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The impact of China's One-Child Policy on economic preferences: A regression discontinuity design

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Abstract

In 1979, China's government adapted the One-Child Policy (OCP), a radical approach to limiting population growth. The One-Child Policy can be regarded as a natural experiment, which allows investigation of whether being a single child in the family changes individuals' economic preferences. Using the Global Preference Survey and employing a regression discontinuity design, I found that OCP significantly changed people's risk preferences, and social preferences, which will reshape Chinese society and economy.

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1 Introduction

In 1979, China's government adapted the One-Child Policy (OCP), a radical approach to limiting population growth. This policy requires urban couples to have only one child except ethnic minorities. This has led to concern about the effect of this policy on human capital(Qin et al., 2017), the single-child generation's health(Zhao and Zhou, 2018), individuals' non-cognitive skills.(Fletcher and Kim, 2019).

A rich literature in psychology and behavioral economics argues that one's personal experiences and environment have a significant influence on economic preferences (Falk et al., 2018; Basin and Verdier, 2000; Dohmen et al., 2012; Malmendier and Nagel, 2011).The OPC created a special living environment for a single-child generation, which limited family size. Most children in this generation did not have siblings. Studies has shown that siblings could help children learn to trust others and be altruistic (Bergstrom and Stark, 1993; Keller, 1997). Siblings also could change people's risk attitude (Kimball et al., 2009). Hence, the hypothesis that being a single child will be more selfish and less likely to trust others is widely believed. However this hypothesis has not been well tested. It is because that as families with only one child are often related with families' financial status, families' structure or parents' special preference. Which making one child families themselves very different from non-one-child families. Hence it is hard to conclude that people with no siblings have special economic preferences. China's OCP provide us a natural experiment, which make the whole generation has no siblings, to investigate the effect of no siblings on economic preferences.

Cameron et al. (2013) has used several standard economics experiments to compare the risk preference and trust between the pre- and post-OCP generations in Beijing, which is the only study focus on OCP's effect on economic preferences. However, it has some limitations: First, it only used the subjects from Beijing. As the political center of China, Beijing has its particularities in economy, policy and culture, which makes it difficult to represent the vast region of China. Second, this study only investigate risk preference and trust, while other important economic preferences, such as altruism and time preference, remain unexplored. To investigate more economic preferences and the universality of findings, I administered a large-scale specialized survey(Falk et al., 2018). I then estimated the effects of the OCP on an individuals' economic preferences using a regression discontinuity (RD) approach, with the birth cohort as the running variable, to help control for selection bias. I first confirmed the results of Cameron et al. (2013) that OCP made individuals more risk-averse. I found the OCP made people less altruistic. The results are robust to alternative regression function specifications and bandwidth choices.

The paper makes two contributions to the literature. First, it enriches the study of

China's One-Child Policy. Second, it adds to the literature on how interactions with peers, including siblings, impact individuals' economic preferences. The paper proceeds as follows: In Section 2, I describe the survey and data. In Section 3, I discuss the approach to statistical inference. I present the main results and several robustness checks in Section 4. Section 5 provides discussions and conclusions.

2 Measurement and Data

I adapted the Global Preference Survey (GPS) (Falk et al., 2018) to measure economic preferences. Also, participants completed a demographic survey. Between March to July 2019 data were collected on Sojump (http://www.wjx.com), which is one of the most popular online survey platforms in China, using their paid sample service. They randomly picked registered users from their 2.6-million person sample of those who lived in different cities in China and have diverse demographic backgrounds. All subjects provided informed consent before participating. I collected 1258 responses; however, 221 omitted critical information, leaving 1037 valid responses. In order to make sure our sample is no selection bias, we compare our sample to data from the 2010 Chinese census and the 2018 wave of the China Family Panel Studies (CFPS) for the same birth cohorts, they have similar demographic and socioeconomic characteristics.

I measured six kinds of preferences: risk preference, time preference, altruism, positive reciprocity, negative reciprocity, and trust. The questions came from the Global Preferences Survey. This survey is the best way to measure the economic preference that I was interested in. The designers validated their survey questions by using experiments with financial incentives and gave each question a relative weight to ensure the survey captured actual preferences even without a real monetary reward.

I also collected demographic data from participants, including whether they were the single child in their family, gender, the family's annual income, education level, their parents' education levels, and whether they belong to a minority group.

