed constraint was not binding (i.e. was irrelevant). However, the interesting fact is that the mean difference between the prices of the unconstrained and constrained versions of DG was 44.5 ECU. Given the fact that the constraint was non-binding (i.e. the participants would not

prefer to send more than 70% of their endowment to charity), such alarge difference in valuations could be due to the subject experiencing a strong psychological reaction.

In 20 cases out of 38, the difference between the valuations of unconstrained and constrained versions of DG was zero. The average donation to charity in this case was 7.85% of the initial endowment, again confirming the assumption that the imposed constraint was non-binding. In the remaining 9 cases, the difference between prices was negative. The average donation in this case was 6.4% of the endowment, with a maximum of 20%. In this case though, the participants valued the constrained version of the game 36.4 ECUs higher than the unconstrained one. The reason participants valued a constrained version of the game more could be that these people were the most selfish (as confirmed by the average donation) who did not enjoy giving, but also, once presented with opportunity, they would rather give because they do not like not giving (Lazear, Malmendier, & Weber, 2011). Therefore, it could be the case that these people considered the prohibition a moral excuse for not giving and thus valued the constrained game more.

The LG was played on 41 occasions. In 18 cases, the difference between prices was positive. Of these 18 cases, the average number where subjects chose a risky option was 3.38, with a maximum of 5 times. Therefore, we can conclude that for these subjects, the constraint (th that they could not choose Option B in more than 7 cases) was not binding. The mean difference between prices was 16.25. This may indicate that the subjects experienced psychological reactance. In 18 cases, the difference between valuations is zero. On this occasion, the subjects chose a risky option 4.72 times on average, a number which is far below the imposed constraint. In only 5 cases did subjects value the constrained version of LG more, and they chose a risky option 3 times on average with a maximum of 6 times. The

average difference in valuations was 9.6 ECUs in favor of the constrained version. It could be that these were risk adverse subjects, and they valued the initial commitment of not choosing numerous risky options. Even though we observe that for some people freedom of choice matters, overall we cannot make a claim because the observed data, with a high likelihood, seem to be the result of random behavior.

A similar pattern of valuation differences is observed between the unconstrained and constrained versions of EG. There are people who value the unconstrained version more, seemingly due to reactance, but there are others who value the constrained version of the EG more, and the overall data are consistent with random behavior. One thing to notice though is that in all cases of EG, the subjects chose to switch from the math to the counting task after 45 seconds. That is, their behavior was consistent with the initial assumption that productivity did not differ across tasks, and the subjects would allocate their time so as to maximize their total earnings from the two tasks.

This experiment does not document that control has any significant effect on individual behavior. There could be several reasons why, in this experiment, subjects did not exhibit reactance. The psychological literature implies that reactance is an emotional response, and it manifests when people experience anger or affection (Brehm, 1966). Therefore, it might be the case that while forcing subjects to think about the BDM value elicitation mechanism and dragging them into a very cognitively demanding mode, they were thinking more rationally and less emotionally. It could also be the case that when the experimenter is giving money to subjects, they might feel that the experimenter is also entitled to create the rules of the experiment. Thus, they may not feel motivated to rebel after all. One way to address this problem would be to let subjects earn money and eliminate the entitlement

effect. Another possibility forwhy subjects did not display control aversion could be the method of communicating the prohibitions. Brehm (1966) argues that the extent of reactance is proportional to the degree of threat. In this experiment, the subjects read a prohibitive message on the computer screen and, therefore, lacking a specific source of authority, the threat level of the message could have been low. If instead it was an experimenter who communicated the message, then the perceived threat to freedom could have been higher.

5. Conclusion

This study was a first step in bringing the theory of psychological reactance into economics and documenting experimentally that people dislike control. For this purpose, I designed an experiment in which subjects were asked to express their valuation of two-choice situations. In one case, subjects were given absolute freedom, whereas in another, their freedom of choice was limited. However, in order to measure control aversion solely, a limit was chosen so that in normal situations (i.e. without constraint), subjects would not pursue a set of behaviors beyond that limit. Even though it can be said that for some subjects the prohibition may have lowered their valuation of the game due to control aversion, the overall data did not confirm that subjects' valuation of free and limited choice situations differ significantly. Thus the initial hypothesis was not confirmed.

This study does not document that the forces of psychological reactance have an effect on individual behavior. However, as I have pointed out, it could be the case that subjects experienced reactance as they were forced to make rational decisions to the extent of reactance, which is a delicate emotional trait, but it was diluted and did not show up in this particular experiment. It is also possible that the constraint imposed in this experiment was not salient enough to induce reactance.

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Appendix A

Table A1 Holt and Laury lottery choice task

Option A	Option B	Expected payoff difference
1/10 of 120 ECU, 9/10 of 96 ECU	1/10 of 231 ECU, 9/10 of 6 ECU	70.2 ECU
2/10 of 120 ECU, 8/10 of 96 ECU	2/10 of 231 ECU, 8/10 of 6 ECU	49.8 ECU
3/10 of 120 ECU, 7/10 of 96 ECU	3/10 of 231 ECU, 7/10 of 6 ECU	30 ECU
4/10 of 120 ECU, 6/10 of 96 ECU	4/10 of 231 ECU, 6/10 of 6 ECU	9.6 ECU
5/10 of 120 ECU, 5/10 of 96 ECU	5/10 of 231 ECU, 5/10 of 6 ECU	-10.8 ECU
6/10 of 120 ECU, 4/10 of 96 ECU	6/10 of 231 ECU, 4/10 of 6 ECU	-30.6 ECU
7/10 of 120 ECU, 3/10 of 96 ECU	7/10 of 231 ECU, 3/10 of 6 ECU	-51 ECU
8/10 of 120 ECU, 2/10 of 96 ECU	8/10 of 231 ECU, 2/10 of 6 ECU	-70.8 ECU
9/10 of 120 ECU, 1/10 of 96 ECU	9/10 of 231 ECU, 1/10 of 6 ECU	-91.2 ECU
10/10 of 120 ECU, 0/10 of 96 ECU	10/10 of 231 ECU, 0/10 of 6 ECU	-111 ECU

Table A2 Effort game payoff structure.

Exercise “math”		Exercise “counting zeros”	
0-15 seconds	8 ECU	0-15 seconds	8 ECU
15-30 seconds	6 ECU	15-30 seconds	6 ECU
30-45 seconds	2 ECU	30-45 seconds	4 ECU
45-60 seconds	0 ECU	45-60 seconds	2 ECU

Supplementary material

Instructions

Welcome to our experiment.

This is an experiment in the economics of decision-making.

The instructions are simple, and if you follow them carefully and make good decisions, you might earn a considerable amount of money. Different participants may earn different amounts. Your payoff and the payoff of other participants in this experiment will be measured in **Experimental Currency Units (ECU)**. Throughout the experiment, all **values** are stated in **ECU**s as well. At the end of the experiment, the experimental units you earned will be converted into a cash payoff in **CZK** using the exchange rate **1ECU = 2.5 CZK.** Average earnings in this experiment will be **400 CZK**. Your cash payoff will be **rounded up to the next nearest 10 CZK**. You will be paid in cash privately at the end of the experiment.

The accountant who is in charge of the payment is not a member of the research team and has not been informed about the details of the experiment. Therefore s/he cannot infer your behavior in the experiment from your earnings. Also s/he will not disclose the amount you will earn to the experimenters. Therefore none of the experimenters will be able to match your personal decisions to your identity. Your decisions in this experiment **will remain absolutely confidential**.

The experiment will take place through the computer terminals at which you are seated. It is important that you keep your eyes on your own screen. During the experiment, **please do not communicate with other participants**. Please turn off your mobile phone at this time. If you have a question, please raise your hand and one of the experimenters will assist you.

A pen and a note sheet are prepared for you on your desk in case you want to use them.

Procedure

In this experiment you are given an initial amount of **100 experimental currency units** (**ECU**s).

The experiment consists of **two stages**:

STAGE 1

In the **first stage**, you will be presented with six games: **G1**, **G2, G3, G4, G5, and G6**. Later in the **second stage**, the computer program will randomly choose one of these six games that you might play. It is equally likely that any of these six games will be chosen. You can earn **additional ECU**s by playing the game.

In order to play the selected game, you need to pay any amount from **0** to **100 ECU**. Below, we shall explain in detail how the payment process works.

First of all, you will be asked how much from **0** to **100 ECU** you are willing to pay to be able to play any of the six games. After you state your willingness to pay (**P**), the computer randomly draws a number (**N**) from **0** to **100**.

If your stated willingness to pay for the selected game is greater than or equal to the randomly drawn number by the computer (that is **P≥N**), then you obtain the right to play the selected game, and **you need to pay N ECU for it** — not the amount of your stated willingness to pay (**P**). In the **second stage**, you make a decision in the selected game, and the amount of **N ECU** will be deducted from your final payoff.

If your stated willingness to pay for the selected game is strictly less than the randomly drawn number (that is **P<N**), then you will not obtain the right to play the selected game in the second stage, and you keep **100 ECU**.

To clarify, consider the following example. If your stated willingness to pay for a particular game is **60 ECU** (**P**) and the randomly drawn number is **15** (**N**), then, if this game is selected, you will play the game (because **P>N**) and **15 ECU** (**N**) will be deducted from your final payoff.

If your stated willingness to pay for a game is **60 ECU** (**P**) and the randomly drawn number is **80** (**N**), then, if this game is selected, you will not play the game (because **P<N**), you will not pay anything and you keep **100 ECU**.

Please note that any numbers used in the examples above are for **illustrative purposes only**. They are not supposed to be suggestive of anyone's actual behavior in this experiment.

Given the mechanism of the payment procedure, it is in **your best interest** to state your **true willingness to pay** to play the given game. That is, given **your true willingness to pay** for the game, you will never do better than stating it truthfully. We ask you to take this for granted for now, and in case there are any further questions the experimenter will be happy to explain this in more detail after the experiment.

STAGE 2

As stated earlier, in the **second stage** the computer will randomly select one game out of G1, G2, G3, G4, G5, and G6. Each game has an equal chance of being selected. Call this game **G**.

Then the computer will randomly draw a number (**N**) from **0** to **100**.

Case 1: P≥N

If your stated willingness to pay (**P**) for G is greater or equal to **N**, then you will play **G** and pay **N ECU**.

Your Payoff = Initial Amount (**100 ECU**) – Number drawn by the computer (**N**) + Earnings from **G**.

Case 2: P<N

If your stated willingness to pay (**P**) for G is lower than **N**, then you will not play the game.

Your payoff = Initial Amount (**100 ECU**).

Further Information

The remaining instructions in this experiment will be shown on your screen. You will have these printed instructions at hand during the entire experiment, so you can refer to them at any time you wish.

Please wait until the Instruction Stage is over. When asked, press the "START THE EXPERIMENT" button that will show up on your screen.