3 Method

The goal was to determine whether there is a causal relationship between OCP and economic preferences. Let Y_i represent the economic preference of individual i and $single_i$ be the treatment status, i.e., whether the individual was the single child in the family. To motivate our approach, consider an OLS regression.

Table 1: Survey description

Preference	Item description	Weight*
Risk taking	Lottery choice task	0.53
	Qualitative survey question	0.47
Patience	Inter-temporal choice task	0.71
	Qualitative survey question	0.29
Positive reciprocity	Qualitative survey question	0.48
	Gift exchange task	0.52
Negative reciprocity	Qualitative survey question: take revenge	0.37
	Qualitative survey question: punish unfair toward self	0.265
	Qualitative survey question: punish unfair toward others	0.265
Altruism	Qualitative survey question	0.46
	Altruism task	0.54
Trust others intention	Qualitative survey question	1

* In cases where more than one component is used to measure preferences we create an index using weights assigned by the designers of the Global Preference Survey (GPS) based on an experimental validation procedure.

$$Y_i = \beta_0 + \beta_1 single + \varepsilon_i \tag{1}$$

Equation (1) compares the preferences of a single child to the preferences of individuals who have siblings. In the event of non-random selection of individuals who were single child, an ordinary least squares approach has the potential to produce biased results. For example, parents who belong to a minority group are allowed to have two children and some wealthy families may pay a penalty to have more children. Any of these possibilities would bias the results if ordinary least squares regression analysis was used.

For this reason, I employed a regression discontinuity design (RD). The RD approach is a quasi-experimental pre-test/post-test design strategy that is useful in establishing causality in which participants have not been assigned to conditions in a random manner. It takes advantage of a discontinuity in the data, in this case, the beginning of the One-Child Policy (1979), and compares observations that lie on either side of this threshold. Since there are untreated observations on both sides of the program starting date, I used a fuzzy RD design to identify the causal effect of the One-Child Policy on individuals' economic preferences.

A fuzzy RD approach provides a research design that allows discontinuity to be an instrumental variable for the status of being a single child, which can be regarded as a locally randomized experiment. In the fuzzy RD design, whether one is a single child partially depends on the location of one's running variable, in this case, the birth year, relative to the cut-off point (1979).

This can be defined as:

$$P_r\left(\text{single-child}_i = 1 | x_i\right) = E\left(\text{single-child}_i | x_i\right) = \begin{cases} g_0\left(x_i\right) & \text{if } x_i \leq x_0 \\ g_1\left(x_i\right) & \text{if } x_i > x_0 \end{cases} \tag{2}$$

where $g_0(x_i)$ is the density function of being the single child before the cut-off and $g_1(x_i)$ is the density function of being the single child after the cut-off. x_i is the running variable, the birth cohort, and x_0 is the cut-off point of the running variable, defined as the birth cohort of 1979. I assumed $g_0(x_i) < g_1(x_i)$ at the cut-off point x_0.

$E[Y_{0i}]$ is the expected value of preferences of all the individuals if there was no OCP. I assume that around the cut-off point x_0, $E[Y_{0i}|x_0]$ is smooth and $E[Y_{0i}|x_0] = f(x_i)$. Suppose the effect of the treatment, being the single child, is ρ, and we have $Y_{1i} = Y_{0i} + \rho D_i$, where $D_i = 1$ if the individual was the single child and Y_{1i} is the preference of the single child individual. Now we have:

$$Y_i = f(x_i) + \rho D_i + \varepsilon_i \tag{3}$$

Since $E[Y_{0i}|x_0]$ is smooth at point x_0, then:

$$\lim_{x_i \to x_0^+} E[f(x_0)] = \lim_{x_i \to x_0^-} E[f(x_0)] \tag{4}$$

Thus we have

$$\lim_{x_i \to x_0^+} E[Y_i|x_i = x_0] - \lim_{x_i \to x_0^-} E[Y_i|x_i = x_0] = \rho(\lim_{x_i \to x_0^+} E[D_i|x_i = x_0] - \lim_{x_i \to x_0^-} E[D_i|x_i = x_0]) \tag{5}$$

From equation (2), $E[D_i|x_i]$ is not smooth at the point x_0. As such, I used:

$$\rho = \frac{\lim_{x_i \to x_0^+} E[Y_i|x_i = x_0] - \lim_{x_i \to x_0^-} E[Y_i|x_i = x_0]}{\lim_{x_i \to x_0^+} E[D_i|x_i = x_0] - \lim_{x_i \to x_0^-} E[D_i|x_i = x_0]} = \frac{\beta_1}{\alpha_1} \tag{6}$$