Chapter 3

Did the Patriarch Cause a Baby Boom in Georgia?

Abstract

In response to the problem of shrinking birthrates in the country, in October 2007, the head of the Georgian Orthodox church announced that he would personally baptize any third and further baby born to Orthodox families from that time. This study uses the initiative as a natural experiment to explore the economic consequences of religious activity. This analysis uses individual level survey data from the Caucasus Resource Research Center (CRRC) Georgia on fertility before and after the initiative for Orthodox Christians (treatment group) and Non-Orthodox Christians (control group) population to identify the effect of the church leader's promise on birth rates. Difference-in-differences estimation procedure is employed to examine the potential causal effect. This analysis does not find evidence that the church initiative had an effect on fertility.

Kewords: fertility, religion, Christianity, Difference-in-Differences, panel data

JEL Classification: J13, Z120, C13

1. Introduction

In 2007, the head of Georgian Orthodox church announced that he would personally baptize any third and further baby born to Orthodox families from that time in an effort to increase the dangerously low birth rates in the country. In March 2009 the BBC reported: “Church leader sparks Georgian baby boom” and further “Two years after having one of the lowest birth rates in the world, Georgia is enjoying something of a baby boom, following an intervention from the country's most senior cleric”. The results are, in the words of the Georgian Orthodox Church, "a miracle".”[16] In the report we read that the number of births during 2008 increased nearly by 20% and the church officials claim that major credit for the dramatic increase in birth rate must be attributed to Patriarch’s announcement[17]. However, in the same report the head of Georgia’s Civil Registry says that the noticeable increase in the birth rate is due to the economic boom. According to the National Statistics Office of Georgia, the birth rate per thousands of population increased from 11.2 in 2007 to 12.9 in 2008, which is approximately a 15% increase, whereas the birth rate from 2000 until 2007 had been fluctuating around 11. According to the same statistics, Georgia experienced remarkable growth in real GDP by about 10 % in 2006-2007, which lessened in 2008 due to war with Russia but still remained significantly higher than in the previous years.

This study aims to empirically investigate whether the church leader’s initiative triggered the considerable increase in the birth rates in post 2007 Georgia. This analysis uses individual level survey data from the Caucasus Resource Research Center (CRRC) Georgia on fertility

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[16] The information can be found at http://news.bbc.co.uk/2/hi/europe/7964302.stm .

[17] The report with similar sentiment was published by the CNN on April 2010. The source is available at : http://www.cnn.com/2010/WORLD/europe/04/23/georgia.powerful.patriarch.ilia/index.html

before and after the initiative for the Orthodox Christian (OC) (treatment group) and the Non-Orthodox Christian (NOC) (control group) population to identify the effect of the church leader's promise on birth rates. Difference-in-differences estimation procedure is employed to detect any potential causal effect.

2. Literature Review

This paper is related to two streams of literature. The first is the analysis of economic consequences of religious behavior. The origins of the study of religion as an important driver of socio-economic outcomes can be traced back to Max Weber's (1905) essay[18] on the differences in per-capita GDP across Protestant and Catholic nations in Europe. McCleary and Barro (2003) show that countries with high levels of religious observance (i.e. attendance at religious services) experience lower GDP growth. However, according to the same study, increased belief in existence of hell and heaven imply higher GDP growth. Crabtree (2010), based on a Gallup poll across 114 countries, reports that the countries with highest frequency of religious population are those which have the lowest per-capita incomes. Lipford, McCormick and Tollison (1993) demonstrated that states with higher rates of church membership have significantly lower rates of violent and nonviolent crimes. According to Lehrer (2004), in the United States religion affects various social activities of individuals including divorce, marriage and fertility. Recent research in experimental economics explores the impact of religion on altruism and cooperation, as these studies through the lens of religiosity analyze the subjects' behavior in Dictator (Eckel & Grossman, 2004; Tan, 2006), Public Good (Anderson & Mellor, 2009), Prisoner's Dilemma (Chuah, Hoffmann, Jones, & Williams, 2011) and Trust games (Bellemare & Kroger, 2007;

[18] The Protestant Ethic and the Spirit of Capitalism

Johansson-Stenman, Mahmud, & Martinsson, 2008) respectively (see Hoffman, 2012 for review).

The second stream of literature this paper related to is about the effects of persuasive communication on sales, voting behavior, charity contributions and investments (see DellaVigna & Gentzkow (2009) for a review of empirical evidence). Stark and Finke (2000) argue that relatively high fertility rates in Mormon populations can be explained by the fact that Mormon Church generously offers social approval and blessings to families who have many children and these offerings (or church recognitions) are greatly appreciated by the Mormon community. Bassi and Rasul (2015) find a positive impact of the papal visit on the frequency of unprotected sex and short run fertility behavior in Brazil. However, they find no long run effect of papal visits on overall fertility.

This study aims to assess whether the Patriarch's call, as Georgian clergy maintains, triggered the increase in birth rates in Georgia or if birth rates increased due to other factors which may have involved improved aggregate social well-being. DellaVigna and Gentzkow (2009) claim that most important factor in the effectiveness of persuasion is personal contact. In the context of this paper, an agent, in this case the head of church, tried to influence the demographic outcome of the country, and he was personally involved in the persuasion campaign. Therefore this paper can also provide evidence for whether personal contact is an effective strategy in persuasive communications.

3. The Initiative and the Country of Georgia

In October 2007, the head of the Georgian Orthodox Church, officially referred to as the Catholicos-Patriarch of All Georgia, announced that he would personally baptize any third and

subsequent child born after the promise was made. The Patriarch is a highly influential and recognized authority among the Georgian population. According to the CRRC, about 94% of the Georgian population considers him the most trusted man in the society. At the end of 2008, he baptized almost 5000 infants at the main Sameba (Holy Trinity) Cathedral, and the tradition continues today.

The announcement of the Catholicos-Patriarch's initiative can be considered a good natural experiment given the composition of the religious population of Georgia. In particular, despite the majority of OCs who constitute 84% of the population, Georgia is also populated with NOC ethnic minorities.. The majority of the NOC population is comprised of Armenians and Azerbaijanis, who represent about 15 % of the population.

The OC population can be labeled adopters of the church initiative and NOC ethnic minorities can be described as non-adopters. The identifying assumption is that the number of births before the Patriarch's announcement followed a similar path across these groups. The latter argument allows for the application of difference-in-differences method to identify the impact of the religious leader's initiative on birth rates in Georgia.

4. Data

This analysis uses household level survey data provided by the CRRC Georgia (Caucasus Barometer Regional Dataset)[19]. Among other household demographic characteristics, it contains information about how many children families have and in which year they were born. It also contains information about parents' religious affiliation and the intensity of their religious

[19] I used 2010-2012 survey data and retroactively created data for fertility behaviour from 2000 to 2010. The dataset runs through 2010, because for the people who answered the Caucasus Barometer survey in 2010 we do not have data in 2011 and 2012.

belief[20]. From the survey data I constructed two kinds of panel datasets. The first contains information about the birth rates in a given year. Table 1 depicts the summary statistics. The share of OC population in the dataset (0.82) is very close to the national average (0.85). The incidence of birth is constructed so that it is one if in a given year family has a new child and is zero otherwise. Table 1 shows that the probability of having children and the age of the mother does not differ significantly across groups, though OCs report having a significantly higher measure of intensity of religious belief ($p<0.001$). Because the church initiative was targeted specifically for third and subsequent children it is interesting to study its impact specifically on the targeted population of newborns. Therefore the second dataset was formed containing information about the incidences of births of third and subsequent children (See Table 2 for summary statistics). The latter dataset is constructed differently to the first one. In this case the households can only enter the data one year after the birth of their second child. For example, a family might have had a second child in 2005. In this case, the family participates in the data from 2006 onwards. If in any year after 2006, a family had the third or subsequent child the incidence would be one, otherwise it would be zero. Those families who had only one child from 2000 to 2010 are not included in the data. Table 2 shows that there is no difference in terms of incidence of having a child across two groups but the age of the mothers and the reported intensity of religious belief is significantly higher in the OC population.

[20] There are two measures of the intensity of religious belief in the data. The first is importance of religion which is a categorical variable on the scale of 1 to 4. It equals one if religion is not important in a respondent's life and four if religion is very important. The second measure is a level of religiosity of a respondent which is also a categorical variable on the scale of 1 to 10. It equals one if a person characterizes herself/himself as not religious and ten if a respondent considers him/herself as very religious. The results in this analysis are based on the first measure of the intensity of religious belief. The results are identical if the second measure is used. See Tables S1-S2 in Supporting Information online at http://home.cerge-ei.cz/lanchava/Chapter%20III%20Supporting%20Information.pdf .

Table 1. Summary statistics for the sample for dataset 1.

	All			OC			NOC			P
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	
Incidence of Having a Child	23892	0.064	0.246	19613	0.065	0.247	4279	0.061	0.240	0.345
Age of Mother	2172	25.18	7.863	1783	25.23	7.778	389	24.98	8.247	0.580
Intensity of Religious Belief	2172	3.27	1.173	1783	3.42	0.601	389	2.61	2.234	0.000

Notes: P shows statistical significance for two tailed t-test.

Table 2. Summary statistics for the sample for dataset 2.

	All			OC			NOC			P
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	
Incidence of Having a Child	9637	0.024	0.155	7545	0.023	0.151	2092	0.029	0.169	0.107
Age of Mother	1231	31.56	6.592	973	32.03	6.413	258	29.82	6.968	0.000
Intensity of Religious Belief	1231	3.25	1.179	973	3.41	0.611	258	2.68	2.199	0.000

Notes: P shows statistical significance for two tailed t-test.

5. Empirical Analysis and Results

5.1 Main Results

To estimate the impact of the Patriarch's initiative on the number of births, the difference-in-differences estimation procedure is used. Consider the following regression of the incidence rate for 2000-2010:

$$Incidence_{it} = \beta_0 + \alpha_{it} + \beta_1(Treatment \times After_{it}) + \beta_2 After_{it} + \beta X_{it} + \varepsilon_{it} \quad (1)$$

where X_{it} is the set of controls. $After_{it}$ is a dummy variable which equals 1 from year 2008[21]. $Treatment_{it}$ is a dummy variable, which is one for OCs (treatment group) and zero otherwise (NOCs, control group). $Treatment \times After_{it}$ is an interaction term which is supposed to measure the effect of the church leader's initiative on the birth rate. α_{it} controls for household level fixed effects.