The empirical analysis implements a Fuzzy RD by using the two-stage, least square (2SLS) regression, making the discontinuity of the probability of being a single child an instrumental variable (Hahn et al., 2001). The endogenous explanatory variable is the single child, and the IV is being born after 1979. The first-stage of the 2SLS is to estimate the α_1 in equation (6) by

$$\min_{\alpha_0,\alpha_1,\alpha_2,\alpha_3} \sum_{i=1}^{N} K\left(\frac{x_i - x_0}{h}\right)[D_i - \alpha_0 - \alpha_1 T_i - \alpha_2 f(x_i - x_0) - \alpha_3 f(x_i - x_0) T_i]^2 \tag{7}$$

and β_1 is estimated from

$$\min_{\beta_0,\beta_1,\beta_2,\beta_3} \sum_{i=1}^{N} K\left(\frac{x_i - x_0}{h}\right)[Y_i - \beta_0 - \beta_1 T_i - \beta_2 f(x_i - x_0) - \beta_3 f(x_i - x_0) T_i]^2 \tag{8}$$

Table 2: Predetermined variables check

VARIABLES	(1) Female	(2) Education	(3) Income	(4) Minority	(5) Father's edu	(6) Mother's edu
RD_Estimate	0.128	0.719*	18.14	0.0683	-0.306	0.165
	(0.163)	(0.417)	(13.40)	(0.0700)	(0.407)	(0.503)
Observations	1,037	1,037	1,037	1,037	1,037	1,037

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

where T_i is an indicator equal to one if $x_i \leq x_0$, zero otherwise. h is the bandwidth selected according to Calonico et al. (2014) and $K\left(\frac{x_i - x_0}{h}\right)$ is a common triangle kernel weight suggested by Imbens and Lemieux (2008).

The first important assumption of RD design is that there is a discontinuity of density of being a single child. I calculated the single-child percentage from China's 2005 min-census data, and there is a significant discontinuity at 1979 (22.94 % before vs 54.04 % after).

The second validity test is checking whether the predetermined variables of the participants are smoothly distributed around the cut-off point. I collected information on six predetermined variables: gender, family annual income level, education level, minority status, father's education levels, and mother's education levels. I ran the RD regression by using these predetermined variables as the dependent variables, and the regression results are shown in Table 2. All the coefficients were not significant, so I could not reject the null hypothesis that the distribution of the predetermined variables was smooth and continuous around the cut-off point.

The third potential concern is that parents might have manipulated the timing of their childrens' births. In our case, it is reasonable to believe that people would not have known before 1977 that there would be a one child policy in 1979, meaning that parents could not have deliberately timed the birth of children as to avoid having them being a single child. Studies also shown that there is no baby boom before 1979 (Hesketh et al., 2005). Which makes it is clear that people who were born just before 1979 and those who were born just after 1979 have no significant different background when they were born.

4 Results

Figure 1 plots the relationship between the proportion of respondents who report being a single-child and birth cohort. The first-stage regression shows that people born before the cut-off had a 48.4% lower probability of being a single-child than those born after (p=0.000).