One of the main assumptions of difference-in-differences estimation is that the outcome variable follows the same trend for the treatment and control groups in the absence of the Patriarch's announcement. The identification strategy may be confounded by disproportionate fear among OC and NOC populations of continuing conflict with Russia in 2008. Abu-Musa, Kobeissi, Hannoun, and Inhorn (2008) report that in some countries, due to wartime stress, fertility among affected populations is lower, though the evidence is not conclusive. However, the war with Russia was short in duration (5 days) and it was local. The international response (from NATO, US, France) was quick and it was clear immediately that it would not turn into a large scale conflict. But if it is true that Georgians (i.e. Orthodox Christians) feared continuation of conflict more, then we should observe a substantial increase in number of children born to Georgian families after 2008[22] and again that would bias our results towards a greater effect of church intervention on fertility rates. The fact that we do not find an effect reinforces the refutation of church's hypothesis.

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[21] There was a dramatic (20%) increase of number of births in 2008 compared to 2007 in Georgia. The Georgian Orthodox Church attributed this increase to a miracle. One of the aims of this paper was to test the latter hypothesis. With the recent definition of variable 'after' the results must be biased towards the positive result of church intervention, because 2008 was the year when the largest percentagewise increase in number of births with respect to the previous year occurred. If, even with this specification, we do not find the effect, we can safely assume that the church intervention indeed had no impact on fertility behaviour in Georgia.

[22] Doepke, Hazan, and Maoz (2015) show that World War II had a positive long term effect on fertility in Europe.

We also restricted our analysis to one particular geographic location — the capital of Georgia. The results stand robust, thus indicating that regional differences were not an issue.

Figures 1 and 2 depict the evolution of the birth rate over time for all and third and subsequent children respectively. As the figures show there is a significant divergence in the trends of outcome variable of the treatment and control groups in 2004-2006

Figure 1

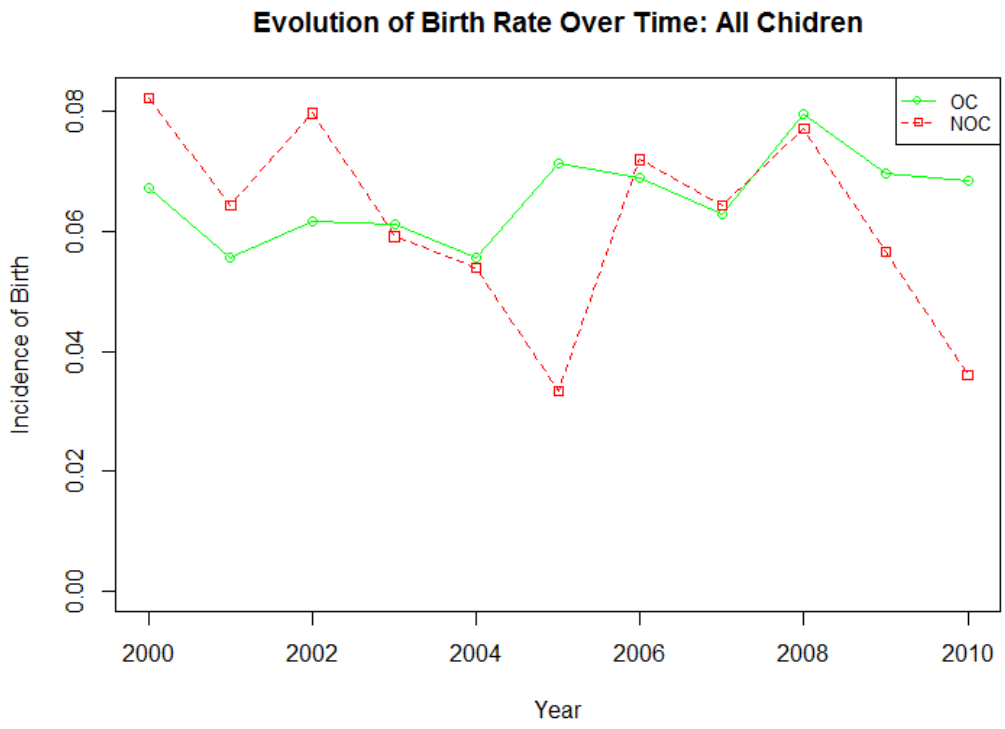


Figure 2

To account for the diverging paths of the outcome variable I controlled for time trend in equation (1) which becomes:

$$Incidence_{it} = \beta_0 + \alpha_{it} + \beta_1(Treatment \times After_{it}) + \beta_2 After_{it} + \beta X_{it} + t_{it} + t \times Treatment_{it} + \varepsilon_{it} \quad (2)$$

Where t_{it} refers to the year.

Equation (2) was estimated while controlling for household level fixed effects. Standard errors were clustered at household level. Table 3 reports the estimation results for all children. Column (1) shows that the desired coefficient is negative but virtually zero in magnitude and statistically not significant. Column (2) displays the results of the regression while controling for available covariates. Including additional variables hardly changes either the size or the significance of the coefficient of interest. Perhaps an intuitive observation is that mothers who had a child in the previous year are less likely to give a birth to another child in a given year.

Table 3

The Impact of the Initiative on the Incidence of Having a Child: Dataset 1
Controlling for Household Fixed Effects

	Incidence of Having a Child	
Dependent Variable	(1)	(2)
$Treatment \times After$	-0.005	-0.006
	(0.014)	(0.014)
$After$	0.012	0.025*
	(0.012)	(0.013)
Mother's age		0.007*
		(0.004)
Mother's age squared $\times 10^{-3}$		-0.502***
		(0.000)
Parents had a child in a previous year		-0.111***
		(0.006)
Constant	0.660	-42.343***
	(1.654)	(5.290)
Control for time trend	*Yes*	*Yes*
Observations	23892	23892
R^2	0.0005	0.0237

Notes: Coefficients in all columns are OLS regression estimates, clustered standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively.

Table 4 reports the estimation results of equation (2) in case of the third and subsequent children while controlling for household fixed effects. Column (1) shows a surprising negative sign of the coefficient of interest, though it is not statistically significant. I re-estimated regression adding available controls as explanatory variables. As depicted in Column (2), the interaction term still has a negative sign and is not statistically significant, indicating that church policies did not have an effect in case of the third and subsequent children. This regression also shows that parents are more likely to have the third or subsequent child if the time which has passed since the birth of the last child is longer.

Table 4

The Impact of the Initiative on the Incidence of Having 3rd and Subsequent Child: Dataset 2 Controlling for Household Fixed Effects

	Incidence of Having a Child	
Dependent Variable	(1)	(2)
$Treatment \times After$	-0.012	-0.011
	(0.010)	(0.011)
$After$	0.018*	0.019*
	(0.010)	(0.010)
Mother's age		-0.015***
		(0.005)
Mother's age squared $\times 10^{-3}$		-0.053
		(0.000)
Parents had a child in a previous year		-0.148***
		(0.016)
# of years passes since the birth of 2nd child		0.010***
		(0.003)
Constant	4.262**	-11.478***
	(1.733)	(3.238)
Control for time trend	*Yes*	*Yes*
Observations	9637	9637
R^2	0.0032	0.0215

Notes: Coefficients in all columns are OLS regression estimates, clustered standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively.

As shown above, a simple comparison of OC and NOC populations did not reveal a significant effect of the church initiative on fertility rates. The above analysis can be enriched by controlling for intensity of religious belief. Figures 3 and 4 depict the evolution of birth rate over time for groups with various intensity of religious belief for all and third and higher children respectively. Again, we see the similar picture of divergent trends of fertility.

Figure 3

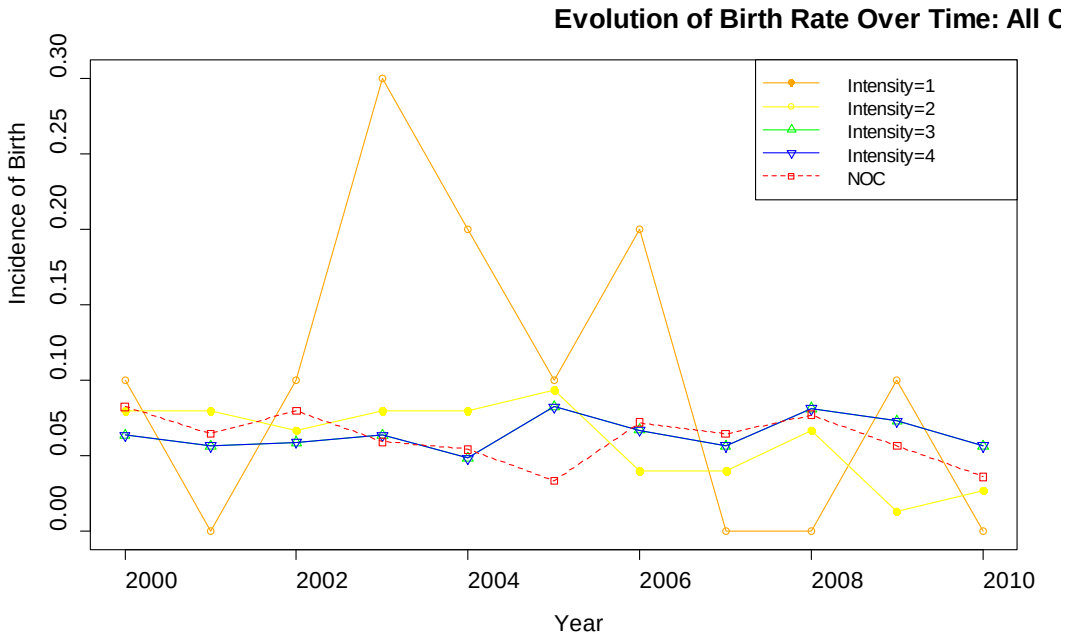
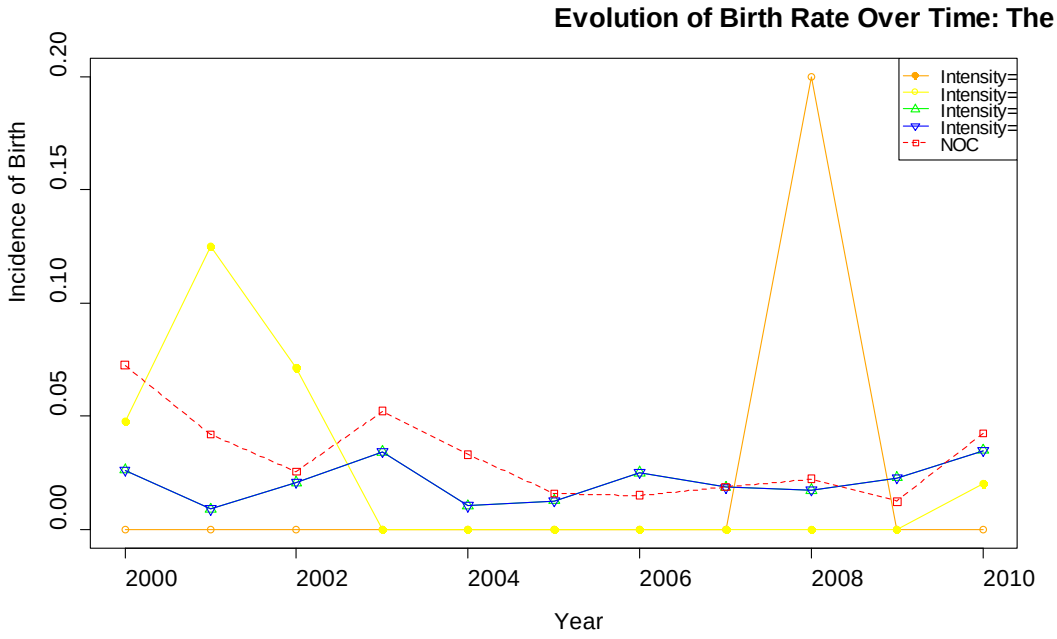