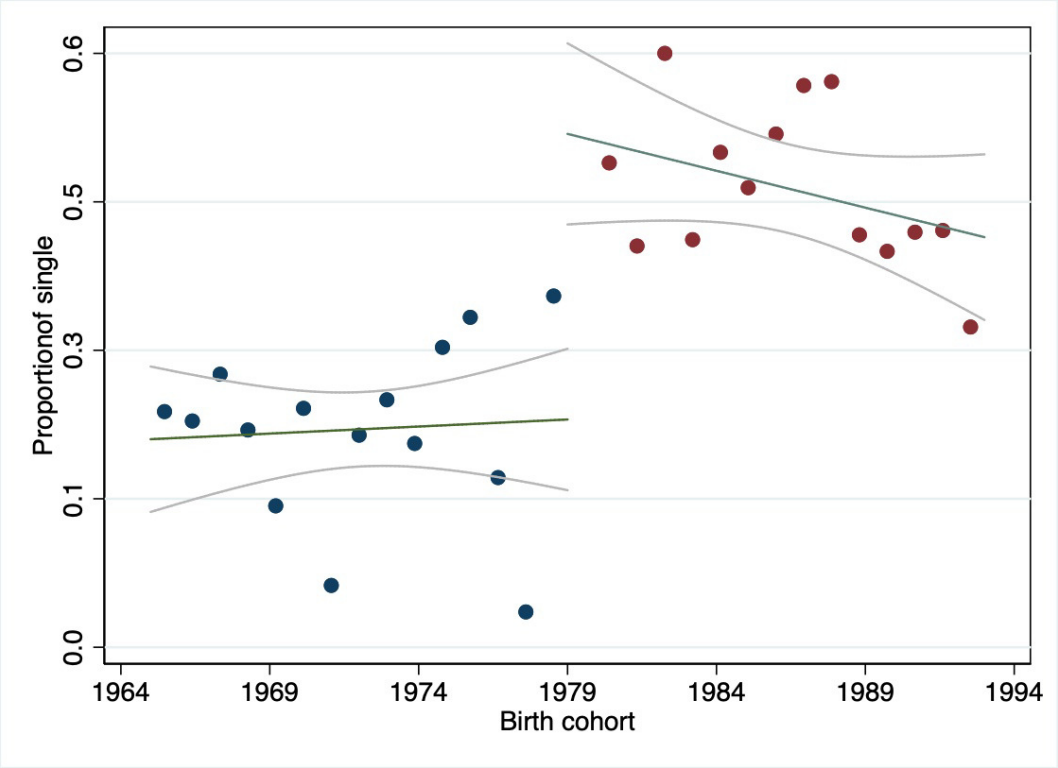

Figure 1: Distribution of single child probability: Each dot represents the proportion of people who were single child of a family within each year cohort, and the green lines are the linear fits for each side of the cut-off, and the gray lines mark the 95% confidence interval.

Table 3: Baseline results

VARIABLES	(1) Risk tolerance	(2) Patience	(3) Pos. R.	(4) Neg. R.	(5) Altruism	(6) Trust
RD_Estimate	-2.251**	1.410	-0.239	0.358	-1.823**	-0.203
	(1.123)	(0.969)	(0.660)	(0.893)	(0.825)	(0.815)
Eff. Observation	178	178	244	178	178	244
Conventional p-value	0.05	0.15	0.72	0.69	0.03	0.80
Bandwith(year)	4.91	4.90	6.52	5.07	5.98	6.90

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

Table 4: Robustness check

VARIABLES	(1) Risk tolerance	(2) Patience	(3) Pos. R.	(4) Neg. R.	(5) Altruism	(6) Trust
Control variables	-2.702**	1.354	-0.256	0.544	-1.494*	-0.314
	(1.106)	(0.959)	(0.679)	(0.700)	(0.821)	(0.845)
Bandwith(-1 year)	-1.606**	0.580	-0.0980	0.694	-2.037***	0.248
	(0.682)	(0.626)	(0.486)	(0.595)	(0.548)	(0.600)
Bandwith(+1 year)	-1.033*	0.534	-0.0873	0.684	-1.987***	0.376
	(0.567)	(0.537)	(0.450)	(0.523)	(0.529)	(0.520)
Epanechnikov kernel	-2.687**	1.381	-0.243	0.393	-1.479*	-0.571
	(1.084)	(1.060)	(0.754)	(0.856)	(0.843)	(1.004)
Local quadratic	-2.334**	1.113	-0.175	0.632	-1.338*	-0.459
	(0.972)	(0.863)	(0.696)	(0.631)	(0.713)	(0.946)

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

The regression results in Table 3 are consistent with the hypothesis that the experience of being a single-child changed participants' economic preferences. The coefficients of being a single-child are significantly negative for risk tolerance (p=0.045), and altruism (p=0.027). I found no effect of patience, reciprocity and trust in others.

Then I performed robustness checks. First, I controlled for the demographic variables in a local linear regression, including gender, family annual income level, and parents' education levels. Second, I tested the sensitivity of the effect of OCP to the bandwidth choice. I used different bandwidths of $h^* - 1year$ and $h^* + 1year$ to do the RD regression, where h^* denotes the optimal bandwidth Cattaneo et al. (2018). Third, I use the Epanechnikov kernel function as an alternative. Fourth, I used a local quadratic regression as a robustness check. Results are shown in Table 4 and are consistent with the baseline results in Table 3.

5 Conclusions

This paper uses the One-Child Policy in China as a natural experiment to study the impact of being a single child on an individual's economic preferences. It was based on survey data using the Global Preferences Survey and utilized a fuzzy RD design. The results show that OCP significantly changes people's economic preferences. It makes people more risk-averse, and less altruistic.

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