Figure 4



Therefore to account for diverging trends of the outcome variable I estimate modified version of equation (2):

$$Incidence_{it} = \beta_0 + \alpha_{it} + \beta_1(Treatment \times After_{it}) + \beta_2 After_{it} + \beta X_{it} + t_{it} + t \times Treatment_{it} + \varepsilon_{it} \quad (3)$$

Where $Treatment_{it}$ in this case is a product of a dummy variable, which is one for OCs (treatment group) and zero otherwise (control group), and the measure of the intensity of a religious belief. Tables 5 and 6 report estimation results for all and third and subsequent children respectively. The results remain virtually unchanged and show that the church initiative did not have a statistically significant effect on birth rates in Georgia, either in case of all children or the third and subsequent children[23].

One possible explanation for the non-result can be peer effects on fertility. That is, the Patriarch's announcement may have had an indirect effect on fertility norms among NOC groups. This is because if the NOC population observes their neighbors having more children, they may want to catch up. This spillover effect may decrease the significance of estimated coefficients. It may be also the case that Patriarch's announcement induced wide media coverage of the issue of fertility and thus affected OC and NOC groups equally by promoting higher fertility. These are valid concerns and there is no way to address them empirically. However, some specific facts about NOC groups in Georgia may throw light on the issue. First of all, the majority of NOC population live segregated in specific regions of country with little or no contact with the Georgian OC population. Therefore it is less likely that fertility peer effects could have been strong. Also, because among these NOC groups Azerbaijanis practice Islam and

[23] It may be argued that the religious leader's initiative would have stronger impact on marginal or lukewarm believers, because strong believers would have been expected to follow the Patriarch's directions for having numerous babies prior to the announcementand they would not need to change their fertility decisions. If this is true, we should expect an inverted u-shape relationship between intensity of religious belief and strength of the policy effect and such inverted u-shape may be responsible for the non-result. We performed a similar analysis as in Table 5 and 6 for lukewarm believers only, but did not find evidence of statistically significant effect of church policy on the probability of having a child for this group either. The results are not reported here. They are available upon further request.

Armenians are members of the Armenian Apostolic Church it is not likely that the announcement of Orthodox Patriarch appealed to them. Finally, the majority of these groups are not literate in Georgian[24] and therefore the effects of the Georgian media's coverage of fertility issue could not have found fertile ground among them.

Table 5

The Impact of the Initiative on the Incidence of Having a Child: Dataset 1 Controlling for Household Fixed Effects and Intensity of Religious Belief as Measured by Importance of Religion

	Incidence of Having a Child	
Dependent Variable	(1)	(2)
$Treatment \times After$	0.003	0.003
	(0.003)	(0.003)
$After$	-0.002	0.011
	(0.011)	(0.011)
Mother's age		0.007*
		(0.004)
Mother's age squared $\times 10^{-3}$		-0.502***
		(0.000)
Parents had a child in a previous year		-0.111***
		(0.006)
Constant	0.660	-42.368***
	(1.654)	(5.281)
Control for time trend	*Yes*	*Yes*
Observations	23892	23892
R^2	0.0005	0.0237

Notes: Coefficients in all columns are OLS regression estimates, clustered standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively.

[24] See p.29 in Trier and Turashvili (2007).

Table 6

The Impact of the Initiative on the Incidence of Having 3rd and Subsequent Child: Dataset 2 Controlling for Household Fixed Effects and Intensity of Religious Belief as Measured by Importance of Religion

	Incidence of Having a Child	
Dependent Variable	(1)	(2)
$Treatment \times After$	-0.002	-0.002
	(0.003)	(0.003)
$After$	0.016	0.015
	(0.010)	(0.011)
Mother's age		-0.014***
		(0.005)
Mother's age squared $\times 10^{-3}$		-0.058
		(0.000)
Parents had a child in a previous year		-0.148***
		(0.016)
# of years passes since the birth of 2nd child		0.010***
		(0.003)
Constant	4.245**	-10.906***
	(1.732)	(3.574)
Control for time trend	*Yes*	*Yes*
Observations	9637	9637
R^2	0.0031	0.0215

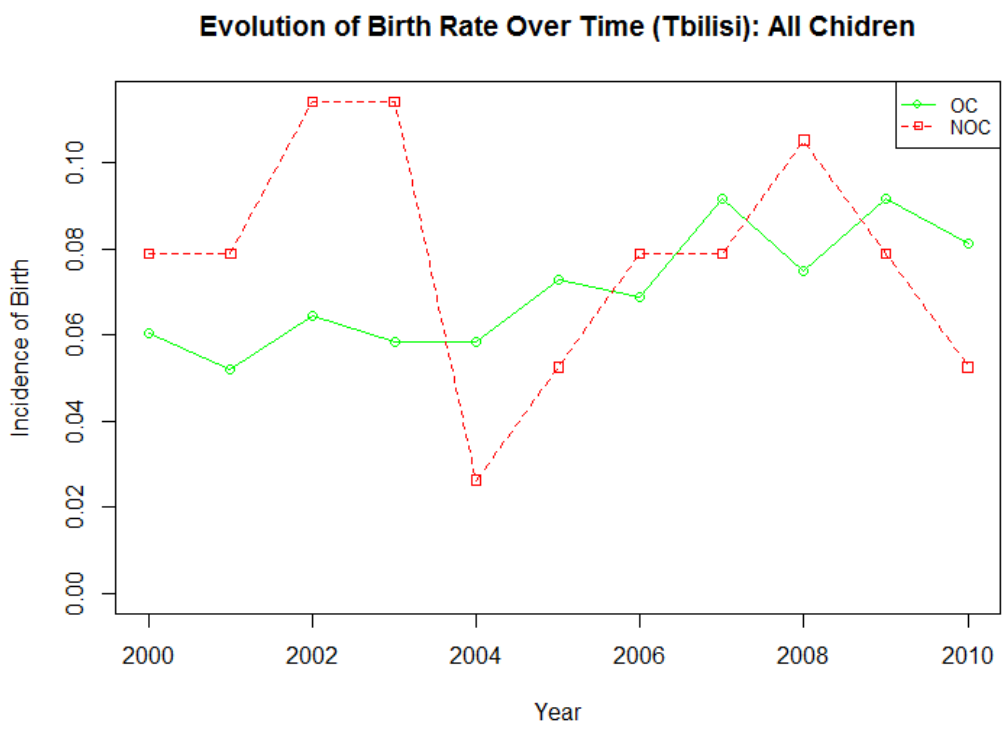
Notes: Coefficients in all columns are OLS regression estimates, clustered standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively.

5.2 Robustness check

It might be argued that the NOC regions of Georgia enjoyed better economic conditions after 2007, which translated in higher incidence of births among the NOC population. This would in turn bias the coefficient of interest towards zero. To address this concern, it would be interesting to do the same analysis only for the capital city of Tbilisi, in which NOC ethnic minorities are

disproportionally represented[25]. Confining analysis to the capital city would potentially make similar trend assumptions more reasonable due to uniformity of socio economic factors that could influence birth incidence rates over time. Investigating the impact of church policy on birth rates for Tbilisi is interesting for another reason as well. As mentioned above, the baptism ceremony took place in the main cathedral, which is located in Tbilisi. Therefore, mainly due to geographic proximity, one would expect that the effect of Patriarch's initiative would be stronger in the capital.

Figure 5



[25] According to CRRC data, the share of NOC population in Tbilisi is 8% (cf. national average of the share of NOC population is 15%).

Figure 5 plots the evolution of the birth rate over time in Tbilisi for all children[26]. Again, it can be seen that there is a significant divergence in the trends of outcome variable of the treatment and control groups. Therefore, I estimated equation (2), controlling for time trend. Estimation results are presented in columns (1) and (2) in Table 7. Neither specification supports the argument that the Patriarch's initiative had a statistically significant effect on birth rates.

Table 7

The Impact of the Initiative on the Incidence of Having a Child (Tbilisi): Dataset 1
Controlling for Household Fixed Effects

	Incidence of Having a Child	
Dependent Variable	(1)	(2)
$Treatment \times After$	0.009	0.008
	(0.009)	(0.009)
$After$	-0.033	-0.016
	(0.031)	(0.034)
Mother's age		0.015
		(0.009)
Mother's age squared $\times 10^{-3}$		-0.559***
		(0.000)
Parents had a child in a previous year		-0.141***
		(0.010)
Constant	-6.526	-41.031***
	(3.406)	(12.388)
Control for time trend	*Yes*	*Yes*
Observations	5698	5698
R^2	0.0019	0.0323

Notes: Coefficients in all columns are OLS regression estimates, clustered standard errors are in parentheses; ***, **, and * indicate significance at 1%, 5%, and 10% level, respectively.

Overall, despite the claims of the Orthodox Church of Georgia, this analysis does not support the idea that the Patriarch's initiative had a statistically significant effect on the birth rate

[26] Robustness analysis was done for all children only. It was not possible to perform a similar exercise for the third and subsequent children because of the insufficient number of NOC families who actually had three or more children during the entire 11 year span.

of either all or the third and subsequent children. The results remain robust if the analysis is performed for the capital city only.

6. Conclusion

Following the Catholicos-Patriarch of All Georgia's initiative in October 2007, Georgia experienced an unprecedented baby boom starting from 2008. According to Georgian Orthodox clergy, the major credit for increased numbers of birth must be attributed to church intervention. Given the composition of the religious population of Georgia, this study uses the Patriarch's call as a natural experiment to study the impact of religion on the number of births. Analyzing the household level data on the incidence of births by using difference-in-differences estimation procedure revealed no statistically significant effect of the initiative on the dramatically increased birth rates. Despite the fact that the Patriarch was in personal contact with the beneficiaries of the initiative, the persuasion strategy did not seem to work in this case. Instead, the dramatic increase of birth rates could have been triggered by the improved economic conditions in Georgia. This may suggest that economic theories modeling fertility decisions on either micro or macro level should account for household economic situation as an important predictor variable.

One limitation of the study is the lack of very comparable control and treatment groups due to divergence in fertility trends between OC and NOC populations. Controlling for time trends does not completely solve this issue.

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